



6. Industrial disasters: booming in an unsafe environment

6.1: Industrial safety: miles to go

6.2: Legal safeguards

6.3: Site selection: hazardous

6.4: Industry's attitude: human lives not worth a dime

6.5: Observance of the law: weak

6.6: Risk documentation and management: inadequate

6.7: Civil society and trade unions: unsure and inactive

6.8: The way ahead



6: Industrial disasters: booming in an unsafe environment

Yet another year passes by, the 14th in a row, to commemorate World's worst ever-chemical disaster in Bhopal. After Methyl IsoCyanate (MIC) leak on 2-3 December 1984 from Union Carbide factory occurred decimating sixteen thousand and injuring half a million, Bhopal has become synonymous to industrial unsafety [1].

The whole world had taken the incident with unparalleled seriousness including India and everyone had hoped that industrial world would take impeccable measures to ensure safety in industries. But even after so many years, the impression is: "Nothing has been done after Bhopal to improve the safety in Indian industries. Whatever has been done is insignificant (in comparison to what needs to be done)", opines Dr. C. Sathyamala, an epidemiologist who has worked on the health effects of Bhopal victims. Although the Ministry of Environment and Forest (MOEF), which is the nodal ministry for handling safety of chemical industries claims to have initiated great measures to ensure safety. "Bhopal is with which not only India but the whole world learnt lessons on industrial safety", replies Dr. Indrani Chandrasekhran, an additional Director with MOEF. "Though it (industrial safety) has not reached a comfortable level, there has been a substantial improvement in industrial safety in India after Bhopal", echoes Director Environment, Safety and Health of Ranbaxy, Mr. VN Das.

6.1 Overview of industrial safety in India

However, what makes above claims immensely interesting is the statistics on chemical accidents in India after Bhopal. Some are here for consideration. In 1985, release of hexacyclopentadiene killed 200 people in Cochin. 11th November 1988, fire and explosion in a factory in erstwhile Bombay killed 35 and injured 26 people. Same year, a fire in an oil refinery in the same place took lives of 35 and injured 16. Similarly, 93 were killed and 53 injured when explosion and fire happened in Medhvan Khind in 1991. Same year, 100 more people were exterminated by LNG caused explosion and fire in Bombay Ahmedabad highway. Two years later, Sulphuric Acid release from a factory in Kalyan, Maharashtra killed 49 and injured 1123 [2].

The list of accidents does not end here only. MOEF has come out recently with a comprehensive list of chemical accidents that have occurred in India after Bhopal. According to the report, there have been as many as 119 industrial accidents between 1984 to 1995 involving hazardous chemicals (Table 1) [2]. The report entitled 'Preparedness and Response to Chemical Emergencies, India Country Report' has been prepared by Pune based consultancy company Prestels India. "Risks due to hazardous chemicals can never be eliminated because the risks are inherent with hazardous chemicals", explains Chandrasekharan. "It can only be minimised by taking suitable risk control measures", she adds. There are others in agreement too. "No Industry is failsafe, you cannot take a full control of nature and all humans", philosophises VN Das. But, the fact of the matter is whatever be the position - beyond debates and arguments - the rate and the magnitude with which accidents are affecting human lives, it looks inevitable that people of India may have a lot more to pay to galloping industrialisation/liberalisation.



The aforementioned MOEF report indicates that a major share of the accidents goes to the fire, explosion and toxic release killing a total of over thousand and injuring nearly six thousand people. Fire alone accounts for near 34% of the mishap, followed by toxic release (31%) and chlorine related accidents (Table 1).

Table 1: Some common causes of industrial accidents between 1984 -95 in India as shown in the report.

Type of material	Number of accidents	Number	
		Dead	Injured
Fire	40	237	217
Toxic release ¹	37	24	810
Others ²	18	455	1097
Explosion	09	235	311
Chlorine	06	02	1574
Sulphuric Acid	3	74	1133
Ammonia	3	10	630
Flammable release	3	00	66

Source: [2]

¹ **Toxic** substances cover a wide range from toxins of natural origin, botulism toxin, snake venom, fish toxin, pyrrolizidine alkaloids, **dioxins**, cyanides, phosgene, mustard gas, organophosphates as sarin and tabun, oleum.

² **Others** include Liquid Petroleum Gas (LPG), acetone, gasoline, oleum, methyl acrylate, sulphur dioxide, hydrochloric acid etc.

Table 2: Number of major industrial accidents in different states of India between 1984-95.

State of the accident	Number of accidents	Number	
		Dead	Injured
Maharashtra	39	376	2278
West Bengal	12	11	240
Madhya Pradesh	10	43	1085
Tamil Nadu	10	202	75
Kerala	8	209	61
Delhi	8	25	40
Gujarat	8	01	151
Andhra Pradesh	6	21	37
Bihar	5	232	237
Punjab	5	8	558
Uttar Pradesh	4	30	02
Goa	2	---	02
Haryana	2	NA	NA

Source: adapted from [2].



Of the total number of accidents, nearly 33% have happened in Maharashtra followed by West Bengal (10%) and Tamil Nadu and Madhya Pradesh (8% each). Maharashtra does not only have a ridiculous distinction of the highest number of accidents but also accounts for the highest number of dead and injured from a single state. 32% dead and 39% injured of the total in India (Table 2). "Number wise the accidents in Maharashtra may be more but statistically, considering the very high number of industries, it will not be much. In Maharashtra, even the documentation of accidents is better", explains Ms. Chandrasekharan. "Compliance to MOEF rules is best in Maharashtra", resonates Mr. VN Das, "This is because there is an excellent partnership between the regulatory authorities and the industries", he adds. Ironically, 10 accidents in Madhya Pradesh after Bhopal also speak of the seriousness with which the bitter experience of 1984 has gone down the throat of the concerned authorities. It is important to point out here that the said list only includes chemical accidents and excludes accidents related to nuclear, railway electrical and others.

So, almost one industrial accident every month is definitely an enviable number. More so when there are well defined accident-prone areas. According to sources well placed in MOEF, the reasons at all levels. "Old technologies as it is make Indian industries innately vulnerable to accidents", comments a high placed official with the ministry on condition of anonymity. Obviously, for such extraordinary high number of accidents in the country, reasons for them must be wide ranging. Some are being discussed below.

6.2: Legal safeguards

Strange are ways of law. After the Shriram oleum gas leak case (1986), which happened after the Bhopal tragedy, a whole new chapter, chapter IVA was added to the statute **related to the running of industries**. It deals with hazardous processes. There are provisions for Site Appraisal Committee to certify where a factory may be located, there are provisions for compulsory disclosure of information about the dangers including health hazard, that could give rise exposure from the materials in the factory or in handling the material during manufacture, transportation, storage or other processes. A disaster management plan is to be drawn up even before a factory may commence activity. For the first time, workers are statutorily accorded the right to **be an important actor in the safety management**. And for the first time again, the compulsory disclosure of information is not only to the inspector under the act but also the local authority and to the general public in vicinity of the factory -- an acknowledgement of the nearness of people at large to the risk of disaster. And that is not all. Along with some constructive laws, some legal flaws are also tucked away in an obscure cranny - specially the infamous section 7B(5) is worth taking a look at. Even as the government put up a semblance of a battle to make Union Carbide Corporation (UCC) pay for the hazardous and deadly technology, this (7B5) incongruous provision, undebated, was slipped into the law. This section spells virtual absolution for the manufacturer, designer, importer or supplier of plant and machinery. Where the user of such plant or machinery gives a written undertaking "to take the steps specified in such undertaking to ensure so far as it reasonably practicable the article will be safe (without the risk of the health of the worker) when properly used". "This law shall have the effect of relieving the designer,



manufacturer/s from what is otherwise prescribed as a duty to care for the safety and health of the workers. That is, a transfer of technology agreement could now relieve the future Union Carbides, the Duponts and other chemical giants of answerability for the effects of the technology they transfer to India. In the unequal world of transferred technologies, this provision only serves to place the company controlling the technology beyond the reach of law”, writes Usha Ramnathan, a law researcher at Indian Law Institute in Hindu daily. **This means once a technology is transferred and the user country has undertaken to operate it safely, in case of a machinery failure and accident, the supplier can get acquitted by citing bad operation as the reason and can wash its hands of all responsibilities. And in the era of liberalisation where technology transfer is a common parlance, this provision will make people a scapegoat of a blunderous legal commission of malafide.** “Legal hurdles have insidiously and wickedly been kept in the law”. Such prejudgments will absolve culprits in advance”, she adds to elaborates the consequence of such provisions.

Ironically, Indian law system is not capable of handling such cases where masses are to be compensated for loss of life, health and property. “Despite repeated occurrence of industrial accidents, the principles on which a person can go to the court and get compensation have yet not been established”, says S Murlidhar, an advocate in the Supreme Court (SC). “We only have standards laid down under the Motor Vehicle Act, Railways Act, Workman’s Compensation Act and these are as it is not satisfactory”, he adds. “The present civil law has not developed to an extent that it can tackle the occurrence of such mass torts and the litigations that arise from it”, elaborates Murlidhar.

The argument does hold water. The existing judicial system has so far not been able to take on the load of these many cases. This is substantiated by the fact that Bhopal has been going on for 14 long years and still is in different states of unfinish. Depressingly, such massive delay in the making of justice, the wait becomes eternally long causing litigation fatigue. So even there is any injustice made in the name of justice, the victim has no strength to contest it further.

Then, the onus of proving affliction/death is on the victim only. This is a colossal task because more often the victims have no control on information, the proof of affliction has to be got from the medical reports in the hospitals. All these leave grand scopes for corruption. As a consequence, the level of injury is scaled down from death case to injury. For example, half of death claims in Bhopal were converted into injury and compensations were accordingly slashed down. Although the original settlement envisaged a compensation of 1-3 lakhs in death cases, the highest claim disbursed is just one lakh. “It is a tragedy after a tragedy”, moans Murlidhar.

Another lacuna is that disposal of procedures of justice have no time limit. So even after 15 years of the incident, victims will be paid at the rate 15 years ago, that too with no interest. For example, The Union of India is known to have 1200 crores (to be given to Bhopal victims) undisbursed. Over these years, this money has been swelling up with interest, but the interest is not being shared with the victims for which they are entitled.



Moreover, there is no provision for future claims of any kind, when it is known that the impact of MIC may well affect the next generation, the next century.

Apart from deficiencies in Civil Liabilities Law, the Criminal Laws are also inadequate. For example, there were 3 foreign and 9 Indian accused in the Bhopal case. Charge was culpable homicide not amounting to murder. The three foreign accused refused to present themselves before the court, and therefore they were declared as 'proclaimed absconders' by the Judicial Magistrate in Bhopal. Later the magistrate ruled if they fail to turn up, their property will be attached. Now, their property was their share in the Union Carbide. Those shares in Union Carbide were wickedly invested to float a trust called Bhopal Hospital Trust (BHT) endowing all their shares in UCC to BHT, with an obvious aim to defeat the attachment. And all these were done on 20th march 1992, just seven days prior to the hearing. The Magistrate, anyway, attached Union Carbide's property and asked CBI to extradite the Chairman Union Carbide, Mr. Warren Anderson. Later US government disclosed that no such request of extradition was received from the Government of India. So that is that.

About the Indian accused, the case was separated from foreign accused and in their case, SC quashed the charge of culpable homicide and enforced 304 A of Indian Penal Code in stead, which is Rash Negligent Act. This is normally invoked in motor accidents in rash driving. Unbelievable!!! But this is pointer to the fact that the present substantive criminal law is too inadequate to deal with mass torts.

"In our system of criminal law, we do not have a way of dealing with corporate criminals. We have no means of understanding how to arrest a company, can you jail a corporation", questions Murlidhar. "In my opinion, like Environment Protection Act and others, you should restrain the activity of the company, the companies should be shut till the time the criminal charges are over", he adds. Interestingly, it was learnt that in our criminal laws, **victims have no position. To fight a claim for compensation, the affected person can file a complain and seek permission of the court to get access to prosecution. Once court allows prosecution, a public prosecutor is appointed to represent victims. In the case of Bhopal, CBI was the public prosecutor. After a prosecutor is appointed, the victim's case is what the prosecutor makes it and not what his actual case is. Now the victim has no direct say in the matter. This leaves a lot of room for dilution and weakening of the case by public prosecutors. There are buyers of the fact that CBI did water down cases of Bhopal victims.** "I do not think CBI pursued the issue very seriously, I don't think they have learned any lessons from Bhopal", reiterates Murlidhar.

Things boil down to the fact that before we generously bring the country on a fast track of industrialisation and liberalisation, Indian civil and criminal procedures need to figure out what are corporate crimes, and how to handle them. But the sorry part is until fresh laws are laid down repealing draconian commissions and omissions in the per-existing laws, Bhopal will continue to serve as a bad precedent for the judiciary. This simply means that hazardous technology will continue to be used, negligently used, and people will have no remedies because the 'law has it all'.



6.3: Site selection

The industries continue to be chosen based on the outdated industrial location theory of placing the production facility close to either raw material sources or markets, regardless of environmental conditions. “Till today experts find it enigmatic to resolve as to how and why was the Union Carbide factory allowed to be set up in the thick of population in Bhopal, 3 km away from Bhopal railway station and only 1.5 km from the bus stand”, Dr, MP Dwivedi, Ex-Director, Bhopal Gas Disaster Centre, was heard as saying in a recently concluded National Conference on Health and Environment organised by Centre for Science and Environment (CSE). His reaction points to the mindlessness with which the crucial work of site selection is carried out. Obviously, closer distances enhance the chance and magnitude of quick public affliction and casualty.

Another issue related to location of industries is the type and combination of industries in an area. Sometimes wrong combination of industries are established in a close proximity. “We have a Site Location Committee but still, in Haldia, West Bengal, a fertilizer and a refinery plants are adjacently placed, one has ammonia and the other inflammable hydrocarbons”, Mr. Sagardhara was heard as criticising in the said conference by CSE. Similarly, according to reports, in Jaipur, a viral vaccine plant and a RDX company are placed in a close proximity. Each one of such industries is fraught with high chances of accidents and when more than one prone industry are allowed to be established in the same area, the results are only to be disastrous.

Next, there are precautions to be taken on the inlets and outlets to the area where industries are established. The best example of goof up is Chembur in Mumbai, Maharashtra which has two oil refineries, three petrochemical plants, a fertilizer plant, a thermal power plant, a 10,000 MT ammonia tank, the BARC nuclear reactors and several other smaller hazardous units. “All combined, Chembur industrial area is like a box canyon”, quotes a paper from Sagardhara in the conference-- surrounded by a hill on one side, marshland on the opposite site and sea on the third. A single narrow road with fairly dense traffic enters the industrial area from the Bombay side. Bombay, like any coastal city has diurnal wind shifts which carry winds towards populated area at nights. These two factors make a potent combination which could spell disaster if an accidental release of toxic or flammable vapour cloud happens at wrong time (Because of only one outlet, escape will be hazardous with a good chance of stampede). Incidentally, this nearly happened in 1985 when 2 T of Chlorine leaked from a petrochemical plant, which was under lock out. Fortunately, the leak occurred during the day when the wind direction was blowing away from the populated areas, which kept casualties down to one dead and 140 hospitalised. Four years later, the wind was not that kind. A flammable vapour cloud from the Bharat Petroleum refinery moved downward and ignited at a point where bitumen was being heated by a naked flame, killing about 34 workmen. In sum, little has been done by the regulatory authorities about risk reduction at existing hazardous sites. Therefore, we need a clear perspective and policy on the site of industries, which should take into account the safety of the public and the workers too.



Relocation of industries from the thick of the population to a less populated area is one effective way of reducing the chance of public affliction and casualty from hazardous industries. There are documented efforts of relocation of industries in India. For instance, in 1996, the Supreme Court had asked 168 industries in Delhi to relocate but slow pace of compliance and protraction of litigations have caused major distress to the workers. The industries are closed and workers are on streets without any rehabilitation. "This is not a progressive piece of judicial intervention. This is anti-people", says Sathyamala. According to reports, the coal miners in Orissa, Bihar and West Bengal have no different fate. Mines have been closed on safety concerns leaving the workers high and dry on the streets. Ideally, in cases of relocation, the trade union should be consulted and a welfare package for the workers should also be a part of it.

6.4: Response of industry

Before Bhopal, industries concentrated only on gain maximisation. Risk (of accidents and hazards) minimisation did not even exist as a concept. In 1982, the Director of the Nuclear Fuel Complex (NFC), Hyderabad had stated to a visiting team of scientists from the Environmental Protection Forum that he would rather put his money in expanding production facilities than on perimeter wall to keep away rag pickers. Prior to this, about 10 rag pickers died in two separate incidents when they were rummaging the solid waste heaps which had nuts, bolts and metal scrapes and could be sold for small sum in the local market. But metal scrape was also mixed with magnesium which caught fire when disturbed, incinerating the rag pickers.

Interestingly, journalist Kesawani of Bhopal had warned about the potential dangers carbide plant posed to the city. In response Madhya Pradesh minister stated in the assembly that carbide plant was not a pebble, which could be lifted easily and placed elsewhere.

The minister's statement and NFC's director's attitude sums up the general attitude prevalent up to early 80's towards chemical risks which was that human lives cannot be valued more than the difficulties or expense on ensuring greater safety. According to reports, even the genesis of Bhopal accident lies in economics. The refrigeration unit meant to keep Methyl Isocyanate system at low temperature so that it does not evaporate was switched off to save a mere Rs. 700 or so a day. Likewise, the pilot flame on the flare tower, which was meant for burning the leaking MIC safely, remained unlit. "The biggest saving carbide company made was by building a plant which made and stored MIC and used it later to make a pesticide 'Sevin'. Bayer, another maker of Savin stuck to making and using MIC *in situ* so that the toxic chemical is not stored, a process that Carbide's Indian engineer's recommended but was rejected by carbide's management", paper from Sagardhara informs. However, some wisdom also seems to have seeped in the right quarters. "Industries have to change their attitudes, they have to recognise that improving safety is for their benefit only", comments Das.

6.5: Legal framework: Is it adequate?



However, the greatest enemy of industrial safety is the shocking level of non-compliance to existing rules. For example, in 1989 an accident took place in Mathura oil refinery where naphtha was being filled into rail cars. The marketing team which checks and certifies that the filling team has filled each car to the proper level, followed the filling team an hour and half later. Till then the tanker car hatches remained open and naphtha evaporated to form a large vapour cloud. No risk control devices were being used, no hydrocarbons alarms, and no flame arresters were in use. Result. Seven people were charred to death. Such poor level of observance of safety norms in Indian industries does not augur well for its future. "Increasing casualisation of safety concern is a sad reckoning. If the safety infrastructure are kept at a poor level, only India will stand to loose in this fiercely competitive global industrial environment", Mr. L. Mishra, Secretary, Labour Ministry was heard as concluding during the aforementioned conference.

Even LPG filling practices are reported to be fraught with such risks. According to Sagardhara's paper, even to this day, LPG tanker trucks are parked very close to refinery and LPG bottling plant filling areas. Trucking personnel cook food on kerosene stoves inside the truck cabins. If a flammable substance leaks, such naked flame will provide ready ignition source very close to large flammable material tanks. "The awareness that it is better to have a truck parking area a couple of kilometers away and have only a few trucks come for filling has not seeped into consciousness of oil companies", comments Sagardhara.

A closer look further substantiates that there indeed is a casual attitude by the industries on safety issue. Rule 13 and 14 of the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules provide for the constitution of an on-site (within the factory premises) and off-site (outside the factory premises within the district) emergency plans for the industries. "According to the latest report (updated on 18th Sept., 1998) from the office of the Chief Inspector of Factories, out of 1193 Major Accident Hazard (MAH) units, only 878 have on-site emergency plans even after 10 years of the enactment", informs NK Jain of Joint Assistance Centre, an NGO in Gurgaon near Delhi. Tables 3 and 4 depict the detail number of such plans made by various states in India.

Table 3: On-site emergency plan - present status in different states of India.

Number	State/UT	Statutory requirement	Prepared
1	Gujarat	300	252
2	Maharashtra and Goa	283	249
3	Assam, Bengal and Orissa	145	75
4	Karnataka, Andhra Pradesh and Kerala	123	105
5	Bihar	87	84
6	Rajasthan	82	82
7	Uttar Pradesh	62	62
8	Tamil Nadu and Pondicherry	59	56
9	Delhi, Haryana and Punjab	58	58
10	Madhya Pradesh	48	48

Source: adapted from [2].



Even a perfunctory look at the Table 3 indicates that the compliance leaves a lot to be desired. Major industrialised states such as Maharashtra, Andhra Pradesh, and West Bengal show glaring omissions in providing sufficient mitigation facilities at the sites of industries. Coincidentally, these are states where the number of accidents has been quite high.

Omissions with the off-site emergency plans are even worse as all states are violators of this provision (Table 4).

Table 4: Off-site emergency plan - present status in different states of India.

State/UT	Statutory requirement	Prepared
Karnataka, Andhra Pradesh and Kerala	23	15
Delhi, Haryana and Punjab	23	3
Uttar Pradesh	22	NA
Bihar	21	0
Rajasthan	20	6
Assam, Bengal and Orissa	18	3
Gujarat	17	9
Tamil Nadu and Pondicherry	15	4
Maharashtra and Goa	10	5
Madhya Pradesh	10	NA

Source: adapted from [2]

NA, not available

Little wonder states find it so difficult to handle an accident much less prevent it. “Industries also violate rule 10 of MSIHC which stipulates that mock drills should be carried out. No mock drill are carried out to bring coordination and promptness in the damage control and mitigation activities”, spoke a well placed official with MOEF on anonymity.

6.6: Risk documentation and management

Prior to Bhopal, little attempt was made by any government organisation to prepare guidance documentation on any aspect of risk management. Therefore industries remained fairly clueless on how to put into place a workable risk management programme. As a consequence, risk management documentation submitted by the industry to the regulatory authorities was of extremely poor quality. “Disaster management plans were submitted without even stating the nature of disaster that is probable”, informs Sagardhara. “Vulnerable zone maps, fire or explosion modeling etc were completely missing from such documents”, he adds. The Factories Act and the Environment Protection Act provide for workmen in a hazardous plant and the bystander population around it to be told the risk they are being put into and what to do in an



emergency. Over time, the larger plants complied with these provisions by distributing booklets to their workmen. But the bystander population was kept in the dark, for fear of attracting public ire and pressure.

Further, the industries do not train their workers and management personnel in prevention and disaster mitigation activities. Few industries and regulatory authorities were willing to spend money training their manpower and few institutes could offer good training. Consequence? There is a glaring lack of awareness about the risks, threats emerging out of the industries among the workers, management and people who are the first respondents. For example, when the Environmental Impact Assessment (EIA) for Indian oil Corporation's Karnal refinery was being done, the EIA team approached the district magistrate to ask him if an off-site Disaster Management Plan (DMP) for the district was prepared. The district magistrate, who is supposed to head the off-site DMP by law, replied in an affirmative and said that they had a good DMP for Punjab militants. Ignorance galore. Industries hardly have a consultation with workers and trade unions to inculcate safety concerns and education. The need of the hour, therefore, is that industries take immediate steps for the management to adopt self-regulation, enhance health and safety disciplines among workers. Safety committees should be activated and safety officers should be appointed.

But according to Ms. Seema Arora, Counsellor of Confederation of Indian Industries (CII) things are changing. "It (safety discipline) is not an easy thing, it involves a total change of mindset", says Ms. Arora. Apparently, CII has started a strong awareness creation programme on improving industrial safety. "We are asking industries to train their workers, contractors, in safety management. Once Industries understand it is beneficial to them, both tangibly and intangibly, they will be honest to accept safety disciplines", she adds.

6.7: Response of civil society and trade unions

According to Sagardhara's paper, NGOs did not know the right questions to ask to improve safety in industries. And if they chanced upon any information, they found it difficult to make any sense of it. Workmen and trade unions were in a bigger bind than NGOs. Their access to environmental professionals were even lesser. And even though they were placed better than NGOs to spot potentially hazardous situations, their interests were in conflicts. Even if they feared for their lives, they were dependent on their employers for their wages, which made them reluctant to raise hazardous issues because holding onto their jobs, were more important. And sometimes, for short -run monetary gains or to increase employment in the plant (and therefore their union strength, workers and unions would remain silent when a plant wanted to expand its hazardous operations.

With time, industry seems to realise this. "NGOs can play a very positive role to build partnership in industries where relation between trade unions and management is strained. They can also help in removing suspicion between industries and regulatory bodies as a representative of people", opines Das.



6.8: The way ahead

“Other countries have learnt more from Bhopal than us and have put into place better mechanisms to manage major accident risks”, observes sagardhara in his paper. And this is precisely what Indians should also do, learn more lessons. Knowing the bigness of error domain, the list will be too long. However, few big amendments can be considered. “Though legislation is not all but it is definitely an entry point”, said L mishra during the conference. But by listening to experts, it appears that more legislations are needed on risk management to strike a balance between gain maximisation and risk minimization. Risk minimisation sounds relevant today when the doors have been opened to encourage more foreign investment, which will emphasise more on gain maximisation. But more than bringing in new laws, what is better way of handling industrial safety is by augmenting and enforcing the existing laws. How is that states go scot-free when they flout rules of making on-site and off-site DMPs? Why is that responsible authorities such as the District Collector/Magistrate, trade unions, management and workers are not educated about risks and are trained to offset damages, despite the existence of rules which stipulate them? According to rules (which came in force in 1996) a four tier--- central, state, district and local--- Crisis Management Group (CMG) has been envisaged to be constituted. However, an enquiry at MOEF about the compliance of this rule is a telling experience. “Only eight states have reported compliance to this rule. The ministry is in the process of compilation of the districts which have drawn plans to constitute DCGs”, informs a source on conditions of anonymity. As per the source, MOEF is coordinating with the chief secretaries of the states to constitute SCGs and DCGs but the main problem is that states lack resource for implementation.

Then there are ways possible in which industries, by taking suitable steps, can improve safety and prevent public sufferings. “Industries should invest more on risk minimisation to make accidents costlier. Costlier the accident, lesser are its chances of occurring”, says Sagardhara. “In fact there should be a public making of the safety document so that there is a public check on regulatory bodies. This will also educate public and help in bridging the gap between the risk perceived and actual risk”, Sagardhara adds. Experts are in unison that risk from an industry should be documented and a disclosure be made to the workers, local authorities and public at large to inculcate a sense of joint responsibility on safety.

Another Achilles’ heel is the transport related accidents, which accounts for a good number of them. The transport facilities should be strictly regulated. “Transport related accidents are difficult to prevent”, says Das. “Educated drivers are difficult to find and there is no mechanism existing to train them (in transport related safety)”, adds Das. It is noteworthy that rapid advances in chemical engineering and large scale use of chemical and energy has considerably increased the need of transportation of hazardous chemicals. Also for an effective mitigation of transport related accidents, the routes of transport must be equipped adequately with damage mitigation devices.

Another area whose safety risks are grossly overlooked is the Small Scale Industries (SSI). “SSI risks are higher as compared to big industries because of improperly designed facilities, untrained manpower”, cautions Das.



The key to combat industrial disasters is proper emergency preparedness.

Therefore, what is needed is to take proactive measure at the levels of prevention, control and mitigation of impact. Industrial accidents are man made. They are usually sudden and unexpected, therefore, harbour confusion and chaos. This is often accentuated and aggravated by the lack of preparedness of the authorities and the public at large. Bhopal is a big example.

Blaming only the industries will be to sideline issues and overlooking the entirety. Industries are partners in the growth and development of the country. Therefore it is not unfair if an industry representative like Das says, "It is easy to blame industries but you also need commitments from the bureaucracy and politicians (for improvement of safety scenario)". What we need is the overhauling of the entire system in which the management, regulatory authorities, workers are intertwined. Every component of this system has its acts to put together. The government has to strengthen legislative provisions with regard to the sites of establishment of industries, relocation etc. There is always a problem of well-defined regulatory body to obviate which, there should be a well indicated enforcing agency with a flawless verification and monitoring system. Regulatory authorities have a crucial role to play for stricter enforcement of safety measures. They also have a much challenging issue of regulation of transport of hazardous chemical. According to Das of Ranbaxy "Regulatory bodies should not work with a stick in hand but should work on a partnership basis (with the industries) and the approach should change to effectively persuade industries for self-regulation. Industries should be encouraged to adopt new management tools such as ISO 9000, ISO 14001 etc".

Industries do have the onus of bringing self-regulation, increasing awareness about risks and organising training workshops and mock drills on regular basis. Workers, trade unions should be a part of the accident prevention and safety network. Apart from these, the damage mitigation and control network including- in addition to the site of accident-district administration, fire brigade, police, civil defence, public health services, etc should have proper planning and coordination. If not properly planned and coordinated, the roles of the authorities may be unclear and actions might interfere with each other.

It is axiomatic that public memory is short. But Bhopal is an experience too traumatic to forget. And it is axiomatic too that we now live in a high-risk society. Whether by choice or default, impact is going to be felt by everyone because hazardous substances have already demonstrated their run away capabilities. Therefore, expectation of mass torts is very real. It has become clear that safety is still not the top priority for the industries. Rules and norms fail to be abided by. This enhances the chance of accidents. On the other hand weak civil and criminal laws are inadequate to ensure commensurate relief and compensations. Worse, lessons from various accidents have not beefed up laws but in stead, hurdles have increased. For example, when Bhopal disaster happened this provision of 7 B (5) allowing absolution was not on the statute book. The prejudgement nestling in this provision could not be used by UCC to build up a defence to escape the jurisdiction of the Indian courts. It is sobering thought that unless such provision/s is/are



repealed, another such disaster may find a transnational offender disappearing through this provision with impunity.

BOX 1

DAMAGES

The effects produced by a chemical disaster would primarily depend upon the nature of accident and vary from target to target. The effects on life systems could be lethal if a toxic gas pollutes the air. When the source of drinking water is contaminated delayed effects will be manifested. The possible biological effects accrue from chemical depending upon the extent of exposure and the potential of the implicated chemical to interact with the diverse anatomical structures and physiological functions. Adverse effects could be from instant death or the appearance of disease clusters. Individual susceptibilities, degree and duration of exposure and failure and success to counter immediate effects modify prognosis. Risk of cancer and mutagenic changes in the progeny are to be anticipated.

Among different pathways of infliction, contamination of ambient air is presumably the most significant one by which the chemical attacks the target organ in major chemical disaster. Intake by inhalation or absorption by skin and mucous membrane constitute the main routes of entry. In the case of contaminated food and water, the target will be digestive and assimilative systems.

Damages and loss from an industrial disaster could be enormous. It involves over a big range, from immediate death in the case of explosion and fire to slow death and crippling in case of toxic contamination. Two types of damages are possible. One, where it is immediate and less. This happens in explosion, fire, etc. The other type is where the loss of life and property is slow and drawn over a longer period. Such types of damages are common with leakage of toxic chemicals, materials. Various types of potential effects of such substances on human bodies are shown in Table 5.

Table 5: Target organs and effects induced by chemical accidents.

Organ	Effects
Skin	Altered appearance Irritation Sensitisation Corrosion
Eye	Irritation Corneal opacity Retinal damage Corrosion
Mucous membrane	Irritation Corrosion
Lung	Irritation



Fetus	Methemoglobinemia Carcinoma Asphyxiation Abortion Malformation Neonatal death
Nervous system	Behavioural change Depression Respiratory paralysis Peripheral neuropathy
Liver	Cirrhosis Carcinoma Necrosis
Kidney Haemopoiesis	Uremia Bone marrow depression Leukemia
Musculoskeletal system	Aplastic anemia Osteoporosis
Immune system	Corrosion Suppression

Source: [2]

BOX 2

LAWS GOOD, ENFORCEMENT BAD

India has a host of legislations on prevention of chemicals accidents. The problem is lack of funds, weak infrastructure of states, lack of proper monitoring and lack of awareness mars their implementation.

Regulatory system for emergency preparedness

- Several legislation have been enacted and rules framed particularly after Bhopal gas tragedy for management of hazardous chemicals in India. Agencies such as MOEF, Pollution Control Boards (PCBs), Chief Inspector of Factories as well as transport, health and local authorities which prescribe precautions/measures to be taken at various stages of handling hazardous substances. It is the responsibility of these organisations to ensure that the regulations are strictly enforced in public interest. For atomic disasters the Atomic Energy Regulatory Board is the responsible agency, for chemical accidents MOEF is the nodal organisation and for biological accidents Department of Biotechnology is held answerable.

The following acts and rules lay down requirements for emergency preparedness and payment of relief and compensation in India.

ACTS



- The Factories Act, 1948, amended in 1976 and 1987.
- The Environment (Protection) Act, 1986
- The Public Liability Insurance Act, 1991, amended in 1992.
- The National Environment Tribunal Act, 1995.

Rules

- Model rules under Factories Act, 1948, amended in 1987.
- The Manufacture, Storage and Import of Hazardous Chemical (MSIHC) rules, 1989 as amended in 1994.
- The Public Liability Insurance rule, 1991 as amended in 1992.
- Chemical Accidents (Emergency, Preparedness, Planning, Response) rules, notified in 1996.

Provisions in the Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) rules, 1989 under EPA, 1986.

MSIHC rules are in effect an industrial accident prevention and preparedness regulation. The rule 13 of these rules requires the occupier to prepare and keep up to date on-site emergency plan for dealing with possible major accidents. The provision applies to hazardous chemical installations, which include both industrial processes, and isolated storages, handling hazardous chemicals in quantities laid down in then rules and indicated as Threshold Planning Quantities (TPQ). Rule 14 of these rules requires the district emergency authority or the District Collector in the state to prepare an off-site emergency plan for the district, incorporating details made available by the hazardous installations and transport authorities. A separate transport plan needs to be drawn up as a sub-plan under the district off-site emergency plan. This is necessary in view of all the transport accidents. Rules cover hazardous operations involving hazardous chemicals. A unit handling 4 T of ethylene oxide is not covered by these rules, as the TPQ is 5 T, although it has as much potential of a major accident. However, the compliance part is the Achilles' heel. The following table depicts the compliance of various states with the rule 13 and 14 of MSIHC rules [2].

Table 3: State wise status of compliance of rule 13 and 14 of the MSIHC rules.

State/UT	No. Of hazardous units	No. Of units	MAH	No. Of emergency plans prepared On-site (rule 13)	Off-site (rule 14)
Andhra Pradesh	761	71		66	11
Assam	49	36		9	Nil
Bihar	740	87		84	Nil
Goa	30	5		5	Nil
Gujarat	766	300		252	9
Haryana	236	15		15	2
Jammu &	NA	7		NA	NA



Kashmir				
Karnataka	790	20	20	2
Kerala	1776	32	29	2
Madhya Pradesh	758	48	48	NA
Maharashtra	1850	278	244	5
Orissa	60	19	19	1
Punjab	184	23	23	Nil
Rajasthan	1583	82	82	6
Tamil Nadu	451	52	49	4
Uttar Pradesh	2300	62	62	NA
West Bengal	124	90	47	2
Delhi	92	20	20	1
Pondicherry	152	7	7	Nil

Source: [1]

MAH, Major Accident Hazard

Provision in the Factories Act and Rules

Chapter IV A, Section 41 B of the Factories Act (amended in 1987) requires the drawing up of an on-site emergency plan and detailed disaster control measures with the approval of the chief inspector. The provision applies to all hazardous process industries listed in the first schedule of the amended act irrespective of hazardous chemicals being handled or not. The amended factories act and the model Control of Industrial Major Accident Hazard (CIMAHA) rules (modified MSIHC) have not been adopted by many states. The implementation of these and MSIHC rules for which the Directorate of Industrial Safety and Health is the authority is lacking. The authorities including the MOEF need to make all out effort to enhance compliance.

Provisions in Public Liability Insurance Act, 1991

As per this act every owner handling hazardous substances in quantities notified shall take out one or more insurance policies before starting his activity. The insurance policy will help to pay immediate relief in case of death and injury to any person (other than workmen) or damage to any property in case of an accident involving a hazardous substance. This relief shall be paid on "Principle of no fault" that is the claimant shall not be required to plead or establish that the death, injury or damage was due to any wrongful act neglect or default. The money provided under the act is an interim relief and ultimate liability to pay total compensation to the victims is that of the owner. This act apart from ensuring financial assistance to the victims makes it obligatory on the part of the owner to prevent accidents and prepare for emergency plans. However, the enforcement has been left on the state governments without mention of a specific authority. The lack of specific enforcing agency leaves it on the sweet humour of individual units resulting in no action by the transporters at all.

The lesson that one learns here is that in order to ensure better compliance, the enforcement authorities need to be designated. The Directorate of Industrial Safety and



Health (DISH) could be the enforcement authority for the factories and the Chief Controller of Explosives for the transport, as most of the hazardous cargo tanks require CCE clearance. The surface transport authority could be an alternative choice.

Provision in Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996.

It envisages a four-tier crisis management set up at the local, district, state and central level. The rules have been gazetted in August 1996 by MOEF. It provides a statutory back up for setting up of a crisis group in districts and states, which have major accident hazard installations and provide information to the public. As per the rules, the government of India is to constitute a Central Crisis Group (CCG) for the management of chemical accidents and set up an alert system within 30 days of notification. The Chief secretaries of the states are to constitute State Crisis Group (SCG) to plan and respond to chemical accidents in the states and notify in the gazette within 45 days. The district collector shall not only constitute a District Crisis Group (DCG) but also constitute a Local Crisis Group (LCG) for every industrial pocket in the district within 60 days. The CCG will be the apex body in the country to deal with and provide expert guidance for planning and handling of major chemical accidents in the country. It shall meet every six months and respond to enquiries from SCG and DCG. SCG will be chaired by the Chief Secretary and is the apex body in the state consisting of government officials technical experts and industrial representatives and will deliberate on planning, preparedness and mitigation of chemical accidents with a view to reduce the extent of loss of life, property and ill-health. The SCG will review all the district off-site emergency plans for its adequacy. The DC shall be the chairman of DCG, which will serve as the apex body in the district. It shall meet every 45 days to review on-site emergency plans prepared by the occupiers of the MAH installations for preparation of a district off-site emergency plan. The district chairperson shall conduct at least one full-scale mock-drill of the district off-site emergency plan each year. Powers under section 10 and 11 of EPA for entry and inspection are to be made available to the central/state and district level crisis group members.

“Eight states have reported compliance to this rule. The ministry is in the process of compilation of the districts which have drawn plans to constitute DCGs”, informs a source on conditions of anonymity. As per the source, MOEF is coordinating with the chief secretaries of the states to constitute SCGs and DCGs but the main problem is that states lack resource for implementation. Therefore, the ministry is also drafting a national scheme for allocation of separate budget on chemical safety. Then, The national Safety Council, an autonomous organisation under MOEF is also organising local level awareness programme for the workers, first respondents, people on how to combat chemical accidents. A manual of safety procedures, dos and don'ts etc are being prepared.

BOX 3



CSE DRAFT DOSSIER: HEALTH AND ENVIRONMENT>>

A. ENVIRONMENT AND DISEASES

6. INDUSTRIAL DISASTERS

Some Major Accidents in India

Date	Place	Details
01/07/80	Konnerikuppam	A truck carrying 6 chlorine tonners, carboys of acetic acid and 15 persons capsized due to tyres. 14 killed and 3 injured.
Aug, 1985	Gwalior	Chlorine gas from factory leaked, 125 affected.
05/05/89	Delhi	Chlorine leak from a road tanker. 200 people affected.
16/02/90	Calcutta	Chlorine from a 100 kg. Cylinder kept in a small in a congested locality started leaking in the night, Cylinder was badly corroded. 4 killed and 87 injured.
July 1991	Chavara, Kerala	Chlorine gas leaked from a chemical company affecting 350 people

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2. Preparedness and response to chemical emergencies, India Country Report (for World Health Organisation), June 1996.



CSE DRAFT DOSSIER: HEALTH AND ENVIRONMENT>>

A. ENVIRONMENT AND DISEASES

6. INDUSTRIAL DISASTERS