INFOCHANGE

agenda

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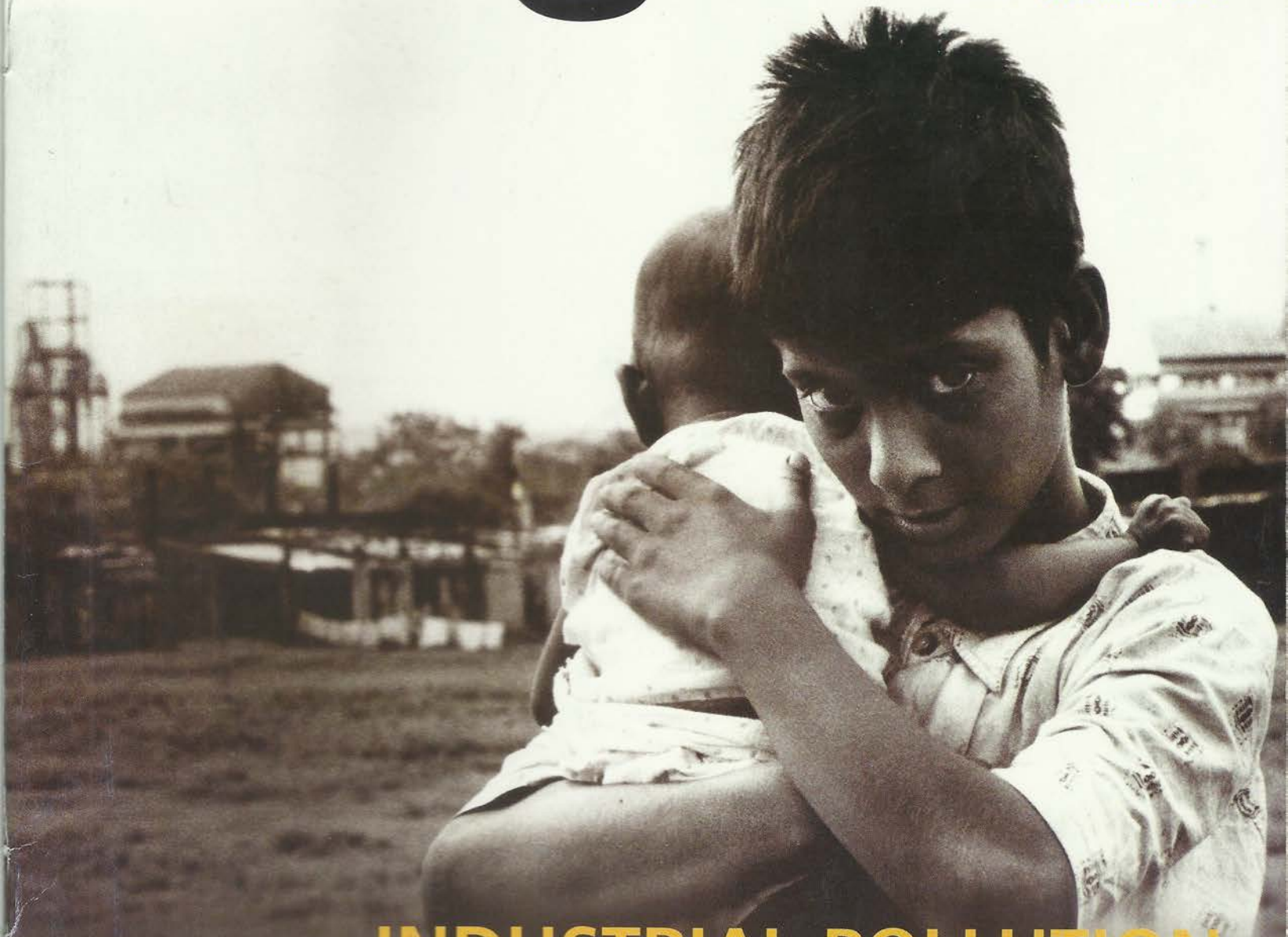

INDUSTRIAL POLLUTION

20 years after the world's worst industrial disaster, many more Bhopals are waiting to happen. Why has so little changed?

INTRODUCTION

FOR TOO LONG NOW, citizens have left policies and decisions that affect their lives and determine the course of development to closed coteries of 'intellectuals' and policymakers.

If civil society is to step in and re-imagine the world, if citizens are to participate in meaningful discussion and advocate change in public policy and social attitudes, civil society must be strengthened through access to diverse perspectives and alternative messages. This is becoming increasingly difficult in a culture that allows little room to question mainstream messages and mainstream agendas.

InfoChange Agenda has been conceived as a quarterly dossier that informs civil society on crucial issues of sustainable development and social justice, issues that are being pushed into the margins. It is designed to enable concerned citizens in India to marshal salient information, perspectives and reportage, so that they can clarify their ideas and participate in drawing up an agenda for a more equitable and sustainable world.

Agenda will be put together every quarter by InfoChange's extensive network of journalists, development analysts and activists. This network has collaborated over the last few years to build InfoChange News & Features (www.infochangeindia.org), one of India's most-visited online resource bases on development and rights issues.

The inaugural issue of *Agenda* is on industrial pollution 20 years after Bhopal. While the world focuses on the Bhopal gas disaster itself, *Agenda* sends its researchers and writers to toxic hotspots across India — from Kerala and Tamil Nadu to Gujarat, Orissa, Jharkhand — to report on the many many Bhopals waiting to happen. In the context of these case studies, *Agenda* analyses why so little has changed in the two decades since the world's worst industrial disaster. And what *should* change.

Please write in to us with feedback on the contents of this inaugural issue and your ideas and contributions for forthcoming issues of *Agenda*.

— Editors

InfoChange Agenda is a quarterly journal published by the Centre for Communication and Development Studies, a social change resource centre focusing on the research and communication of information for change

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Rajesh Vora

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This issue has been guest-edited by Nityanand Jayaraman

Cover: Second- and third-generation survivors of the Bhopal gas disaster with the Union Carbide factory in the background

Photograph by Alessandro Marongiu

Wrong questions. Wrong answers

The Union Carbide disaster in Bhopal had several lessons to teach. Unfortunately, very few of these lessons have been learnt. Why? Perhaps because of our propensity to ask the wrong questions. Questions such as: "What is the best place to dump toxic waste?" The right question for a true democracy would be: "How can we avoid generating hazardous wastes?"

NITYANAND JAYARAMAN

IT IS NOW the 20th anniversary of the Union Carbide disaster in Bhopal. No lessons have been learnt from it. And it is unlikely that any will be, because the lessons teach us not about better technology or stricter regulation. The lessons are about a basic respect for life — the living and the yet-to-be-born, about the primacy of life over profits, about how disasters will happen as long as some people can be called upon to pay for the lifestyles of others, about the futility of our search for a safer world unless we abandon the notion that the existing industrial and corporate cultures are a given that cannot be disturbed.

If one were to learn from Bhopal, one would first have to know what caused the disaster, why so many people were affected, what conditions may have averted the disaster and so on. Second, one would have to use this information to put in place the changes required to prevent a repeat of the disaster. In the aftermath of Bhopal, we also realised that, as a society, we were unprepared to deal with the medical, economic and social rehabilitation of victims, and meting out exemplary punishment to the perpetrators of industrial accidents as a means of providing a deterrent.

In the case of Bhopal, the causes of the disaster are known: the technology that was exported to India by Union Carbide was inherently flawed and untested; several safety systems were either dismantled or pending repair as the company went ahead with a no-holds-barred cost-cutting drive.

The death toll — about 8,000 in a matter of days — and the 500,000 or more people that were affected, were a direct result of siting a hazardous factory in a thickly-populated neighbourhood. Another factor that impeded the saving of lives was Union Carbide's refusal to divulge toxicity-related information regarding the chemicals released that night. Ironically, the Corporation was secure in the knowledge that industrial secrecy laws protected its right to refuse disclosure of this information. The information remains a secret to this day.

The disaster could have been averted if earlier warnings had been heeded. Worker injuries, toxic gas leaks and even deaths predated the disaster. These were accompanied by complaints to the management and the regulatory agencies, all of which were ignored.

Twenty years after the Bhopal disaster, the demands of the survivors remain the same as they were in the years after the incident — punishment of the guilty, just compensation for survivors, clean-up of the contamination, economic and medical rehabilitation of the victims and their children. Meeting all these demands would tell us exactly what is needed to prevent another Bhopal from happening. More importantly, resolving the Bhopal demands would also tell us how economically unviable it is to bypass informed consent and pander to corporate interests.

On the face of it, the lessons taught by Bhopal are simple enough to internalise. Use well-tested processes that have multiple layers of built-in safety. Don't locate hazardous industries near residential areas. Require and ensure the disclosure of chemicals and chemical hazards by industries to workers and nearby communities. Pay heed to worker and community complaints about pollution.

So why won't these lessons be learnt? Political expediency is one reason; economic viability is another; and the imbalance of power between citizens and corporations yet another. Simply put, the current culture among regulators, planners, policymakers and judges, not to mention industrialists, allows a community to exercise its right to a hazard-free living and working environment only if that is economically and technologically viable for the industry, and politically expedient for the powers-that-be. In many cases, a community's aspirations for a clean environment may just not be economically viable, the dominant culture argues.

In *Fertilisers and Chemicals Travancore Employees Association vs Law Society of India*, the Supreme Court overturned an order by the Kerala High Court directing the closure of an ammonia storage tank located in a populated neighbourhood. In a telling article on industrial risk in Indian law published in the *Economic and Political Weekly* (October 9, 2004), legal commentator Usha Ramanathan writes that "Pragmatism, and a perception of risk and hazard as inherent in the ways of the modern world, led the [Supreme] Court to draw up a calculus between 'utilities which exist in public interest... and human safety'."

The Court argues that "we do not discount such risks but [these] are counterbalanced by services and amenities provided by these utilities." Tacitly, the Supreme Court has condemned a special group of people to bear the risks associated with industrial installations regardless of whether or not those people benefit from the service or amenity, and whether or not they are willing to be the risk-bearers. The SC may have referred only to "public interest" installations. But even prior to this order,

regulators, planners and policymakers had extended this argument to the private sector.

Which is this special group of people who are called upon to sacrifice for the sake of public, or even private, interest? As a rule, these are people who lack political power, are poor, or do not know enough about the dangers of hazardous industry to prevent them being set up in their communities.

The world over, it is a fact that hazardous facilities, garbage dumps and toxic waste landfills are disproportionately sited in working class and/or — in India's case — lower-caste neighbourhoods. The unspoken assumption is that if they are poor, they can't be too choosy about the investments that are made in their community. In the tussle between sensible siting and political expediency, the former has consistently been a loser.

Here's one telling reminder of how even the basic parameter of industrial planning — siting — has not been internalised by India's decision-makers: Early this year, Tamilnadu Waste Management Ltd proposed to set up a Treatment, Storage, Disposal Facility (TSDF) in Melakottaiyur village near Chennai, to receive toxic wastes from various parts of the state. Despite its fancy name, TSDFs involve a state-of-the-art hole in the ground for dumping some toxic wastes, and a state-of-the-art hole in the wall for burning others. The landfill site, which was chosen by experts, was to be located in Melakottaiyur lake. The area surrounding the proposed landfill is fertile agricultural land. A balwadi is located barely 500 metres from the project site, and a Dalit residential colony abuts the site.

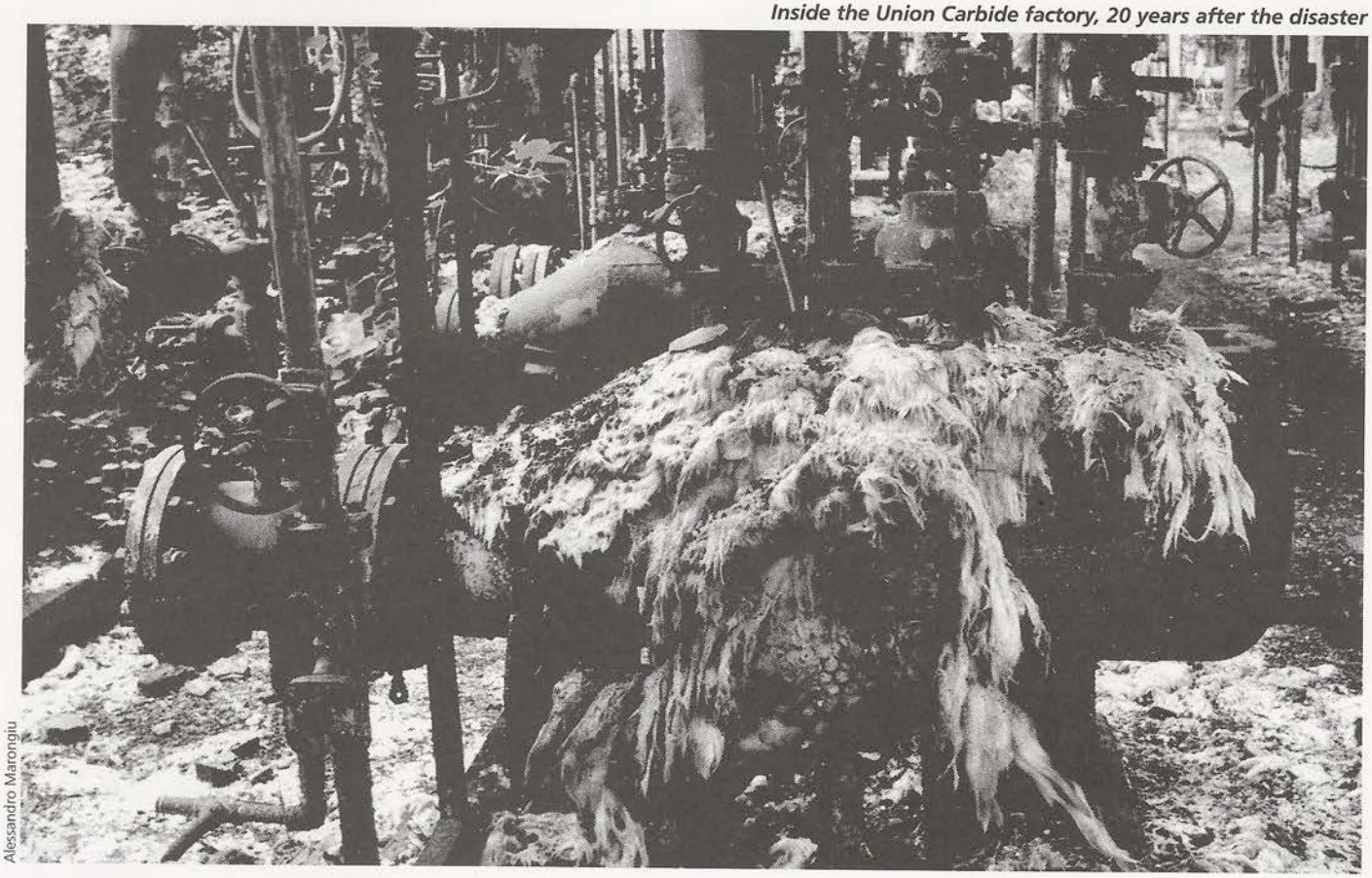
Alerted by public interest organisations in the city, Melakottaiyur villagers rallied around to prevent the siting of the toxic dump on their land. More than 2,000 people attended the statutory public hearing held by the government. Not only did the people demand that the industry representatives that were sitting alongside the district collector chairing the public hearing be sent off the dais, they squarely rejected the project and vowed resolutely to fight it.

Melakottaiyur, for the reasons stated above, was certainly not appropriate even by the government's own siting guidelines that require landfills to be located away from habitation, areas with a high groundwater table, water sources or sensitive areas such as schools or protected areas.

After its visit to Tamil Nadu, the Supreme Court Monitoring Committee (SCMC) on Hazardous Wastes recommended that the Tamil Nadu Pollution Control Board should "surrender or put on hold" the Melakottaiyur site. Instead, the Board was asked to "try and locate common landfills within the confines of industrial areas and industrial estates".

Taking the country back to pre-Bhopal days and even contradicting the observations of its predecessor — the High

Inside the Union Carbide factory, 20 years after the disaster



Alessandro Marongiu

Powered Committee (HPC) on Hazardous Wastes — the SCMC also opined that "for secured landfills within industrial estates... it may not be necessary to conduct public hearings since the industrial estate is already an approved notified site."

This order is dangerous for two reasons. First, the proposal to do away with a public hearing robs communities of their only chance to know about the project or influence it. Ironically, it was not the concept of the landfill itself, but the democracy that allowed the Melakottaiyur people to resist that was questioned by the SCMC. The SCMC's reasoning seems to suggest that some community has to bear the risk of hosting the landfill.

Contrary to the SCMC recommendations, a report submitted by the HPC to the Supreme Court emphatically states: "It is not the statutory environment protection authorities that will protect and save the natural resources. . .but members of an alert and informed community, fully aware of the nature of hazards and the impacts of these on their health. Potentially affected communities and the public at large must be involved in every aspect of hazardous waste management. . .Absence of structures for public consultation and participation have resulted in India becoming the location of some of the most polluted areas in the world."

The second danger of the SCMC order is its implicit assumption that industrial estates were notified in line with stringent industrial siting criteria. In other words, industrial estates, by and large, are not located near residential areas or water bodies or on land with a high water table. If this were true, there would not be community protests against pollution such as one sees in Eloor, Paradip, Cuddalore, Vapi and a thousand other places in India. Industrial siting has little to do with environmental criteria and everything to do with the availability of inexpensive land, good water, access to raw materials and markets, and cheap labour.

The SCMC order would revictimise those already suffering the effects of the first siting mistake made by the government. Rather than clean up these places and rehabilitate affected communities, the order condemns them to a life with another toxic landfill thrown in. Did we learn any lesson at all on siting hazardous industry after Bhopal?

WHAT HAPPENS once a hazardous industry is inappropriately sited? Improper siting inevitably leads to injury of worker, community and the environment. With a responsive regulator, unsafe workplace or environmental practices can be easily detected and injuries prevented. But if the regulator fails, victims of industrial pollution have to pitch a battle against a stacked deck involving the corporation, the regulators and the courts on the one side, and a sceptical public that views victims as people out to make a fast buck.

Take the case of Hindustan Lever Ltd's (HLL) now-closed mercury thermometer factory in the tourist and school town of Kodaikanal in the Palni hills of Tamil Nadu. A year before the Bhopal disaster, HLL's predecessor Pond's India Ltd imported a 30-year-old thermometer factory from Watertown, New York. The factory was shut down in New York reportedly for environmental reasons. Upon relocation, the factory was allowed by the Government of India to import mercury, glass and other raw material, export all thermometers, and leave behind the mercury wastes in India.

Mercury is a heavy metal that transforms into deadly methyl mercury in contact with organic matter. In Minamata, Japan, Chisso Corp discharged mercury wastes into a bay. Hundreds of villagers exposed to the methyl mercury through their food died, and thousands more, including children born to exposed people, were injured.

For its factory in Kodaikanal, HLL's predecessor was allowed to convert agricultural land to industrial use. It set up its factory on a bluff whose slopes drained into the perennial Pambar River through Shola forests — a sub-montane ecosystem that is unique to the Palni hills and Nilgiris.

During its operation, HLL dumped mercury wastes in the Sholas and in scrapyards and publicly accessible locations around South India. Fortuitously, there was an upright officer leading the Pollution Control Board at the time. HLL was ordered to shut down and clean up. At least 300 tonnes of mercury waste were even re-exported to the US. On the environmental front, at least, things were going well.

However, ex-workers say that over 16 years of operating a shoddily-run factory, HLL and its previous owner Pond's India Ltd have exposed between 600 and 800 workers to mercury in the workplace. Workers report mercury spills as a routine occurrence. "Anytime you went to the shopfloor during work hours, you'd find mercury on the floor. The oven room and distillation rooms were thick with mercury vapour and none of us had proper masks or protective equipment," recounts Raja Mohammed, an ex-worker who is currently organising ex-employees.

HLL's pollution in Kodaikanal was not accidental; it did not arise despite their adherence to stringent environmental and worker safety measures. HLL itself admits that "thermometers are a product line which is not core to Unilever. . .[The factory's] long-term future within Unilever was under review even before recent events, given the strategic decision to exit non-core products".

HLL's statement willy-nilly acknowledges that as a non-core facility, the factory was not given as much attention as other core facilities. In common parlance, that could be called 'negligence'. Negligence with a non-hazardous activity may not be of much concern except to shareholders. But with mercury, the consequences can be severe.

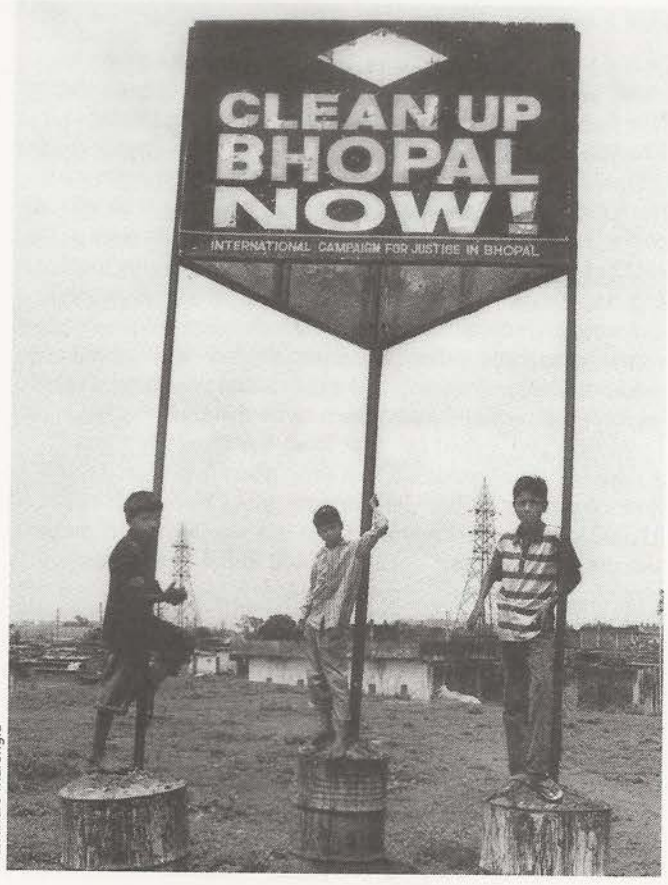
The health concerns raised by ex-workers are yet to find a receptive ear. At least 15 employees — averaging around 30 years — have died, and the workers say it is most likely because of their workplace exposure. Scores of people bear visible signs — skin diseases, premature greying of hair. The number of people reporting incessant headaches, stomach pain, kidney problems and blood in the urine ought to lead the Factories Inspectorate to wonder if workplace exposure to mercury could be the common factor behind all these ailments.

The Factories Inspectorate — which is responsible for ensuring workplace safety — has given HLL a clean chit without conducting any appropriate medical evaluation on the workers exposed to mercury.

The SCMC is the only statutory body to have acknowledged mercury-related health damage of workers and community residents. "The situation at HLL is extremely serious in nature. There can be no two opinions that remediation and rehabilitation of the natural environment and of workers and others are both urgently required. . .," the SCMC reports.

However, even the SCMC only "suggests" health rehabilitation of affected workers "by HLL as a social rehabilitation package". The workers, it seems, do not have a right to the rehabilitation despite the fact that they were injured due to mercury exposure arising from illegal workplace practices. This is not unlike the Bhopal case, where the Supreme Court directed Union Carbide to set up a 500-bed hospital as a humanitarian gesture.

The ability of corporations to get away with mass poisoning such as this is protected by law. A company can poison an entire reservoir or river, wipe out a town, run away with your grandmother's term deposit, or convert the sacred lands of native people to radioactive wastelands. For the worst of these, the liability is limited — in most cases — to civil damages not exceeding the assets of the company. Any creative accountant will tell you how to manage your assets in times of liability.



Alessandro Marongiu

SO IS THERE A WAY OUT of this depressing mess? Yes, there is. But we're unlikely to take that route for the reasons stated at the beginning of this editorial. Not all questions have answers. Wrong questions, especially.

The SCMC is widely considered to be one of the more upright, credible and creative environmental committees appointed by the Supreme Court. In recommending that secure landfills be set up in notified industrial estates without the mandatory public hearing, the SCMC has demonstrated its susceptibility to political expediency and economic viability. Its order underlines the pressure on the Committee to find an answer, quickly, to the wrong question: "Where can we dump our toxic wastes?"

The SCMC, for instance, advises the Tamil Nadu Pollution Control Board that "the search for a TSDF may be resumed... once public confidence about such facilities has been established."

It may be worthwhile for the Board to consider mandating an aggressive programme of reducing the use and release of toxic chemicals from existing polluters, even while screening investments in the state to prevent the setting up of more hazardous industries. Simultaneously, the state and even the country should encourage the setting up of clean industries that can feed off the natural and human resources available indigenously.

Time and technology alone will not instill public confidence.

There has to be change in the mindset of regulators and policymakers. Collectors, police and pollution control board officials are commonly seen as anti-people, pro-industry, corrupt, unapproachable and disrespectful of villagers. It is public confidence in these people that needs to be established, and that has little to do with the public and everything to do with the regulators.

In a truly democratic set-up where all people are equal, it would be virtually impossible to locate a hazardous waste dumpsite. The right question for a true democracy or an aspiring one would be: "How can we avoid generating hazardous wastes?"

The argument on economic viability, unfortunately, is one-sided. If the argument were extended to workers and communities, we would be speaking a different language. Pollution-impacted communities and workers can tell you how their ill-health is economically unviable for them. The answers to industrial hazards, toxic wastes and pollution require a redefinition of development and of corporations. It requires subjecting them to the rigorous, time-consuming and frustrating process of democracy.

Just as we may never attain the ideal of true democracy, we may never truly eliminate hazardous wastes. But a lot can be done in moving towards the ideal.

Nityanand Jayaraman is an independent journalist and researcher focusing on investigating corporate abuses of the environment and human rights. He is based in Chennai, and is associated with the International Campaign for Justice in Bhopal

Anger and denial on the streets of Bhopal

There are several different stakeholders in Bhopal: the survivors from Old Bhopal struggling to keep the issue alive, the activists nurturing their own constituencies, the decision-makers and bureaucrats of New Bhopal who desperately want to forget the gas tragedy. The tension between them, and the endless blame game, is dividing Bhopal

SUROOPA MUKHERJEE

ON THE NIGHT of December 2/3, 1984, almost 40 tonnes of methyl isocyanate (MIC) spewed out of a storage tank at the Union Carbide India Ltd (UCIL) factory in Bhopal.

Who were the real victims of this disaster? Newspaper clippings tell us they belonged to the lowest economic strata, people living on the fringes of society. Was this accidental? No, for the line of separation between the two parts of the city is marked by the Upper lake. Its shimmering waters absorbed the gas and prevented MIC from spreading to New Bhopal, where the rich and more privileged members of society reside.

Those who lived in Old Bhopal breathed in the deadly concoction of gases that caused multi-systemic injuries. Today their lungs, eyes, reproductive systems, immunological levels and mental health are severely impaired.

How did the gas affect the rest of the city? A relative with whom I stayed, in Arera Colony, the first time I visited Bhopal described the night quite grimly. "At first, we were not even aware of the event. But then a doctor friend rang up. We took our car and went some distance and saw people straggling along in groups and trying to run. We heard people shouting and crying. The magnitude of what happened became clear in the morning when we heard the news. It must have been very bad. We have heard about the extent of suffering from friends who worked for the victims. But Bhopal has also become a media story. It is so difficult to separate fact from fiction."

How, indeed, does one separate the fact from the fiction? One way is to explore the attitudes of those who were not directly affected, but whose opinions determine how Bhopal is popularly perceived. This includes the decision-makers of New Bhopal: people in government, whose point of view feeds into the policies made and implemented by the State. Like the Director of the Bhopal Cell, Ministry of Gas Relief and Rehabilitation, Bhupal Singh, who said rather bitterly: "Our office is being asked to look after these people for the rest of their lives and now the next generation as well. When will it all stop? Where is the money and the resources? How long will Bhopal pay the price for a single event that was essentially an accident?"

What makes the Hiroshima of chemical disasters a continuous tragedy is the way in which it has been written off as a 'one-time event' whose aftermath was contained by a monetary settlement.

In Bhopal itself, everyone is trying to forget the world's worst industrial disaster. But they are compelled to remember. This is where the conflict is. This is perhaps why there is so much anger and denial everywhere in Bhopal. Doctors, bureaucrats, intellectuals, students, traders, ordinary citizens respond with hostility to any questions pertaining to the disaster. To hear them speak is to understand the invisible line that distinguishes fact from fiction. Denial is as much a mental affliction, and the violence and suffering it unleashes is evident on the streets of Bhopal, even after 20 years.

IN MANAGEMENT PARLANCE, the best way to classify an event is to identify the stakeholders and see their response. The pattern that emerges is fairly typical, and it helps to arrive at neat and conclusive definitions. But Bhopal has a strange way of evading definition. We begin with doctors and bureaucrats who were called upon to take 'charge' of the disaster hours after it occurred. Why should the truth be elusive in their case?

Dr N P Mishra, who was dean of Gandhi Medical College in 1984, describes the night as overwhelming and unprecedented. "The first problem was that of numbers. My team treated 170,000 patients in one day. The second problem was lack of information. UCC continuously informed us that the gas was not toxic and that we should not apprehend long-term effects of the gas. They insisted that most of the casualties were a result of panic and people running. But I took it in my hands to organise bulk supplies of medicine. I rang up colleagues and civil surgeon friends in neighbouring towns like Indore, Hoshangabad and Vidisha and asked them to send supplies of medicine and necessary staff like nurses and wardboys. I called up local chemists and asked them to pool in their stocks. Payment, I said, would be made later. Subsequently, I was accused of taking steps without prior government permission. I find this kind of attitude unfortunate. In an 850-bed hospital, 17,900 patients were admitted and treated. Tell me honestly, can the role of doctors be underplayed in the Bhopal gas tragedy?"

Dr Mishra is far more hesitant when I ask him what kind of research was initiated to study the impact of MIC on the human body. "I am afraid research had to take a back seat because we were too busy managing patients. Four-five days later, the Indian Council of Medical Research (ICMR) stepped in and 27 projects were set in motion. The then-DG told us that money was not a constraint. I realise now that this was a research opportunity of an unprecedented kind. But there was bureaucratic intervention at every step. There was a ban on the

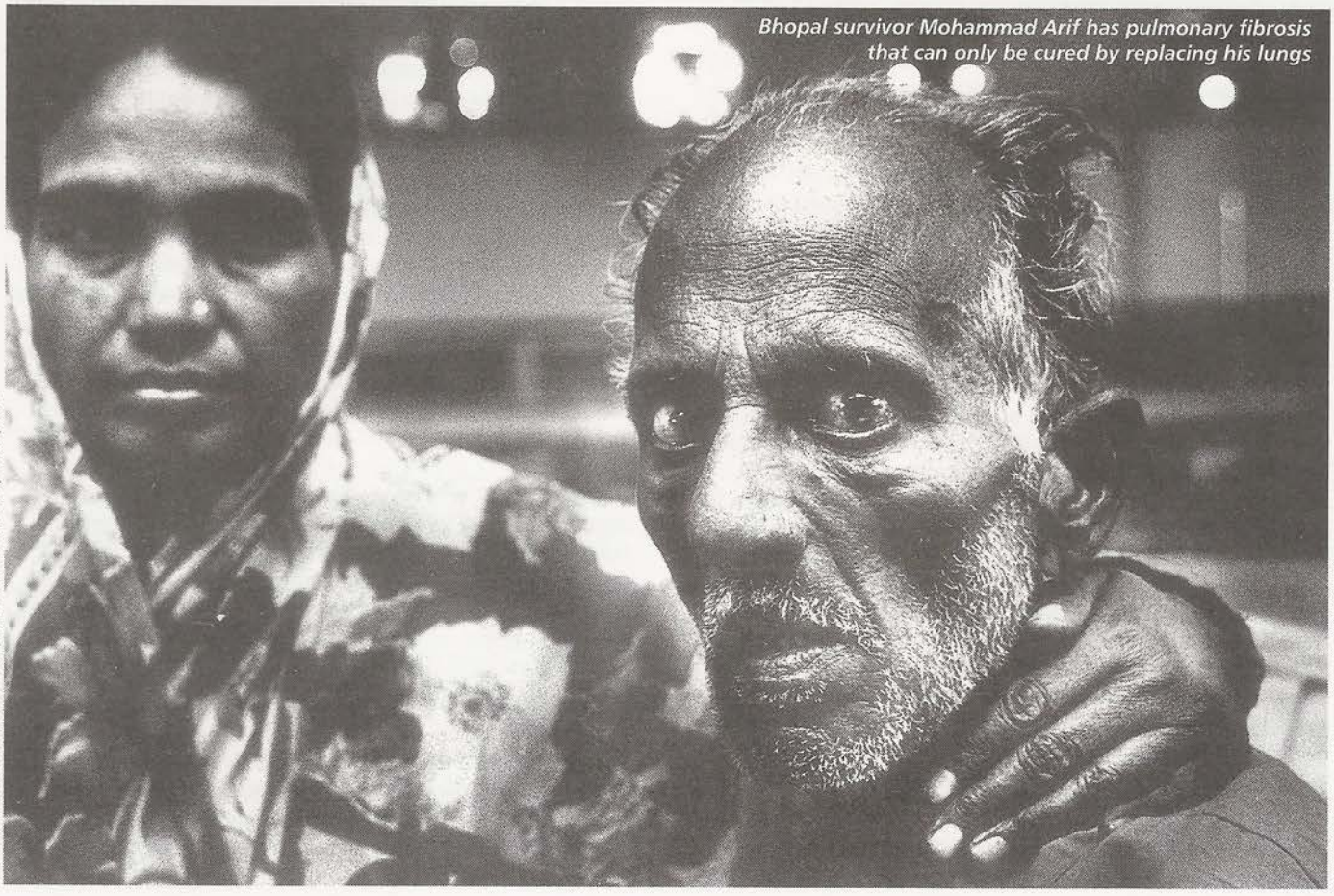
publication of data, and we had to take permission from the central government to attend seminars, speak at any public forum or to the media. And then, just as suddenly, in 1994 the projects were terminated so that many of the findings remained inconclusive. I was appalled to read a press statement made by the present DG that most of the research done here in Bhopal was sketchy. I vehemently deny it. It was excellent work but the findings were suppressed."

I am sitting in Dr Mishra's room and I can see the walls are decorated with awards, citations and pictures taken with dignitaries. Outside is his OPD, and patients are waiting in large numbers. He tells me that even today he sees gas patients, and though he cannot treat them free and much of his diagnosis is symptomatic, in the absence of significant findings, he works very hard to bring relief to them. When I ask him whether patients continue to suffer the after-effects of the gas, that UCC was proved wrong, his answer is evasive and echoes what most other doctors say: "Do not be taken in by the big rush at gas rahat (relief) hospitals. There is no way of knowing the true from the false cases. You see, each one of them is given a card that entitles them to free treatment. So families flock to the hospitals and hordes of relatives jump onto the bandwagon."

When I ask doctors why there is so much anxiety about 'true' or 'false' cases, and why it is used as a parameter to define a gas victim when no such distinction can be part of any treatment protocol, they reply defensively. At the same time, this criterion becomes the basis for arriving at conclusions with far-reaching implications. Dr Rachna Pandey, who was then a post-graduate student at Hamidia Hospital and was working on the clinical medicine project, is categorical when she says that no research is possible in Bhopal today. She admits that if the "projects had continued, path-breaking facts would have emerged. But now all one can have are speculations and postulations. Real and fake facts have got so mixed up that no retrieval of original data is possible. Too much time has been lost. Maybe that is the real tragedy".

AS I LISTEN TO HER I realise what is happening in Bhopal today. Attempts are being made to put together parts of a jigsaw puzzle, but the picture that emerges is so smudged that it cannot appear real from any angle. There is large-scale generalising. I am repeatedly told: "Slums in any part of India are no different from the gas-affected *bastis*. Who drinks clean water in India? Are not most women in India anaemic? Are we not dealing with large-scale poverty and destitution and beggary? There are toxins in everything we eat. If you say that there are more cancer cases in Bhopal then maybe Bhopalis smoke more. Given the statistics for TB, cancer or any other disease, how different is it from the rest of India?"

The biggest bugbear in this disaster is the compensation money that was paid to survivors. How does it matter that it is a



Bhopal survivor Mohammad Arif has pulmonary fibrosis that can only be cured by replacing his lungs

Raghu Rai/Exposure: Portrait of a corporate crime/Published by Greenpeace

"Our office is being asked to look after these people for the rest of their lives and now the next generation as well. When will it all stop? Where is the money and the resources? How long will Bhopal pay the price for a single event that was essentially an accident?"

pittance? Or that it will be used only to pay hefty medical bills, or debts? Post-1984, the widespread ailment that grips Bhopal can indeed be termed 'compensation neurosis'. But it is something that has affected everybody. Almost everyone I spoke to blamed the government for not working out a parameter to separate the deserving from the undeserving. Doctors and bureaucrats, for all their mutual suspicion, agreed that money had corrupted the Bhopal survivors. Collectively they said: "A large section of this population has become lazy and greedy. We cannot get domestic help in Bhopal because that section of society lives on the dole. NGOs and activists back them. They take to the streets and voice their complaints. Every gas victim in Bhopal is a politician who takes advantage of a corrupt system."

The bureaucrats I meet are vociferous in the blame game. Iqbal Ahmed, principal secretary in the ministry of relief and rehabilitation, is candid when he says that the state is up against the Centre. "My coffers are empty. It is easy for the Supreme Court to give orders to supply water through pipelines and tankers. But where are the funds? No, you are wrong to say that we have asked for money from the Rs 1,500 crore surplus lying with the Reserve Bank. We have simply said give us the money from wherever you want. We do not want the victims to pay, but then who pays? What about the mammoth task of cleaning up the contaminated site? Do we have the money and the technology? It is easy for people to make noise in the press. I am glad that now the US court has said that Union Carbide will have to do the cleanup. We have asked an Indian agency to look into the modalities. We are working day and night but the task is not easy. I cannot answer your question about why Madhya Pradesh took back the land. Then you go back to the beginning and ask why the Supreme Court made a settlement. What was the government at the Centre doing then? The questions are endless and I do not have the answers."

The director of the Bhopal cell, Bhupal Singh, is more ready with his answers. "What is the point of giving these people more money? They will spend it on buying consumer durables like colour televisions and what not. Soon Bhopal will be flush with surplus money and this will lead to inflation. So all we said was let the money be kept in a central kitty, and let it be used for long-term treatment. Please understand: the tragedy has been a disaster for some and a boon for others." I am reminded of what the former chief secretary to the government of Madhya Pradesh said to me at an earlier meeting: "The problem with the Bhopal survivors is that they want the government to hold their hand forever. I agree that earning capacity has gone down with physical disabilities and that lighter options should be provided, but you have to be rational. Grants and loans are well within the capacity of the government and they are available. Look, even if bureaucrats are willing, politicians do not listen. Vested interests and corruption are rampant at every level, and where is the system for accountability?"

It is surprising that almost all the official stakeholders are reluctant to say that a national commission on Bhopal, comprising eminent people from different walks of life, should be set up to constantly monitor the situation. Some react angrily: "Is it not bad enough that the Supreme Court is monitoring us all the time? And orders are simply passed to do this or that without going into the ground realities. Besides, any national commission will soon become bureaucratic and be mired in red tape. Mark my words, everybody passes the buck in this country." The former chief secretary is more amenable: "OK, a scientific body, maybe."

Why is it that the scientific approach with its emphasis on objectivity is a failure in Bhopal, I ask myself. But then, how can denial and objectivity go hand in hand? The virulence that one faces in response to questions can best be summed up by a statement made by the chief medical officer in the presence of the director and almost all the superintendents of gas hospitals. "The truth of the matter is that there is no way of knowing scientifically whether people are still suffering the after-effects of the gas. In other words, 95% of people in Bhopal are not gas victims." Heads nod in unison and a superintendent butts in: "The fact is that if we had been honest in defining the number of 'real' gas victims the number would not have crossed 30,000. But we said: 'Let it be, these are poor people, if by identifying them as gas victims they will get benefits, what harm?'. We have been more charitable than negligent." To my volley of questions about why have a gas relief and rehabilitation ministry if that be the case; and on whom is the allocated budget being spent if the percentile is only 5%; and why is the state government refusing to come out with a white paper on expenditure, the replies are angry, with counter-accusations of unwarranted and unethical questions. Denial and brutality go hand in hand, and I realise that I am as angry and frustrated at the end of the day. Imperceptibly, the gas has begun to affect all our lives.

The other two stakeholders are the political activists and the survivors. The activists are wide-ranging. Some claim to be gas-affected Bhopalis with distinct political affiliations, others are middle class and academic — people who stayed behind in Bhopal and who believe in combining information and action.

Some are women and youth leaders. The groups are fractured and not always in agreement about ideological positions and modes of operation. In a sense they too are sucked into the wilderness of vested interests, and the corridors of power. There is much talk in Bhopal about NGOs making money. As one official put it: "People claim to be working for the downtrodden but they are full of themselves, seeking media attention and credit for what is done. How much work do they really do? Yes, there are some who work but they are unsung and unknown."

Meeting individual leaders is to encounter a closed exterior that reveals nothing of the inner turmoil. They nourish their own constituencies and work for the benefit of their own groups. Many of them have loyal followers and I am taken to meet them.

THE GAS SURVIVOR is perhaps the most ambivalent of stakeholders. The physical and mental scars are palpable, so is the anger and frustration with the system. They do not know whom to blame. They view me with a mixture of suspicion and trust. The fact that I have come with a group of students who represent the youth and future of the country makes them curious. The fact that we are from Delhi, the seat of power, makes our role crucial. They flock to us and ask for details to be conveyed to the *sarkar*, as they describe the government at the Centre. Their demands are chillingly simple: clean water, proper medication and means of livelihood. But what they are really asking for is far more complex: "Give us justice not money, give us back our lives and, please, listen to us," is what they say repeatedly.

When I take the students to Neelam Park where a survivor group has been holding meetings every Thursday and Sunday for the last 20 years, we meet a group of widows. Once the initial introductions are over, and the hesitancy dispelled, they hold our hands and cry. Many recount their stories with the usual compulsion that marks narration in Bhopal. How does one distil fact from fiction? I watch the rows and rows of faces, gnarled, wasted, sick, full of despair and hope. When one of the students asks them why they come here every week, a woman who identifies herself as a group leader of sorts says: "We will continue to fight for justice till the day we die. We lost everything on that night, we have nothing else to lose, so we have no fear." I realise that activism in Bhopal has percolated down from the leaders to the nameless faces, and individual constituencies nurtured by different political groups cannot bury the similarities and the differences. I see that many of the women are burkha-clad, their ages ranging from the very young (second-generation, born to gas-affected parents) to the very old. They carry papers and documents as proof of their identity, and when that fails they reveal the scars on their bodies. They are not hesitant to face the camera or to talk to us.

"What is the point of giving these people more money? They will spend it on buying consumer durables like colour televisions and what not. Please understand: the tragedy has been a disaster for some and a boon for others"

In New Bhopal the faces turn away from the camera and people refuse to comment. To them Bhopal is no longer a part of their living reality. They are too busy making their own careers and earning their living. As one young woman retorted: "I am a student of architecture. I have no time for social work." To others, our motive as a group is suspect. What are we doing here — research, investigation or social activism? "People like you come and go but nothing happens," they say bitterly.

EVERY NIGHT we have our group meetings where each of us recounts the day's happenings. Our own narratives have become repetitive and strangely inconclusive, but our energy levels have not dissipated. Bhopal makes us speak out and protest. We are largely students of literature (and from most counts fiction is our area of interest), but here we are grappling with a different discourse, language and meaning. For many of us this is our first experience of fieldwork that takes us outside the closed academic circle. As we exchange notes we comment that we find management's use of the stakeholder model inadequate. What we are talking about is a man-made disaster that affected lives in different ways. Twenty years have passed and the scars remain on the psyche, hidden or palpable. Any kind of classification only creates artificial distinctions between true and false, and separates the beneficiaries from the losers. In the process, the pressing issues of justice, liability and responsibility get blurred. As one student succinctly puts it: "I have learnt more about systems of oppression in these few days than I have from all my readings. What is staring us in the face is class and gender discrimination, based on how power operates. Bhopal is a modern-day tragedy that had to happen one way or the other."

What we intend to do with our 'fact-finding' is to write a report accompanied by a video presentation. We then plan to take it to all the officials who hold positions of power in Delhi. We want to tell them why and how Bhopal continues to matter even today. We also want the collective strength of youth, that We for Bhopal as a group represents, to be felt in the right quarters. If in the process we are able to counter the denial that is part of the popular perception of Bhopal then we would have made a small but significant beginning.

Suroopa Mukherjee is Staff Advisor of We for Bhopal, a students group based at Delhi University and committed to the fight for justice for survivors of the Bhopal gas tragedy. The aim is to create awareness about the pressing issues of environmental pollution, violation of human rights and corporate crime

Safe livelihoods

The development or closure of industry is generally based on the premise that industry must be isolated from other human activities. Not only does this throw workers out of jobs, it does nothing to control pollution, because every relocated hazardous unit will simply continue to pollute elsewhere. It would be better to promote industry that protects both livelihoods as well as environment

DUNU ROY

INDUSTRIALISATION IN INDIA began in the middle of the 19th century with the building of the railways and its associated coalmines, and the emergence of textile and jute mills. By 1930, in the aftermath of the First World War, the pattern of industry had changed somewhat, with plantations of tea, coffee and rubber emerging as major employers, along with large manufacturing units in steel, general engineering, paper, cigarettes, armaments, and foundries. Mining expanded into manganese and mica, and a nascent construction sector emerged.

The Second World War contributed enormously to the growth of cement, sugar, shipbuilding, dyes and beverage units. The chemical industry also made its first appearance, and fertilisers, rayon and aluminium were the first large enterprises to come up. Massive expansion of this industry took place in the 1970s when plastics, polymers, synthetics, dyes, pharmaceuticals, resins, petro-products, paints and a range of organics and intermediates registered a remarkable rate of growth. From 1990 onwards there was a corresponding jump in the consumer goods industry, information technology and telecommunications.

For a century-and-a-half, industries were regarded as the primary engines of growth and the basic arena of conflict lay within the units — between the owners and the workers. By 1980, as the social and environmental impact of industry spread, larger social conflicts began to emerge between industry and its neighbourhood. Much of this had to do with where industry was located.

Firstly, there is the large industrial township built on the lines of Robert Owen's 'garden cities'. This was a self-contained area, planned to house both a single large industrial conglomerate as well as the workforce that was to operate it. An excellent early example was the sprawling township of Jamshedpur, specifically built for the first integrated steel plant of modern India. Not only was this township completely under the control of the TISCO management, it was also novel for its anticipation of future requirements. Between 1920 and 1970, it became a notable site for struggles of workers for better working and living conditions. But even the far-sightedness of this industrial group could not foresee its exponential growth. By 1980, the town had changed into a city plagued with innumerable environmental and social problems — including conflicts with the polluted and pillaged hinterland.

The second site is the industrial estate, specifically set up to accommodate a number of industrial units. In the aftermath of the political violence of the late-1970s in Bengal, when industry began to flee the state, both Maharashtra and Gujarat set up a number of industrial estates to attract this freed capital. But these industrial estates also became sites for the concentration of industrial hazards. The GIDC estates in Baroda and Ankleshwar are good examples, as they contain 77 of the 250 major hazardous chemical factories in Gujarat. They have been compelled to establish Emergency Response Centres while all the factories are supposed to have standard emergency plans with all necessary equipment and mutual aid facilities available to each factory.

Industry associations like FICCI and CII are also involved in spreading awareness about preventing pollution in industry. But the role of these bodies is confined to disseminating information. They do not play a regulatory role; the onus of adopting relevant technology lies with members. Consequently, every unit within the estate pursues its own profit-making trajectory, while appearing to conform to safety specifications.

The third site is actually not a single site at all, but a distributed one. It is the outcome of rapid industrial growth that cannot be encompassed within the actual space provided by planning and regulatory bodies. This space is almost always much less than what has been formally planned. Hence industrial enterprises tend to come up on their own initiative, along major transportation routes and near markets, wherever the requisite infrastructure is available. There is no adequate regulatory machinery to supervise these industries, most of which are within the small- and medium-scale sector, and they become the objects of environmental concern. Thus, when international NGOs pushed for a total ban on the export of hazardous wastes, the residents of Picnic Gardens, an affluent colony in Kolkata, mobilised to take legal action against the small lead-smelting units in their area. In 1994, the Supreme Court eventually ordered that the units either control pollution within a year or shut down, but this did not solve the problem. What the Court did not understand was that the task of developing clean technologies for small firms is not merely a technical one; there are also institutional and socio-economic dimensions to the process of change.

The development of these sites, and their subsequent environmental consequences, has an immediate and major impact on the lives of workers and their families. For instance, the occurrence of pneumoconiosis, or Black Lung disease, was

Alessandro Marongiu

View of the Union Carbide factory from a neighbouring settlement in Bhopal

widespread in coal mining townships, although in the early years Company doctors tended to diagnose it as tuberculosis in order to avoid corporate liability. A Greenpeace study of the chemical units in the industrial estates between Mumbai and Ahmedabad found that 50% of chemical storage tanks were in bad condition, but 80% of workers were not using personal protective equipment, while in 77-86% of units they were reporting respiratory, skin and eye complications.

There has been no major cross-sectoral study of the health of workers in the distributed small-scale sector, but a review of the literature on occupational health reveals numerous studies of respiratory diseases, thermal stress, chemical effects, musculo-skeletal disorders, and so on. All these point to the enormously heavy load of death and disease in the working class, much of which is not documented in public health records. But when industries are closed on environmental grounds, workers are doubly impacted as few of them receive compensation or any rehabilitation assistance, while the social and economic costs of relocation are traumatic.

When closure orders are issued by courts which have no grasp of the underlying dynamics of industrial development, they only serve to reinforce the pressure by global forces to change the character of the Indian economy. Thus, the organised manufacturing base within industrial areas begins to be eroded and is replaced by 'clean' service and trade enterprises, such as office complexes, showrooms and banquet halls. The 'dirty' work is outsourced to the informal sector, which has to locate its own space in the distributed sites. This, in turn, creates the looming threat of 'illegality' over this sector and it can be closed again on the pretext of pollution. It is then presumed that new formal industrial areas will be able to take up the slack. But, as the experience in Delhi demonstrates, this too remains a myth. When the government of Delhi invited industries in 'non-conforming' areas to relocate, only one-third of the applicants were proposed to be relocated at a greenfield site, leaving 85% of the irregular industries (and their workers) out of the pale of the legal system. And even at the greenfield site, there is no provision for housing and services for the estimated 1,38,000 workers and their families — or the 'unplanned' workforce which will construct the estate.

All strategies for development or closure of industry are based on the premise that industry has to be isolated from other human activities. This does not address the essential issue of controlling pollutants, because every developed or relocated hazardous unit will continue to pollute wherever it is and affect the workers. Since both air and water pollution enter the ecosystem, they have long-term and long-range effects that become manifest over time and space and are not immediately visible. The above strategies also bypass the plight of workers who are either thrown out of jobs or have to travel long distances to get to work. An alternative strategy could be premised on the notion that industry has to provide 'safe' livelihoods. In other words, it has to protect both livelihoods as well as environment. One can pick up valuable lessons for this from the cumulative experience of the 'mixed-use' industrial towns, the principles of occupational safety, the struggle of affected groups to protect their environment, and the creativity of small household enterprises. Within the larger context of globalisation and privatisation (as an answer to upper-middle-class aspirations) there is an emerging possibility of negotiating the Right to Safe Livelihoods for workers in a truly democratic society. This will not only protect those who toil for a living, but also those who live in the neighbourhood of all work, and provide a realistic basis for sustainability.

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Victims twice over

Contaminated water is just one of the problems that the gas victims of Bhopal have to face. There's also the continued apathy about their compensation, the continuing struggle for medical treatment, and the reluctance of Dow Chemical (Carbide's new owners) to clean up around the old plant

DILIP D'SOUZA

An internal Carbide study in 1989 admitted that the liquid samples drawn from inside the plant contained naphthol and/or Sevin in more than permitted quantities

Alessandro Marongiu

ON JANUARY 22, 2001, the *Hindustan Times* in Bhopal carried a news item headlined: 'Gas victims brave dry taps in filthy colony'. The colony *HT* referred to was set up for victims of Bhopal's 1984 gas tragedy. The item says the "water supplied to houses (in this colony) could contain human excreta as the drainage lines intersect water supply lines at many points, thus contaminating the drinking water."

This spectre of contaminated drinking water was corroborated in Bhopal's *Central Chronicle* of April 21, 2001. There, you can read that the "Engineer-in-Charge, Public Health Engineering Department (PHED), H N Vajpayee, said that it was totally wrong to presume that the groundwater (where gas victims live) is safe for drinking."

Then on November 27, 2001, the *Central Chronicle* had a news item headlined 'Gas victims drinking highly contaminated water'. An excerpt from that news story: "Thousands of gas victims residing around the now-closed Union Carbide's Bhopal pesticide plant ... were forced to drink highly contaminated water ... Apart from benzene, there were several other chemicals which were present in the closed plant and their seepage is leading to water pollution. In some of the handpumps, water is giving (a) foul smell. ... (A) report of (the) National Institute of Toxicology said that they have detected a large number of hazardous chemicals in the samples of water and soil collected from the residential areas around the factory. These (include) aromatic hydrocarbons, benzene oxide, dichlorobenzene, naphthalene..."

These are three random bits of news, out of literally reams of Bhopal gas disaster news over two decades. I chose these for two reasons:

- They are all from one year, which I also picked at random.
- They all refer to the same problem: contaminated water.

More than 16 years after the disaster happened, its victims were forced to use contaminated water. Not just because colonies to house these victims were built so carelessly as to have their water supply 'intersect' drains carrying excreta. That's bad enough. But over the years, chemicals stored in the defunct Carbide plant have also seeped into the groundwater.

If all that seems hard to swallow — like the water itself — consider this. Contaminated water is actually just one problem — some would even say a minor problem — that gas victims have to face. There's also the continued apathy about their compensation, even if a recent Supreme Court judgment holds out hope there. There's the continuing struggle for medical treatment; yes, even 20 years later there are gas victims being treated — thousands every single day. There's the hostility from fellow citizens who don't want to hear about the gas leak any more. There's the reluctance of Dow Chemical (Carbide's new owners) to clean up around the old plant. There's more.

You see all this happening, and it might strike you that one kind of person you don't want to be in India is a victim of a major industrial disaster. Because not only do you suffer the effects of the disaster, nobody gives a damn about your rights afterwards either. The official machinery that's put in place to help you will, in fact, make life more difficult for you. You end up being a victim twice over. Maybe more.

And in this piece, I want to use just this one travesty — water that is contaminated — to demonstrate this truth about victims' rights.

Of course, there are human rights documents that spell out what should happen with victims of a disaster, as in Bhopal. Take just one example, the Permanent Peoples' Tribunal Charter on Industrial Hazards and Human Rights. This carefully thought out document was drafted in the wake of the Bhopal calamity. Here are two excerpts from its introduction:

"(The Charter's) substance, and hence its authority, derive directly from the collective experience of those who have been forced to live with the consequences of industrial hazards.

"It is a set of demands from below, to be seized by individuals and groups acting in the context of particular struggles. The way in which it is interpreted and used will necessarily vary from one situation to the next, but it nevertheless articulates a universal vision of a world in which people are able to lead their lives without industrial hazards."

In other words, this Charter is a fair representation, an encoding if you will, of the needs and desires of victims of industrial disasters. It is a document that, if adhered to, will greatly reduce both the risks of living near hazardous plants and the fallout of a catastrophe like Bhopal saw.

If adhered to.

In any case, the Charter has these lines that you might apply to the situation that the three news items above speak of: "All persons affected by hazards have the right to effective and innovative policies to reduce, abate or compensate for hazardous activities. To achieve the realisation of this right, the steps taken by states and businesses shall include (among others) pollution abatements or cessation."

Now contaminated drinking water supplied to gas leak victims 17 years later hardly qualifies as 'pollution abatements or cessation'. But neither the state nor the firm concerned (Union Carbide, and now Dow Chemical) has taken any serious 'steps' to achieve that 'abatement or cessation'.

In fact, they have disputed the very existence of pollution. In 2002 the head of Dow in India, Ravi Muthukrishnan, wrote to me saying, "There are differing views on the science surrounding the extent and source of any contamination." He mentioned studies by the National Environmental Engineering Research Institude (1997) and the Madhya Pradesh Pollution Control Board (1998). According to him, these concluded that the contamination in the water could not be linked to the "chemicals formerly used" at the Carbide plant, or to "past disposal activities" there.

Yet these two studies — or at least Muthukrishnan's mention of them — do not address what even the sleepy security guards at the rusting plant warn passers-by about, even today. The chemicals stored at the plant, they tell you openly, have seeped into the ground and are a health hazard. "The soil itself is now poisonous," one guard said as he refused to let me enter. (What about you, I asked him, what do you feel about doing duty standing on this soil? "I don't even touch it," he said.)

Dow can speak of 'differing views on the science'. But everyone around the plant knows: their water is contaminated.

In JP Nagar, across the road from the Carbide plant and thus the closest residential area to it, I visited wells that nobody is willing to use. One had a municipal board warning that the water was unfit for human consumption. Another was in the home of a man called Govandi Lal. The irony was not lost on him: he has a well at home, but he must use a municipal tap for water.

Victims groups have been and might have remained stuck in this twilight zone of "the plant has contaminated the water" versus "no, it hasn't". Luckily, the US justice system has taken a different view. Earlier this year, Judge John Keenan of a District Court in New York asked the Government of India to submit a letter saying it had no objection to Dow cleaning up the pollution around the abandoned plant.

Hidden somewhere in there is yet another twist in this sorry tale. Among the papers Carbide was forced to disclose to this Court in 2002 is a report of an internal study Carbide conducted on the contamination issue. It's called 'Presence of Toxic Ingredients in Soil/Water Samples Inside Plant Premises', and here are some lines from it:

"The seriousness of the issue needs no elaboration. Samples drawn in June-July '89 ... inside the plant were sent to R and D. ... The solid samples had organic contamination varying from 10% to 100% and contained known ingredients like naphthol and naphthalene in substantial quantities. Majority of the liquid samples contained naphthol and/or Sevin in quantities far more than permitted by ISI for onland disposal. All samples caused 100% mortality to fish in toxicity assessment studies and were to be diluted several fold to render them suitable for survival of fish."

Carbide has known about the contamination for 15 years, but has chosen silence and denial.

After sustained pressure from citizens around the world, including a hunger strike by three activists, and after Prime Minister Manmohan Singh personally intervened, the government did submit the necessary letter to Judge Keenan in June 2004.

You might wonder why it takes so much for a government to hand over a mere letter that assumes no obligations anyway. Let that pass as just more evidence of official apathy towards victims. Instead, this episode means that we might finally see some move, even if 20 years on, towards that Charter's "pollution abatement and cessation".

Yet that figure — 20 years — is itself a final sign of the struggle victims must wage for their ordinary rights.

Trained as a computer scientist, Dilip D'Souza has written two books and has won several awards for his writing

Can a Bhopal happen again?

This investigation of the toxic hotspots in just one Indian city, Delhi, reveals that the disaster management plan for even the capital remains largely on paper. Delhi alone has 1,777 industries generating hazardous wastes, but no chemical hazards map. Tilak Bazaar, Asia's largest chemical market, is in the heart of Chandni Chowk. It's a tinderbox waiting to explode

RAKESH KALSHIAN

TO A NEWCOMER, it looks like any other bustling street in the labyrinth called Chandni Chowk, Delhi's oldest and busiest marketplace — congested, dilapidated and a messy mix of tradition and modernity. But Tilak Bazaar is different in one important respect: instead of the wafting swirls of spices and aromas of vintage culinary delights, here your nostrils are assaulted by strong vapours — acrid and pungent — of a chemical miasma.

Welcome to Asia's largest chemical market. With its narrow lanes, ramshackle and densely-populated houses, haphazard electric wiring, poor sanitation, and virtually no fire-safety precautions, Tilak Bazaar is a tinderbox waiting to explode. Indeed, between 1994 and 1996, at least 55 people were killed and over 500 shops destroyed in fires that have engulfed the area.

Here, you can witness flagrant violation of practically every law in the book as poor migrant workers cart and unload and load drums of dangerous chemicals sans any caution. A cocktail of deadly chemicals flows in open drains. Nobody knows how many different kinds of chemicals are stored here, let alone what might happen if a major fire was to break out in one of the storerooms. Apart from the residents, an estimated 20,000 workers work in this small area. R C Sharma, Delhi's Chief Fire Officer, says, "It is impossible for a fire brigade to enter this area and put out the fire. And when chemicals catch fire, they release all kinds of gases injurious to people's health and lives. The pity is we can't do anything about it. The only way you can avert a disaster here is to shift this market to an area where it can be properly regulated."

Tilak Bazaar is not an exception. Delhi's many-layered, thickly-textured architecture hides many a chemical Minotaur that can trigger a mini Bhopal any time. According to the Delhi-based National Productivity Council, there are currently 1,777 industries that generate hazardous waste every day, much of which is either dumped into wastewater drains or in landfills. Many of them are housed in thickly-populated residential areas where they pose a grave danger to people's health and lives. Consider the following toxic hotspots:

- Asia's largest PVC market in Vishwas Nagar, where more than 20,000 migrant workers toil in appallingly hazardous conditions to eke out a living. People living around the PVC manufacturing facilities are also exposed to the same health hazards as the workers. Worse still, highly inflammable materials such as PVC resin are stored in large quantities on site. A fire in the area could be potentially damaging to people's health. In 1997, a major fire gutted Delhi's largest waste plastic market, spewing into the atmosphere many dangerous gases such as dioxin which are likely to have been slowly absorbed into the bodies of nearby residents.

- The Roshanara Garden market which for a long time has served as an unregulated chemical godown and which witnessed a minor fire in June this year. According to Sharma, there were no casualties but the possibility of a major fire cannot be ruled out.

- The Wazirpur industrial area where steel is processed uses all sorts of hazardous chemicals which often find their way into the groundwater.

- The five water treatment plants at Chandrawal, Badarpur, Haiderpur, Wazirabad and Bhagirathi, each of which store over 900 kg of chlorine gas. A leak in any one of them could pose a danger to thousands of people over a distance of 6 km, according to the Delhi government's off-site emergency plan.

- The gas-fired thermal power station at Indraprastha where, according to experts at Delhi's National Disaster Management Institute, a leak of naphtha gas could affect communities in a radius of 3 km.

Besides, cold-storage plants that store ammonia, tankers transporting all kinds of toxic chemicals and gases, and several huge oil depots, all operating amidst residential areas, are also potential threats. According to the National Capital Territory (NCT) Off-Site Emergency Plan of 1998, the most significant hazards arise from the uncharted storage of chemicals and materials as there are many unlicensed and unauthorised industries, operations and activities.

K T Ravindran, professor of urban planning at the School of Planning and Architecture, laments a complete absence of an urban planning strategy or ethos. "The authorities seem least concerned about the safety of workers or residents. Let alone dramatic chemical accidents like Bhopal, we are all victims of slow disasters that are happening all the time — pesticides in water and vegetables and toxic chemicals in the air."

A glaring example of official apathy towards the safety of both workers and neighbourhoods is the recent accident in a steel factory in Ghaziabad in which at least 10 contract workers were blown to pieces and several critically injured when a live bomb exploded in their faces as they were unloading a truck full of

imported metal scrap at a steel plant.

This accident could have occurred anywhere as authorities combing scrap godowns and factories found bombs, many of them potentially explosive, in various parts of the country. Fearing raids by the police, factory owners had dropped them wherever they pleased — two live shells were found just outside a school in Ghaziabad, creating a panic situation.

Had it been a terrorist strike, one could still have blamed it on bad luck, bad diplomacy or a combination of both. But this was, once again, a case of negligence. The authorities were caught napping as usual. And this wasn't a freak accident either. It was merely one more in a series that has consistently demonstrated the unconscionable disregard for the safety of workers and communities in the event of a disaster in installations dealing with hazardous substances. Since human memory is short, let's remind ourselves of some recent accidents (see also *History of hazards* on page 46).

- In the last four years, in Nandesari, about 25 km from Vadodara, at least 13 incidents of gas leaks and fire accidents have left 14 dead, 22 injured, and 14 crippled forever.
- In February 2004, an explosion and fire at India's space centre in Sriharikota, Andhra Pradesh, left 36 dead.
- In October 2003, five workers were killed and 41 injured in a major explosion in a fertiliser plant in Bharuch.
- In January 2003, nine firemen were injured when they were trying to douse the flames in a storehouse of chemicals in Ahmedabad.
- In 1997, a fire at a refinery in Vishakhapatnam claimed 34 lives and injured 31 workers.
- In 1997, an ammonia leak from a tanker injured 400 people in Bhopal.
- In 1995, another ammonia leak from a tanker affected 2,000 people in Maharashtra.
- In 1995, an explosion in a tanker carrying petrol killed 100 and injured 23 in Chennai.
- In 1994, a chlorine leak from a tanker killed four people and injured 300 in Thane district, Maharashtra.
- In 1994, a fire in a chemical store injured over 400 people in New Delhi.
- In 1992, an explosion in a chemical warehouse claimed 43 lives in New Delhi.

THE BHOPAL DISASTER raised difficult and unattended issues such as how to prevent potentially dangerous chemical plants from being located in heavily populated areas; how to ensure that as much as possible is known about the risks and effects of toxins being used or produced; how to ensure the safe operation and maintenance of industrial facilities; and how to develop effective disaster plans for the protection of workers and nearby residents.

Any civilised and caring society would have taken these four lessons to heart. But have we?

"To be fair," says Dr N H Hosabettu, who heads the Hazardous Substances Management Division in the Ministry of Environment and Forests, which deals with chemical and industrial disasters, "in the wake of the Bhopal gas tragedy, the government did enact a few stringent laws to ensure that another Bhopal does not occur." Among other things, these laws regulate the handling and transport of hazardous materials; provide for the relocation of industrial plants if situated in populated neighbourhoods; bestow on workers the right to demand information about health and safety at work; oblige employers to disclose to the public all the information regarding dangers of chemical operations, their health hazards and measures to overcome such hazards; and mandate an up-to-date and adequate on-site and off-site emergency plan in case of a chemical disaster. The rules also provide for the creation of crisis groups at central, state, district and local levels with differentiated roles and responsibilities to deal with an emergency.

Between 1994-96, 55 people were killed and 500 shops destroyed in fires in Tilak Bazaar. Here you can witness the violation of practically every law in the book as poor migrant workers unload drums of dangerous chemicals

"The trouble is," admits Hosabettu, "that the administrative machinery, especially at the level of state governments, has lacked the political will and competence to enforce these laws." Delhi is a classic case of the dangerous gap between theory and practice. It wouldn't be an exaggeration to say that the authorities entrusted with the task of preventing or managing chemical disasters haven't awakened to the gravity of the situation yet.

To begin with, the officials of the Delhi Disaster Management Authority (DDMA), an agency entrusted with the task of managing disasters in the city, seem least concerned about their responsibilities. They refused to speak to this reporter, while the Home Secretary declined to be quoted. Unfortunately, this characteristic tight-lipped bureaucratic attitude couldn't have been more inappropriate, given that the nature of the agency requires openness and proactive outreach to all audiences to educate them about disaster prevention and preparedness. Little wonder then that neither communities nor factory owners or workers have heard about the DDMA.

It appears, though, that the DDMA had good reason to malinger. They had precious little to say because the disaster management plans for the city are still to be finalised. According to Brig B K Khanna (Retd), a disaster management consultant with the National Disaster Management Institute in New Delhi, the plan was supposed to be ready in February this year when the DDMA formally came into being. "We have been asking them to give us their plans but no luck so far. While most other states have sent in their plans, I wonder why they are sitting over it."

A disaster management plan does exist, confirms Dunu Roy, an activist fighting for industrial workers' rights. However, he believes the bureaucrats will not share it with communities or NGOs. That, unfortunately, runs counter to the very purpose of a disaster management plan. It is ironical that an authority that is supposed to deal with emergencies is so inaccessible: it has only one phone number which it shares with another department. Nor does it have any literature to disseminate, even to journalists, let alone other citizens.

The authority's website dismisses chemical disasters in two paragraphs. Ravindran, whose advice is often sought in such matters, says: "Chemical disaster is not even discussed at such meetings. All they are worried about is earthquakes." Indeed, so far there have been only three mock-drills to demonstrate Delhi's preparedness in managing disasters, and not surprisingly, all of them dealt with earthquakes.

According to the plan, each cluster should have a well-designed emergency control room equipped with facilities such as a sophisticated communication system that allows emergency response agencies to act quickly and in concert when a disaster occurs; a regularly updated inventory of hazardous materials in the area; a station that provides data on crucial variables such as wind velocity and direction for real-time simulation of accidents; a ready reckoner of the possible impact of hazardous chemicals on people's health, as well as information about what relief agencies can do to alleviate immediate suffering; and a detailed map of the area showing the location of industries, residential areas, sensitive locations, access routes, etc.

But all this remains on paper so far. Sharma admits that what is being done in the name of disaster management falls far short of what we ought to do. "The laws are in place but there is a lack of will and coordination among different authorities to handle such disasters in an effective manner. Besides, we need more people and machines to cope with the city's disaster potential."

He regrets not having a chemical hazards map of Delhi and believes that "if we had one, it would be much easier to identify potential disasters and thereby prevent them from happening. I also think that authorities like the MCD, which are supposed to regulate such hazardous activities, should take their tasks a little more seriously."

Say, for instance, forcing all hazardous industries to prepare an off-site emergency plan which is now a legal requirement. The industries are required to put a board outside their premises with details about the hazardous chemicals and wastes stored on site, and the dangers posed by them. The law requires them to disseminate information to communities and workers on how to respond to an emergency. "But," says Khanna, "very few abide by this rule; the majority haven't even prepared the off-site emergency plan. In fact, at least four industrial plants have approached our institute to prepare these plans for them."

The health establishment too is grossly under-prepared to deal with the consequences of a chemical disaster. A senior epidemiologist in the Central Government Health Services (CGHS), who refused to be identified, concedes that "hospitals in Delhi are not geared to handle emergencies in the event of a chemical disaster. Unless we create a team of doctors specially trained to give first-aid as well as treat victims of chemical exposure, we can't save lives in the event of a chemical disaster."

It is clear that Delhi's political masters lack the political will to deal with its disasters, chemical or otherwise. "Every time there is talk of hazardous industries, the authorities react with the response — shut them or shift them. That this might deprive thousands of workers of their livelihoods doesn't seem to bother them," says Roy.

For Roy, an alternative strategy could be based on the notion that industry has to provide 'safe' livelihoods. "In other words," he says, "it has to protect both livelihoods as well as environment. This is the concept on which the 'garden towns' of the earlier industrial complexes were built. We could learn a lot from the experience of the 'mixed-use' industrial towns, the fundamental principles of occupational safety, the struggle of citizens groups to protect their environment, and the creativity of small household enterprises." He suggests the following roadmap:

- Convert polluting units into viable non-polluting ones, and shut down those that cannot be controlled with accessible technology.
- Promote the mixed use of land (as accepted by the Second Master Plan), so that industry and residences and recreational and commercial areas co-exist and reduce the need for large infrastructural investments.
- Make it mandatory, using existing zoning laws, for industry owners and regulatory authorities to live in mixed-use industrial areas so as to provide personal incentive to plan for pollution prevention measures.
- Assert the Right to Work in a Clean Environment so that both livelihoods as well as environment are protected, as provided for in existing labour legislation and in Article 21 of the Constitution.
- Make workers and communities an integral part of disaster management plans.

But the big question, as always, is: how soon, if ever, will political will catch up with this eminently good sense? Until it does, painful memories of Bhopal must be kept alive.

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Burnt paddy and dead fish

Five years ago the fishermen of Kharnasi, near the Oswal fertiliser plant in Orissa, used to catch 10 quintals of hilsa fish per trip. Now, the catch is down to a quarter of that. 50% of the fishermen have stopped taking their boats out. Following a gas leak, 3,500 hectares of paddy turned yellow overnight. This report shows the extent to which livelihoods are being eroded by industrial pollution

MANIPADMA JENA

DAWN IS STILL an hour away. Bishwesar Haldar picks his way in the dark to the riverbanks. These days he hardly ever goes fishing. Completing his ablutions early, however, has been a habit since he was 13 and began accompanying his father in the dinghy. The air outside is thick and moist and the haze is hugging the earth. Lights from the factory across the rivulet from the Mahanadi river gleam wickedly through the mist like huge eyeballs with giant orbs. As the mist curls around him, Bishwesar's lips begin to tingle. Then the delicate tissue inside his nostrils stings as when his wife puts too much red pepper in the fish curry. Floating in the still dark morning air, unseen by the fisherman, are microscopic acid droplets, which splash against the moist film protecting the eyes, burning them and making them water; he curses aloud. The full impact of the noxious smog hits him now and he squats on the grass, choking and coughing. As the constriction in his upper chest eases a little and he can breathe, he traces his way back. And waits for the acid haze to clear.

Since April 1999, Bishwesar and more than 100,000 people of 25 gram panchayats in two districts around the Oswal Chemical and Fertiliser Ltd (OCFL) plant, at the port town of Paradip in Jagatsinghpur district of Orissa, have been getting used to such ailments. What they find difficult to get used to, however, is the slow erosion of their livelihood base, eaten away like an acid attack by the pollution of OCFL. Fishermen, paddy cultivators, vegetable farmers and cattle owners find their livelihood base severely impacted by the air and water pollution; they find their own and their family's health slowly deteriorating.

OCFL is a Rs 2,000-crore fertiliser plant, producing 2 million tonnes per annum (mtpa) of Di Ammonia Phosphate (DAP) fertiliser — one of the largest producers in India. It was set up in 1999, just five kilometres from the deep sea harbour in the port town of Paradip in Orissa. Since production began in April 1999, OCFL has faced a host of complaints and agitation from local people over water and air pollution. It has a case for pollution pending against it in the Orissa High Court. Despite three major accidents, a number of ammonia gas leaks and a few Orissa State Pollution Control Board (OSPCB) raps, the industry has carried on with seeming impunity.

The joint inspection by the Ministry of Environment and Forests (MoEF), the Central Pollution Control Board (CPCB) and the OSPCB in February 2002 and their indicting report followed by two months of closure, has not reined in the polluting industry. In August 2003, 3,500 hectares of paddy crop were burned

Manipadma Jena

yellow by a massive gas leak. Two hundred people, mostly children and the aged, were affected by respiratory illness. In 2003, around 20 head of cattle and an equal number of goats died after grazing on grass and foliage contaminated by what the villagers say is a white powder. Often, delicate plants like basil and others just shed all their leaves and stand nude in the morning.

BISHWESAR'S VILLAGE Kharnasi, with 14,000 families, is in Kendrapada, on the border of Jagatsinghpur district, 2 kilometres across the Mahanadi river from the OCFL plant as the crow flies. A few kilometres away the river opens out into the Bay. Ninety per cent of Kharnasi's population draws its livelihood from fishing and allied activities. The Jaya Durga Marine Fishermen's Cooperative Society was set up in 1986 with 900 members. Till the OCFL started operations in April 1999, Basant Sikdar, 35, says they would catch up to 10 quintals of hilsa (an expensive variety of mullet) fish in a three-day haul; today their catch has dwindled to 25% of that. Their fathers used hand-rowed dinghies; Basant Sikdar and every other fisherman has at least a 5-15 horsepower diesel motor fitted to his dinghy. On one fishing trip they spend 100-150 litres of fuel. Since the last four years their catch does not even cover their costs. They cannot venture into new fishing fields because each fishing community has an unwritten ownership over these.

As a result, nearly 50% of the fishermen have stopped taking their boats out, informs Narayan Haldar, president of the Cooperative.

While the fishermen sit idle their debts are mounting. Nabarana Burman had taken a loan in 2000 of Rs 50,000. "Earlier we would repay substantial loans in just the three months of peak

hilsa season," he says. Now he has not been able to repay any of it and the loan stands at Rs 80,000. The only way he can repay his loan is by selling his boat, as Bishwesar has done.

Nabarana Burman had 2 acres of cultivable land. Fishing was booming business here in 1997, and he sold an acre to buy a 15 bhp boat for Rs 1,00,000. Then OCFL came and by 2001 he was forced to sell his boat. Today he earns daily wages of Rs 40, when he gets hired that is, by repairing nylon fishing nets. His remaining one acre in a single crop year gives just 700 to 800 kg of paddy. If sold at the government support price he gets a paltry Rs 2,500. Earlier Burman would get 1,200 kg of paddy from that one acre.

Agriculture too has been hit by OCFL. "Coconut produce has reduced by 75%; black spots appear on the upper portion near the stem. Bamboo produce is 50 to 60% less since the last four years. Cashew is badly hit. If the toxic emissions touch the plants during the flowering season they burn and shrivel and hardly give 20% of the normal produce; we know this because when the OCFL plant was closed during the flowering season we got a near-normal harvest after four years," say Mrutunjay Mandal, sarpanch of Ramnagar.

Ramnagar is the largest daily vegetable market in Kendrapada district. Twenty gram panchayats depend on these 'haats' for wholesale procurement, so the vegetables find a ready market. But the women tell us that the local vegetables acquire black spots, which cause the vegetables to rot. "Pitapat village was the main supplier; today next to nothing comes from that village situated just across OCFL, separated by the Mahanadi river," adds former sarpanch Bijoy Shukla.

The worst destruction occurred in September 2003. Entire villages got up one morning to see their acres and acres of paddy turned yellow overnight — nearly 3,500 hectares, the Mahakalpada tehsildar's report later calculated. The tehsildar's report just mentioned 'Oswal gas', but the gas that caused the damage could have been either sulphur-dioxide or ammonia fluoride emission. The people of Barakanda, Baulakani, Ramnagar, Bajrabahakud, Bahakud, Baradanga, Suniti, Gogua and Kharnasi villages, which were worst-affected, agitated. An FIR was filed. "We forwarded 60,000 complaints from the affected villages to the tehsildar of Mahakalpada block. The environment minister Surya Narayan Patra visited with a high-level team. There were heated debates in the state legislative assembly," says Mahakalpada block chairman Balaram Parida, whom we met up with in Mangalpur village.

OCFL was shut down for three months.

OCFL OBTAINED ENVIRONMENTAL CLEARANCE in July 1998 from the Ministry of Environment and Forests under EIA notification, 1994, with specific conditions. The plant started trial production in April 1999 and obtained consent from the OSPCB to operate from 20.01.2000 to 31.03.2000 under specific conditions. After complaints from the people of some panchayats of Mahakalpada block, an OSPCB surveillance squad for surprise inspection and monitoring visited the OCFL factory on 11.10.2000 and found that the industry was violating a number of consent conditions: 20 conditions out of the 30 it had agreed to for controlling water pollution were not being met and 11 of the 28 for air pollution control were being disregarded.

OSPCB found that the industry was discharging untreated wastewater into the nearby creek and Mahanadi river. In November 2000, OSPCB/MoEF refused permission for OCFL to operate for 2000-01. Cases were filed subsequently under Section 25 and 33 (A) of the Water (Prevention & Control of Pollution) Act, 1974 and Section 31(A) of the Air (Prevention & Control of Pollution) Act, 1981, to control and mitigate pollution. Directions were issued by the MoEF under Section 5 of the Environment (Protection) Act, 1986, to take adequate measures for the fisherfolk, who had reported that on several occasions dead fish were found floating, possibly due to occasional discharge of acidic effluents from OCFL. On 24.11.2000, the consent refusal order was issued to OCFL. On 6.12.2000, OCFL was allowed to present its case in person. OCFL was asked to furnish an action plan on implementation of various aspects of default. On 11.12.2000, OCFL submitted an action plan and resumed operations. Because of OCFL's assurance the cases were not pursued.

In 2002, the Joint Committee found nothing much had changed since it had issued the above orders for OCFL to clean up its act. Their inspection revealed that Atharbanki Creek water, adjacent to the plant and running into the Mahanadi river, indicated high pH levels of 2.16 and high concentrations of fluoride (318 mg/l) and phosphate (589 mg/l). Similarly, the

Chronicle of disasters

One morning in September 2003 entire villages woke up to see their acres and acres of paddy turned yellow overnight: nearly 3,500 hectares, according to the Mahakalpada tehsildar's report. The report mentioned 'Oswal gas' as the cause of the disaster; the gas that caused the damage could have been either sulphur-dioxide or ammonia fluoride emission.

This was not the first accident. Gas leaks and fires on April 9, May 6, May 9 and May 28, 2000, had allegedly killed six workers and injured over 20, according to newspaper reports. Following this, the government ordered the closure of the DAP plant and sulphur-carrying conveyor belt for two months.

- In November 2000, when an ammonia leak occurred, reportedly the sixth since OCFL began operations, people fled the area fearing a Bhopal-like disaster. Media reports pegged the number of affected at 10,000.
- In 2001, Paradeep Phosphates Ltd, a Government of Orissa fertiliser industry situated a few kilometres from OCFL, filed a formal complaint that air pollution from OCFL was adversely affecting their employees' and their families' health.
- In March 2002, yet another fire broke out in OCFL's sulphur godown, causing extensive damage but fortunately no casualties. An official inspection found violation of prescribed safety measures.

effluent sample collected from another *nullah* leading to the river Mahanadi (near the guard pond) indicated pH levels of 2.47, fluoride levels of 248 mg/l and phosphate of 559 mg/l. This indicated that the industry had been discharging untreated effluents into the creek as well as the Mahanadi.

Effluent discharged from the new gypsum pond area to the *nullah* leading to the Mahanadi had pH levels near neutral (7.13) but very high fluoride content (793 mg/l). At a number of places HDPE liners (to protect groundwater contamination) were found to have been turned off or damaged and the accumulated effluent was highly acidic.

The team visited the Effluent Treatment Plant (ETP) installed by the industry a few months earlier for treatment of fluoride-bearing wastewater. The wastewater streams coming to the ETP are treated with milk of lime. The treated wastewater, OCFL claimed, was recycled and used in the phosphoric acid plant for rock phosphate grinding. The team however found that the ETP is treating only part of the effluent generated in the industry.

The wastewater was not segregated from the storm water before being discharged. The sample sediments from this drain were found to contain a very high concentration of fluoride (7.10 mg/g or 7,100 mg/kg). This is indicative of discharge of untreated effluents containing very high concentrations of fluoride into the water bodies.

The verdict of the team was serious: poor wastewater and sludge (gypsum) management in the industry has resulted in pollution of the Atharbanki creek and its surroundings. Hazardous waste management is far from satisfactory and the industry has not been authorised for hazardous waste disposal. No monitoring system was in place.

The team advised that the industry be issued closure directions till they had full-fledged arrangements for storing gypsum, proper handling of gypsum, an adequate effluent treatment plant, adequate segregation of wastewater from storm water and proper recording facilities of the effluent and storm water discharged and stored in the guard pond. The industry should not be allowed to manufacture phosphoric acid till a fluorine recovery unit is installed. The extent of environmental damage caused due to fluoride contamination was to be evaluated by a third party. The cost of assessment of such damage would be borne by the industry. The Mahanadi river and Atharbanki creek/drain(s) were to be monitored at least once a month by OSPCB.

The Joint Committee's recommendations have reportedly made little difference. OCFL's gates are shut tight. But OCFL has not, according to environmental activists, built the Phase II gypsum pond for which 275 acres are earmarked. "If OCFL is not flushing the gypsum slurry into the waterways where is the capacity overflow going?" asks environmental activist Biswajit Mahanty.

According to research in the US, the manufacture of one pound of phosphate fertiliser produces five pounds of contaminated phosphorous slurry. According to these studies gypsum pile-ups are highly acidic and toxic. This combination makes for a poisonous cocktail which, when leaked into the environment, wreaks havoc with the fish population. A large spill in Florida, USA, killed up to 1 million fish.

"But for all this we don't want Oswals to close shop. Let them just let us live in peace," says Shanti Haldar, a Red Cross worker at the Kharnasi cyclone centre.

Polluting processes

To understand the dangerously high polluting potential of Di Ammonia Phosphate (DAP), which is produced at the OCFL plant, one must understand the process of its production. Phosphoric acid is produced when a mineral called rock phosphate is mixed with sulphuric acid. The phosphoric acid thus produced is again mixed with ammonia gas, and DAP fertiliser is ready.

The ammonia gas is brought from outside and stored at the plant. Both sulphuric acid and phosphoric acid are however prepared inside the plant. To prepare the sulphuric acid, the sulphur is first burned to produce sulphur-dioxide gas, which is subsequently converted to sulphuric acid.

Sulphur-dioxide and ammonia are high-level environmental pollutants. But these are the basic raw materials of a DAP fertiliser plant, hence an in-built mechanism for recycling the effluents within the plant itself is a must. Gases like sulphur-dioxide and ammonia cause damage to the eye, skin and respiratory organs of human beings.

Fluoride has been and remains to this day one of the largest environmental liabilities of the phosphate industry. The source of the pollution lies in the raw phosphate ore, which contains as much as 2-4% concentration of fluoride. When the ore is processed with water-soluble phosphate (via the addition of sulphuric acid) the fluoride content is vaporised into the air, forming highly toxic gaseous compounds — hydrogen fluoride and silicon tetra-fluoride.

The OCFL plant has four main units producing 1,60,000 metric tonnes /month of phosphatic fertiliser in the Di Ammonia Phosphate plant (DAP), 7,000 tonnes/day of sulphuric acid in the Sulphuric Acid Plant (SAP) and 2,650 tonnes/day of phosphoric acid in the Phosphoric Acid Plant (PAP). It also has its own 64 MW Captive Power Plant (CPP). It has two ammonia storage tanks of 20,000 tonnes each and a 5.5 km long conveyor system from the port to the plant.

The potential air pollutants generated from the OCFL are sulphur-dioxide emission, acid mist, fluorinated gas, and emissions of ammonia fluoride fumes as well as particulate matter. The potential water pollutants are mainly leakages, spillages and washings from the three plants as well as effluents from the CPP. In solid waste, gypsum from the PAP is the worst because it has not been addressed; there is also sulphur muck from the SAP. Possible leakage from the ammonia storage tanks could lead to a large-scale disaster.

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Hold your breath: You're in SIPCOT, Cuddalore

Chemical odours are an indicator of serious chemical pollution. If you can smell it, the chemicals may already be above safe levels. At the SIPCOT chemical industrial estate in Cuddalore, one of the smelliest places on earth, villagers have formed their own environmental monitoring committee and have quantifiably established that they are being gassed on a daily basis

NITYANAND JAYARAMAN

JUST AS THE Inuit natives of the ice-bound lands of the North Pole have a hundred words to describe different kinds of snow, the villagers living in and around the SIPCOT chemical industrial estate in Cuddalore, Tamil Nadu, have a multitude of words to describe the chemical odours that assail them throughout the day. SIPCOT, Cuddalore, has to be among the smelliest places in Tamil Nadu.

Most villagers, even children, can tell you the name of the company they are standing downwind of just by the smell. "There is the SPIC factory that smells like a public toilet; Asian Paints smells like sapota fruit; Pioneer Chemicals smells alternately like a burning dead body or a decomposing corpse; Tagros Chemicals has a hospital-like odour or sometimes like boiled sugarcane juice; Shasun Chemicals stinks really bad like rotten cabbage or rotten eggs," recounts S Ramanathan, a villager from Semmankuppam, and a member of the recently-formed community group called SIPCOT Area Community Environmental Monitoring (SACEM). SACEM comprises village volunteers trained in monitoring, documenting and taking evidence-based action on pollution.

Nityanand Jayaraman

Villagers have for years complained about the intense chemical odours that pervade their homes at all times of the day. "At night, the stench engulfs us. We just can't breathe. There's nothing we can do except go indoors and shut all the doors. We can't bear it. Our eyes burn. We feel like somebody is tearing at them, and our chests feel suffocated every time the wind brings the smell," says Lalita of Eachangadu. Her friend Solai adds: "When the stench sets in, at least we can cover our noses with a cloth. What will the infants do? That's why they are always sick. We can't do anything and nobody cares." Both Lalita and Solai testified to the Indian People's Tribunal on Environment and Human Rights headed by Justice (Retd) J Kanakaraj of the Madras High Court in November 2002.

Even the tribunal members who visited SIPCOT reported "a noticeable stench of chemicals in the air". In their report, published in July 2003, the tribunal writes: "Villages like Kudikadu, Thaikal, Eachangadu and Sonnanchavadi lie in a virtual 'gas chamber' surrounded on three sides by chemical factories and bounded on the fourth by the river."

Chemical odours are an indicator of serious chemical pollution. If you can smell it, the chemicals may already be above safe levels, says Dr K Babu Rao, a chemical engineer and scientist at the Indian Institute of Chemical Technology, Hyderabad. For example, if you can smell benzene, which has an aromatic odour, you're already inhaling at least 38,281 times higher than danger levels. Similarly, formaldehyde, which has a characteristic pungent odour, has an odour threshold to danger level of 11,400.

Air pollutants are particularly dangerous because unlike water- or food-borne toxins, many air pollutants enter the brain directly after inhalation.

The Tamil Nadu Pollution Control Board is supposed to maintain the quality of the environment outside the factory; the Factories Inspectorate is supposed to ensure that the workplace is safe. Neither regulator has, to date, presented a single scientific study investigating the chemicals behind the odours or the health

effects that may have resulted. Indeed, even a review of scientific literature will reveal the possible chemicals behind the odours reported. For instance, methyl mercaptan and dimethyl sulphide smell like rotten cabbage. Acetone is the key ingredient in nail polish. The rotten egg smell is characteristic of hydrogen sulphide, a gas that affects the central nervous system and stunts the mental development of children.

Unfortunately, Indian regulators have treated chemical odours merely as a nuisance, and people's complaints have been dismissed without presenting a shred of evidence to justify the dismissal.

"THERE IS A GENERAL SENTIMENT especially among bureaucrats and regulators that villagers are fools and lowlifes," says Shweta Narayan, coordinator of the Community Environmental Monitoring project. "It is, in fact, the educated people in high places that cannot understand the commonsense statements made by the villagers. That is why our project is equipping villagers with the ability to convert their commonsense observations on pollution into a language that regulators cannot ignore."

In August 2004, SACEM published its first report — on chemical odour incidents in SIPCOT. The report summarised data gathered over a 14-week period between April and July 2004. In total, monitors recorded 283 chemical odour incidents, of which 223 were intense. Interestingly, monitors were able to discern 36 kinds of odours and 30 immediate health symptoms related to the odours. They confirmed that although chemical odours were prevalent throughout the day, their intensity and frequency were higher in the late evenings and early mornings.

"Until recently, we would talk only in general about pollution. But now we see and understand the details, and this is helpful in communicating pollution as a problem," says S Pugazhenthi, a fisherman and SACEM member.

Through their odour-monitoring study, the villagers have quantifiably established that they are being gassed on a daily basis.

In September 2004, SACEM released the results of five air samples taken by them between April and July. For the first time in India, ambient air was tested for 89 toxic gases. The monitoring was done not by the Pollution Control Board or the industry, but by villagers armed with a bucket (see *Bucket brigade*). The report entitled 'Gas Trouble: Air Quality in SIPCOT, Cuddalore' found 22 toxic gases, of which at least 13 were used as raw materials in one or more SIPCOT industries.

At least 14 of the 22 chemicals, including trichloroethene, carbon tetrachloride, acrolein, methylene chloride and hydrogen sulphide, violate the US Environmental Protection Agency's (EPA) safety levels. 1,2-dichloroethane, a cancer-causing chemical that was found in an air sample taken downwind of Tagros Chemicals, exceeded safety levels by a factor of 22,973. Levels of hydrogen sulphide, a gas that smells of rotten eggs, in the air sample taken downwind of CUSECS Pump House No 5 was 874 times the US EPA safety level.

Bucket brigade

Between December 2003 and March 2004, SIPCOT Area Community Environmental Monitors received training in water pollution, chemical odour and air pollution monitoring. In March 2004, the US-based NGO Global Community Monitor trained the monitors to take air samples during intense odour incidents using a unique community-friendly device called the 'bucket'.

The bucket (which is literally that) serves as a rugged enclosure for a sampling bag made of a special material called Tedlar. The bucket's airtight lid is fitted with an inlet valve connected to the Tedlar sampling bag and an outlet valve connected to a small vacuum pump. Operating the vacuum pump empties the bucket of air and creates a pressure differential that allows outside air to flow through the inlet into the sampling bag. Once filled, the bag is sealed, removed and sent to a laboratory that will analyse the contents for a total of 89 toxic gases.

The bucket was developed as a low-cost community sampling device to help communities take instant air samples before the pollution disappeared. Barring the imported special stainless steel inlet valve and the Tedlar bag, the bucket deployed in Cuddalore is fully Indian and costs approximately Rs 1,500. The fully stainless steel air sampling canister that the bucket replaces costs upwards of Rs 25,000 and can be used only once after which it has to be returned to the lab for analysis. It can be reused once the sample is purged and the canister is cleaned by the lab.

Currently, the Tedlar samples are being sent to a USEPA-certified laboratory in California, where the cost of analysis varies between Rs 10,000 and Rs 25,000 per sample depending on what you want to test for. The analysis is performed using a gas chromatograph/mass spectrometer for volatile organic compounds, and a gas chromatograph fitted with a sulphur chemiluminescence detector for sulphur gases.

However, it is hoped that the first few samples will create sufficient demand for such analyses in India to force Indian labs to invest the resources to enable them to perform Tedlar analyses within the country.

According to SACEM, the report justifies the SIPCOT villagers' demands for continuous air monitoring, including for toxic gases, an aggressive air pollution elimination programme, long-term health monitoring, specialised healthcare facilities for SIPCOT residents and a ban on the setting up or expansion of any polluting facility in SIPCOT.

"I have worked nine years with the bucket and seen at least 500 results from different places around the world. SIPCOT, Cuddalore, has to be the worst place to breathe and certainly the worst that I have seen in terms of the kinds and levels of toxic gases in the air," says Denny Larson of the California-based NGO Global Community Monitor. "The levels of some of the chemicals are at least 1,000 times higher than what we saw in other developing countries like South Africa, Thailand and the Philippines." Larson's organisation is a partner in the Community Environmental Monitoring project. Other partners include village volunteers from SIPCOT, Cuddalore-based consumer organisations FEDCOT and the Cuddalore District Consumer Organisation, and environment and human rights group The Other Media.

The report triggered instant reactions from a number of agencies. The Madras High Court directed the state legal aid cell to file a public interest petition on the matter. The State Human Rights Commission took suo motu notice of the report's findings and asked the Pollution Control Board to respond. And the Supreme Court Monitoring Committee ordered the Central Pollution Control Board (CPCB) to set ambient air quality standards for toxic gases, and directed the State Pollution Control Board to bring down levels of air pollution below USEPA-prescribed safe levels within three months, or order the companies to shut down.

Strangely though, on October 11, when the CPCB embarked on the monitoring exercise ordered by the Supreme Court, it did not contact the village monitors whose pollution patrols and

Health effects of chemicals found in SIPCOT air

SNo	Chemical found (Name of units that use chemical as raw material)	Odour	Found in samples taken downwind of	Health Effects	Target Organs	Carcinogen
1.	Hydrogen Sulphide	Rotten eggs	• CUSECS 5 • Shasun Chemicals. • Tagros • Asian paints	Irritation of eyes, respiratory system; coma, convulsion, conjunctivitis, eye pain, tears to eyes, dizziness, headache, weakness and exhaustion, insomnia, gastrointestinal disturbance	Eyes, respiratory system, Central Nervous System	×
2.	Methyl Mercaptan (Shasun)	disagreeable odour like garlic or rotten cabbage	• CUSECS 5 • Shasun Chemicals • Tagros	Irritation eyes, skin, respiratory system; narcosis, convulsion	Eyes, skin, respiratory system, Central Nervous System, blood	×
3.	Dimethyl Sulphide (Shasun, SPIC)	NA	• CUSECS 5	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system, Central Nervous System, blood	×
4.	Ethanol (Morgan Acid)	Characteristic suffocating odour	• CUSECS 5 • Sample 1 Shasun	Irritation eyes, skin, nose; headache, drowsiness, lassitude (weakness, exhaustion), narcosis; cough; liver damage; anemia; reproductive, teratogenic effects	Eyes, skin, respiratory system, central nervous system, liver, blood, reproductive system	×
5.	Methylene Chloride (Shasun, SPIC)	Faint sweet odour	• CUSECS 5 • Sample 2 Shasun • Sample 1 Shasun	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numbness, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, respiratory system **Cancer Site:** [in animals: lung, liver, salivary & mammary gland tumors]	✔
6.	Trichloroethene	Chloroform like odour	• CUSECS 5 • Sample 2 Shasun • Asian Paints	Irritation of eyes and skin; headache, visual disturbances, weakness and exhaustion, dizziness, tremor, drowsiness, nausea, vomiting, dermatitis liver injury, carcinogen	Eyes, skin, respiratory system, heart, liver, kidneys **Cancer Site:** [in animals: liver and kidney cancer]	✔
7.	Toluene (SPIC, Morgan Industries, Morgan Acids, Tantech Agro)	Sweet pungent benzene like odour	• CUSECS 5 • Sample 1 Shasun • Tagros • Sample 2 Shasun • Asian paints	Irritation of eyes, nose, weakness and exhaustion, confusion, euphoria, dizziness, headache, dilated pupils and tears to eyes, anxiety, musde fatigue, insomnia, dermatitis, liver injury, kidney damage	Eyes, skin, respiratory system, Central nervous system, liver and kidney	×
8.	Dimethyl Disulphide	NA	• Sample 1 Shasun • Tagros	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system, Central Nervous System,	NA
9.	Acetone (Morgan Acids)	Fragrant mint like odour	- Sample 2 Shasun Chemicals. - Sample 1 Shasun	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	×
10.	Isopropyl Alcohol	Odour of rubbing alcohol	- Sample 2 Shasun - Sample 1 Shasun - Tagros	Irritation eyes, nose, throat; drowsiness, dizziness, headache; dry cracking skin; in animals: narcosis	Eyes, skin, respiratory system	×
11.	*n*-Hexane (Shasun, Tagros)	Gasoline like odour	- Sample 2 Shasun - Sample 1 Shasun	Irritation of eyes, nose, nausea, headache, peripheral neuropathy, numbness, extremities, muscle weakness, dermatitis, dizziness, chemical pneumonia	Eyes, skin, respiratory system, Central Nervous System	×
12.	Chloroform	Pleasant odour	- Sample 1 Shasun - Sample 2 Shasun - Tagros	Irritation of eyes, skin; dizziness, mental dullness, nausea, confusion; headache, weakness, exhaustion; anesthesia, enlarged liver [potential carcinogen]	Liver, kidneys, heart, eyes, skin, Central nervous system **Cancer Site:** [in animals: liver and kidney cancer]	✔
13.	Carbon Tetrachloride (Shasun, Tagros)	Characteristic ether like odour	- Sample 1 Shasun - Tagros	Irritation of eyes, skin, CNS depression, nausea, vomiting, liver, kidney injury, drowsiness, dizziness	Eyes, respiratory system, lungs, liver, kinder, skin **Cancer Site:** [in animals: liver cancer]	✔
14.	*n*-Butyl Acetate	Fruity odour	- Sample 1 Shasun - Asian paints	Irritation eyes, skin, upper respiratory system; headache, drowsiness, narcosis	Eyes, skin, respiratory system, central nervous system	×
15.	Vinyl Chloride	Pleasant odour	- Tagros	Weakness, exhaustion; abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system **Cancer Site:** liver	✔
16.	Bromomethane	Chloroform like odour	- Tagros	Irritation eyes, skin, respiratory system; muscle weakness, in-coordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty);[potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system **Cancer Site** [in animals: lung, kidney & fore-stomach tumors]	✔
17.	Acetonitrile (Tagros)	Aromatic odour	- Tagros	Irritation nose, throat; asphyxia; nausea, vomiting; chest pain; lassitude (weakness, exhaustion); stupor, convulsions; in animals: liver, kidney damage	Respiratory system, cardiovascular system, central nervous system, liver, kidneys	×
18.	1,2-Dichloroethane (Tantech Agro)	Chloroform like odour	- Tagros	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system **Cancer Site** [in animals: fore-stomach, mammary gland & circulatory system cancer]	✔
19.	Benzene (Shasun, Morgan Acids)	Aromatic odour	- Tagros	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow **Cancer Site:** Bone marrow (leukemia)	✔
20.	Acrolein	Piercing disagreeable odour	- Asian paints	Irritation eyes, skin, mucous membrane; decreased pulmonary function; delayed pulmonary edema; chronic respiratory disease	Eyes, skin, respiratory system, heart	×
21.	Vinyl Acetate (Morgan Acids)	Pleasant fruity odour	- Asian paints	Irritation eyes, skin, nose, throat; hoarseness, cough; loss of smell; eye burns, skin blisters	Eyes, skin, respiratory system	×
22.	Carbon Disulphide (SPIC)	Sweet ether like odour	- Tagros	Headache, dizziness, restlessness, increased heart rate, Blood pressure, coma, convulsion	Respiratory system and cardio vascular system	×

sampling resulted in the 'Gas Trouble' report. Instead, the CPCB team was taken around the SIPCOT estate by industry representatives.

Even while efforts, seemingly to respond to the environmental crisis in SIPCOT, are on, the state government is engaged in business-as-usual. At least three new industrial proposals threaten the residents of SIPCOT.

This despite the fact that the Indian People's Tribunal, in 2003, and the State Human Rights Commission, in 1998, noted with concern that the people and the environment of SIPCOT were already subject to toxic overload. Both had recommended that no new polluting industries be allowed in SIPCOT.

The most frightening of the three new proposals is the one for a 38-tonne-per-month ammonium perchlorate unit by Pandian Chemicals. The chemical is a deadly explosive used as rocket fuel to propel spacecraft and missiles. Not only that, perchlorates are a common and persistent groundwater toxin that can inhibit the functioning of the thyroid in exposed people. Particularly at risk are nursing infants, foetuses, children and pregnant women who tend to have low levels of thyroid hormones to start with. Thyroid malfunction affects the mental and physical development of children, causes impaired vision, movement, hearing and behaviour, enlargement of thyroid glands and possible thyroid tumours. Children born to mild-to-moderate iodine deficient mothers can suffer from low IQ and impaired brain development, according to scientific literature.

Add to these problems the risk of an explosion. In February 2004, an explosion at an ammonium perchlorate unit at India's premier space research facility in Sriharikota killed 36 people instantly.

In Cuddalore, the same chemical is being manufactured by a small industry. Even worse, the public hearing was done away with because the project was a small industry located within a notified industrial area. The assumption here is that a notified industrial area would meet safety norms and siting criteria such as distance from habitation and water sources. Unfortunately, within 100 metres of Pandian is a town bus stand, a house, an electricity board office and the beginning of the Semmankuppam village. A deadly factory in a populated area. Remember Bhopal?

The residents of Semmankuppam are rightfully irate. Their panchayat had passed a resolution several years ago prohibiting the setting up of polluting industries within its boundaries. The panchayat president has, to date, refused to give its okay to Pandian despite intense pressure from the panchayat union, the government and the industry.

SACEM says if nobody's listening, they'll be made to listen by the sheer weight of the evidence and public opinion generated.

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Lethal wastes

Around 0.7 million tonnes of asbestos waste from an abandoned mine are poisoning the land and water in the Roro hills, Jharkhand

MADHUMITA DUTTA

ABANDONED IN 1983, the Roro mine, a chrysotile (white asbestos) mine some 20 km from the district headquarters Chaibasa, West Singhbhum district, in Jharkhand (formerly part of Bihar), has become a health scourge for villagers living at the foothills of the Roro hills. For the past 20 years, a massive pile of nearly 0.7 million tonnes of asbestos waste, mixed with chromite-bearing host rock overburden, has been lying on top of the Roro hills.

Some 5,000 people and their cattle live within a 5-kilometre radius of the waste. And the forests teem with wildlife.

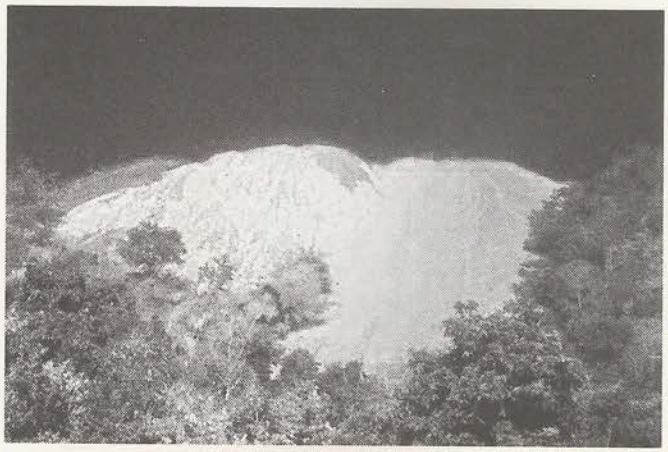
Twenty years ago, Hyderabad Asbestos Cement Products Limited (now known as Hyderabad Industries Limited), a Birla Group company, used to mine asbestos here, to manufacture asbestos cement products. During its operations, around 4-5 lakh tonnes of asbestos were produced annually. This was one of the largest asbestos mines in India, employing about 1,200 workers, mostly tribals. It's not known how much profit the company made from the asbestos produced at the Roro mine, but the company's current annual turnover is around Rs 3.2 billion (US$ 67.4 million).

Over the years, waste from the abandoned mine has seeped into the land, water and bodies of the once self-sufficient Ho community — the first people of this tribal state. The river Roro flowing down from the hills joins the Subarnarekha downstream, carrying with it tonnes of asbestos waste.

The villagers cultivate small agricultural farms (paddy) at the foothills of the Roro hills, which are slowly (especially the ones right at the bottom of the overburden) being covered in asbestos waste. The waste has extended several metres down the slope, spreading in a small alluvial fan into the paddy fields. It's a 40-cm-thick sludge of crushed contaminated rock, thinning out at the edges of the fan.

Several smaller waste dump sites at the top of the hills pose a threat to children and the elderly who take this route to graze their animals on the thickly forested higher reaches of the hills. Worse, playing children often slide down the hill slopes raising dusty clouds of lethal waste in their wake.

The Roro hills were originally mined for their chromite by the Tata Iron Ore Company, which has a steel plant and a charge-chrome plant in the region. After acquiring much richer chromium leases in the adjoining state of Orissa, the Tata Iron Ore Company relinquished its mining interests in the area to a mining company owned by the Birlas, one of India's largest



What looks like snow is actually asbestos waste on the hill slopes

business establishments, that went on to mine both chromite and asbestos. Later, its mining operations were confined to asbestos.

The Roro mine was closed down in 1983 when the company realised, after digging deeper into the mines, that the grade of asbestos mined here was not up to scratch.

The mine's closure was preceded by a period of labour unrest and intense trade union rivalry. Issues of occupational safety, exposure and the health of workers were raised. After closing the mine down, the company shifted all its assets including mining equipment, tools and machinery. Everything except the asbestos waste.

For the past 20 years, no one — the local administration, the mines and safety department or the mining company — has bothered to inspect the waste or assess its impact on the environment and on the local community. Although the abandonment of old mines may be a regular feature in India, in this case the health risks to humans and the environment are far greater since asbestos and chromium are known carcinogens.

Twenty years ago, the company shifted all its assets. Everything except the asbestos waste. Some 5,000 people and their cattle live within a 5-kilometre radius of the waste. And the forests teem with wildlife

According to a press release in an old issue of *Singbhumi Ekta*, a weekly from Chaibasa published between January and August 1981 by the late P Mazumdar, leader of the United Mines Workers Union (AITUC), 30 workers from the Roro mines died of asbestosis (a debilitating lung disease caused by asbestos fibres). The issue was raised in the Indian Parliament by then Member of Parliament Indrajit Gupta, but no action was taken against the company.

The government of Jharkhand recently drafted an industrial policy, inviting Indian and multinational companies to exploit Jharkhand's riches especially in the mining and energy sector. But in its frantic march towards 'development' and economic gain, the state has overlooked the history of criminal negligence by mining companies that, in their pursuit of profit, have left behind degraded forests, toxic waste and poisoned communities. Roro mine is just one such example.

In December 2002, a fact-finding team constituted by Mines, Minerals & People (MM&P), a national network of mining struggle groups, and the Jharkhandis' Organisation for Human Rights (JOHAR), a human rights group, visited the area to carry out a preliminary assessment of the asbestos waste and its impact. They followed it up with an indicative health survey, in January-February 2003, whose findings suggest that the careless closure of the mines and the unscientific disposal of toxic asbestos and chromite waste by the company posed a serious threat to the health of the local community and the environment. The cross-sectional health survey of 14 villages around the Roro hills (45% of respondents were former workers of the Roro mine) indicated a probable link between working in the asbestos mines and various persistent health problems. The survey clearly showed that mine (especially asbestos mine) workers had greater chances of developing low back pain, shortness of breath (dyspnoea), blood in their sputum (haemoptysis), and hearing and visual loss.

Despite several representations to individuals and state and central government agencies like the Jharkhand State Pollution Control Board, the Central Pollution Control Board, the director general of mines and safety, the state mining department and the district collector, Chaibasa, the government has taken no action. Nor have any remedial measures been taken at the site. Even a public hearing organised by JOHAR and the MM&P for those affected by asbestos wastes (attended by over 1,500 people) failed to initiate any action on the part of the government. Surprisingly, there has been no public response to the fact-finding report or the public hearing from Hyderabad Industries Limited.

Meanwhile, the state geological department has visited the site to explore new mining possibilities. JOHAR has requested the Supreme Court-constituted Monitoring Committee on Hazardous Wastes and Chemicals to intervene in this matter.

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'Hema Chemicals has left its mark on everything'

Several former employees of Hema Chemicals in Vadodara, Gujarat, whose health suffered as a result of constant exposure to chromium and other chemicals, continue to wage a legal battle against an industry that has exploited its workers and violated labour and environmental laws, endangering not just the workers' lives but that of an entire community

FRENY MANECKSHA

WE ARE SITTING in an open space under a tree in a Vadodara residential colony. Ram Kailash Saroj is talking about the 14 years he spent working at Hema Chemicals. He recalls the long hours spent working with hazardous chemicals, with insufficient protective gear, breathing in chromium dust and other chemicals. The chemicals have marked not just his life, he says, but everything around him. Forty-three workers at the unit were diagnosed with nasal perforations. Several suffered from dermatitis. Ram Kailash himself got gangrene and had to have his toe amputated. His poor health cost him his job and, at 40-plus, he is left with a bleak future.

"*Hema Chemicals ki nishaani sub jagah par hai,*" ("Hema Chemicals has left its mark everywhere") he says pointing to telltale yellow streaks on the ground. This, he says, is hazardous chromium waste illegally dumped around the Gorwa industrial estate. The waste was sold by truck drivers and others to the residents of Vadodara, as earth. The waste has seeped into borewells and contaminated water bodies. Unsuspecting villagers used the toxic mass to level roads, even to build their homes.

Hema Chemicals illustrates how, even 20 years after Bhopal, a company can exploit its workers and violate labour and environmental laws, endangering not just the workers' lives but that of an entire community by polluting the water, the land and the air.

After a long and protracted struggle, on August 13, 2004, the Supreme Court's Monitoring Committee (SCMC) directed Hema Chemicals to inspect the site where it had illegally dumped over 45,000 tonnes of extremely hazardous hexavalent chromium waste. The order directed the company to have the waste removed by an expert body. It instructed the National Institute of Occupational Health (NIOH) to conduct a medical study to evaluate the impact of unattended waste on the health of people living at the site, with a view to awarding damages. The court ordered Hema Chemicals to deposit Rs 17 crore towards the initial remediation work.

To date, however, Hema Chemicals has reportedly not deposited a single rupee.

The SCMC also indicts the Gujarat government and the Gujarat Pollution Control Board (GPCB) for not moving expeditiously to halt this "careless, irresponsible and indiscriminate" dumping.

The orders have come five years after the Paryavaran Suraksha Samiti, a Gujarat-based environment and health group, and the People's Union of Civil Liberties highlighted the grave risks to Hema Chemical's workers and the public at large through some 40 letters and phone calls to the GPCB, the Ministry of Environment and Forests, the Central Pollution Control Board and the Central Vigilance Commission.

Despite several orders by the GPCB, Hema Chemicals continued to dump toxic waste and made no effort to remove, encapsulate the waste and shift it to the Nandesari hazardous waste landfill. The company also ignored the nine criminal complaints filed by the Factory Inspectorate, between 1996 and June 21, 2001, for violations regarding the health and safety of its workers.

KANTIBHAI KRISTIAN, a trade union activist and former electrician with Hema Chemicals, explains working conditions at one of the two units that were eventually ordered to be shut down by the Gujarat Pollution Control Board in August 2001.

The company manufactured potassium and sodium dichromate, chromium sulphate and other chromium-based chemicals used in alloy and metal plating, and manufacturing of a variety of products like dyes and paints.

The production process involves crushing the chromate ore, mixing it with soda ash and then roasting the mixture in a furnace at temperatures ranging between 1,100 and 1,200 degrees Centigrade. After the recovery of sodium chromate, the solution is put into water tanks to get basic chromium sulphate (BCS). It then becomes non-recyclable solid waste (yellow sulphate) which is turned into sodium sulphate.

Chromium is widely known to be a toxic substance; bichromate, which is a hexavalent, is a human carcinogen.

Jagdish Patel of the People's Training & Research Centre, a chemical engineer who for over two decades has been working to safeguard the health of industrial workers, elaborates on the health risks. He lists the following chromium-related morbidity (signs and symptoms) and its effects on the body.

Chromium causes nasal irritation leading to perforation of the nasal septum. Those exposed to chromium develop slow-healing ulcers (known as chromium ulcers) and suffer allergic dermatitis. It can cause major damage to the kidneys and lungs and bring about pulmonary oedema.

Kristian says the work of roasting the material in the furnace was carried out in the open, and there were practically no safety rules. The pay (in 1985) was meagre — Rs 8 per day — forcing

people to work overtime, sometimes 14 hours a day, and thereby exposing them to greater risks from the chemicals. Since the workers were paid daily they did not take leave even when fumes from the furnace made them sick.

Ram Kailash, who was made supervisor of operations in the liquid tank, says that though they were given gumboots the boots did not last long. And the protective gear proved ineffectual in preventing the liquid from affecting parts of the body.

"The heat was terrific because of those furnaces and the workers were forced to take off most of their clothes. The grinding of the ore was done in the open. The air was full of chromium dust. It went into our hair, our nostrils, even the food we ate," he recalls.

Rule 102 of the Gujarat Factory Act says that the manufacture of chromium products is hazardous and that a certifying surgeon must visit the factory regularly. For years this did not happen at the factory's two Gorwa units. Nor was there any monitoring apparatus in place to monitor chromium levels (the legal tolerance level for chromium in the atmosphere is 0.05 mg per square metre).

"The air was full of chromium dust. It went into our hair, our nostrils, even the food we ate"

At first, the workers, engrossed in a struggle to demand decent wages, did not relate their symptoms of loss of appetite, dermatitis, irritation in the nose and wounds that continued to ooze for days as being work-related. Even when they went to doctors, under the ESIS (Employment State Insurance Scheme), they were not examined properly or told that their problems were a result of the work they did.

Ram Kailash, who is firmly entrenched in the trade union movement although both his father and his uncle had been close to the *maalik* (owner) and had ended all attempts to form a union, says that in 1985 he and two other workers attended a camp organised in Mumbai by a non-profit organisation called PRIA. Here they met Jagdish Patel and decided to include considerations of health and safety in their charter of demands. They called for an inspection of the premises by the factory inspector, but the inspector refused to admit that anything was wrong.

In 1996, Ram Kailash had to have his toe amputated after gangrene set in. The amputation became a kind of watershed in the history of the struggle.

A demand was made to the Factory Inspectorate for an examination of the workers. In his report dated March 27, 1998, Dr S K Varma the certifying surgeon, factory inspection, found that as many as 43 workers at Hema Chemicals had nasal perforations. There were 27 cases of dermatitis.

A study conducted by the National Institute of Occupational Health, Ahmedabad ('Report on Biological & Environmental Monitoring and Health Surveillance of Chromium-exposed Workers in Chemical Industries') also indicated that the blood chromium levels of 14.80% of workers exceeded permissible levels and that in some cases they were as high as 27 micrograms/100 ml.

In 1999, Ram Kailash and two other workers were sent to the ESIS Special Medical Board where they demanded relief under the Workman's Compensation Act. They were awarded compensation for 15% disability. (Kailash refused, saying his health had been permanently damaged and that he wanted long-term relief. His case is still being heard.)

However, when another batch of workers with nasal perforations were later sent to the board they, curiously, were refused any compensation although their earning capacity had been severely impaired. They have since appealed to the medical tribunal.

It is believed that at least nine workers may have died from chromium-related illnesses between 1999 and 2001.

Although the Factory Inspectorate filed several criminal cases against Hema Chemicals for breaching the health and safety rules for workers, the owners have offered little assistance to the workers.

In a travesty of justice, Ram Kailash was sacked after Abhiyan reported his plight. The owners of Hema Chemicals alleged he had brought disrepute to the company. Kailash filed a case that is still pending in the labour court.

The 250-odd workers should have greeted closure orders for Unit 2, and later Unit 1, by the GPCB in August 2001 with sighs of relief. But they find themselves in a sort of limbo. They have received no wages from the company despite a Gujarat High Court order saying that closure of the units due to their non-compliance with pollution control standards would not result in the denial of wages to workers.

While the SCMC has pegged Rs 17 crore as the amount Hema Chemicals must pay up to clean up water bodies and the area where it dumped hazardous waste there is no mention of recompense for workers in whose bodies the toxic chemicals played havoc.

For Paryavaran Suraksha Samiti, the People's Training & Research Centre and the Vadodara Kamgar Union the battle is far from over. They are demanding that workers be given extraordinary wages and compensation as many eke out an existence even as they struggle with various ailments.

Even if the workers try to seek some other employment they are branded, as it were. The publicity surrounding their case has meant that companies are reluctant to employ them, as they know they are in poor health. Their only solace is that their long struggle today may in some way contribute to a less toxic tomorrow.

Freny Manecksha is an independent writer and editor based in Mumbai

Burn-and-dump in Kerala

Three years ago, Grasim Industries' polluting unit in Mavoor, Kerala, was closed down following public pressure. What is the significance of this victory in a state that continues to adopt a burn-and-dump attitude to hazardous wastes? And why is it that despite several Supreme Court orders, nothing has changed in Kerala's Eloor industrial area, one of 35 global toxic hotspots?

SURENDRANATH C

July 2001, Mavoor, Kozhikode
Caught in the vortex of popular protest, the pulp and fibre factories of Grasim Industries at Mavoor in north Kerala, the oldest and largest private sector industry in the state in terms of the number of people employed, closed down permanently. The struggle against the polluting factory had drawn thousands of people from all walks of life to the banks of the Chaliyar, the river polluted by the factory. All except the trade unions that kept asking: "Why are the environmentalists fighting just Grasim and not the more polluting industries in Eloor?"

The fact is that in Eloor too, the industrial hub of the state in Ernakulam district, the struggle against pollution has divided the community. Community residents who protested against pollution were branded 'green imperialists' by some trade unions.

August 2004, Eloor, Kochi
On August 14, the Supreme Court Monitoring Committee on Hazardous Wastes (SCMC) directed the Kerala State Pollution Control Board (KSPCB) to close down within eight days all units that have no authorisation under the Hazardous Waste Rules, 1989.

"The state of Kerala was more than a decade behind the process improvements in other states: it looked as if the state had pushed itself into a time-warp from which it was unable to extricate itself," the SCMC observed.

More than 100 companies in Eloor were affected by the SCMC's orders. The order triggered accusations and counter-statements between the trade unions and community organisations. Indeed, the SCMC directive should have been anticipated. As in Chaliyar, the struggle in Eloor against pollution is several decades old. In 1999, the international NGO Greenpeace declared the Eloor industrial area one of 35 Global Toxic Hotspots, based on a study that found more than 100 chlorinated chemicals including DDT and its derivatives in a stream draining the effluents from three factories, including DDT producer Hindustan Insecticides Ltd.

The stream and other similar effluent drains from Eloor's industries eventually empty either directly or indirectly into Kerala's lifeline — the river Periyar.

A health study conducted by Greenpeace found Eloor residents far more likely to suffer from and succumb to a range of ailments than residents of Pindimana, a less-polluted riverside village upstream of the industrial estate.

Nationwide, polluting companies have been allowed to operate without proper authorisation and/or adequate facilities to contain their pollution or toxic wastes, in flagrant violation of the law. In May 1997, eight years after the notification of the Hazardous Waste Rules (1989), the Supreme Court ordered State Pollution Control Boards across the country to show cause as to why industries without the requisite authorisation or facilities should not be closed down.

Between 1989 and 2004, and even after the Supreme Court warning in 1997, the KSPCB like many other state regulators did little to remedy the toxic disaster unfolding in Kerala.

It was only after the August directive of the SCMC threatening KSPCB officials with contempt of court proceedings that the regulator sprang into action. It served closure orders on 32 industrial units and ordered over 100 more to tighten up their hazardous waste disposal.

The closure orders spared no one: big public sector companies such as the Fertilisers and Chemicals Travancore (FACT), Hindustan Insecticides Ltd (HIL), Kochi Refineries, Hindustan Newsprints Ltd (HNL), Travancore Titanium Products Ltd (TTPL) and several medium and small private sector units were ordered to down their shutters until legally adequate disposal practices were adopted.

Even here, it appears that the KSPCB was more intent on protecting itself from the SCMC's ire than on forcing the industries to clean up. No attempt was made either to clean up the already-accumulated wastes, or to plan for the future by requiring companies to reduce toxic substance use and toxic chemicals release from their factories in a time-bound manner.

"The sheer magnitude of the problem has only aggravated complacency," observes Jayaraman C, an engineer who works with Kochi Refineries, a public sector oil major that was also ordered to close shop or clean up its act. "The collective feeling is that it's simply impossible for any official agency to close down so many industries at one go and so there is nothing to fear."

The KSPCB's dithering has won it no friends either within the community or among trade unions.

"The PCB only passed the buck and hurriedly ordered the industries to close down," says Member of Parliament and labour leader Chandran Pillai. He acknowledges that it is time industries and labour started working together on

checking pollution.

"The orders were unilateral and highly dangerous to the workers' interests," argued P K Gurudasan, Secretary, Centre of Indian Trade Unions. The Kerala High Court also found the closure orders unjustifiable on the grounds that no show-cause notices were filed prior to the closure orders. The court directed that the KSPCB's orders be treated as mere 'show-cause notices' and gave the industries 15 days to file their response. Separately, Kerala Chief Minister Oommen Chandy requested the SCMC on September 14 to grant it a month to comply with its orders.

But even after a month, "the state government, the PCB and the industries have not shown any interest in carrying out the Supreme Court orders," said Tapan Chakrabarty, a member of the SCMC.

FIFTEEN YEARS AFTER the notification of the Hazardous Waste Rules, five years after the reminder by the Supreme Court ordering the immediate implementation of the Rules, and two months after a Supreme Court-appointed committee ordered the closure of all units in violation of environmental rules, nothing has changed. SCMC member Tapan Chakrabarty put it simply: "The state government, the PCB and the industries have not shown any interest in carrying out the Supreme Court orders."

"The stipulated time is over," the SCMC observed after a review in mid-October. Responding to complaints by community members and environmental organisations, during its October visit, the Committee also uncovered and aborted attempts to sabotage the Local Area Environment Committee set up by the SCMC to supervise the implementation of SCMC directions. The SCMC had directed the KSPCB to set up Local Area Environment Committees (LAEC) with representation from industry associations or industrial units and local environment groups. The LAEC in the Eloor-Edayar region was granted powers to conduct an environmental audit of all the 247 industries in the area and to report to the Supreme Court on industry's compliance with all the environmental laws.

The LAEC functioned smoothly for a while and gathered data from more than 100 companies. But it soon came to a grinding halt following a decision by KSPCB chairman Paul Thachil to expand the committee by including trade union representatives and three more officers of the PCB.

"This was an attempt to dilute the environmental agenda of the Committee and silence the community representatives in the Local Area Environmental Committee," said V Purushan, a member representing the community group Periyar Malineekarana Virudha Samiti in the LAEC.

"The ground realities in Kerala are terrible," observed SCMC member Dr Claude Alvares. Shooting down the reconstitution of the LAEC, the SCMC member said, "The decision to alter the composition of the LAEC by the PCB was unilateral."

"Pollution is a technical problem, but we have only been seeking political solutions to technical problems," reiterates pollution biologist Dr K T Vijayamadhavan, retired professor, St Joseph's College, Kozhikode, and a member of the Society for Protection of Environment — Kerala (SPEK). The scientist was one of the first in the state to send out warning signals on heavy metal pollution during his participation in the Save Chaliyar struggle.

THE CLOSURE of Grasim Industries' polluting unit located at Mavoor on the northern bank of the river Chaliyar has brought some cheer to the local community. Three years after its closure, the river has regained its original serenity. All visible signs of pollution — the blackish brown water covered with patches of dirty white froth, the pungent stench, the dead fish floating on it — have been flushed out from the surface. Irimeen, malan, paral, braal and many other local varieties of fish and mussel have returned to the river in plenty, supplementing the food of the local people and restoring the traditional occupations of thousands of fishermen and traders downstream of Mavoor.

"Ever since its inception in 1963, Grasim had flouted the recommendations of scores of expert committees on pollution control and process alteration. Grasim had also not cared to adopt sustainable practices of extraction of raw materials," points out P K M Chekku, a leader of the Save Chaliyar agitation since 1975.

Nityanand Jayaraman

The closure decision nevertheless represents only a partial victory, local activists say. On the one hand, at least 2,000 company workers — who once fought against the community's environmental concerns — are jobless. On the other hand, no plan has been put in place to restore the damaged environment or care for the long-term health effects on the community.

Only registered industrial workers got their compensation; casual workers numbering around 600 still march in protest in Mavoor town demanding a share of the retrenchment compensation.

"At least the children are happy because the respiratory diseases that had afflicted almost all of them have disappeared," says N A Rahman of Vazhakkad, the village that bore the brunt of air and water pollution from the Grasim plant. However, other health effects linger and continue to take their toll. "Deaths due to chronic impact such as cancer and cerebrovascular diseases are still being reported from the Chaliyar villages," observes Dr P K Dinesh, a doctor who has been running the Vazhakkad Medical Centre since the 1980s.

The 'polluter' hasn't 'paid'. As a result, the social divide between those who fought for their right to a clean environment and those who defended their jobs has survived the closure of the industrial unit.

The river sediment may still contain harmful heavy metal deposits, including mercury. A 1988 study by Dr M N Muraleedharan Nair, scientist at the Centre for Earth Science Studies (CESS), had found that sediments of the river had retained mercury upto 2 ppm even 32 months after the factory suspended production between 1985-1988. But unaware whether such contamination still exists, people now catch and eat the fish that breeds in the river and even the effluent treatment pond.

THE FIGHT IN CHALIYAR seems to be over, at least from the community's side. There are no demands for on- and off-site cleanup, and neither have the authorities considered this need.

The report of the Committee on Public Accounts (1998-2000) is a rather belated indictment of the negligence of KSPCB. Even in 1993, the board had found mercury, zinc, copper, lead and chromium in excess of the prescribed limits in Grasim's solid wastes dumped in open paddy fields. No action was taken against the company.

Nothing seems to have changed with regard to the KSPCB's attitude towards polluters. Take the case of Travancore Titanium Products Ltd (TTPL). The public sector TTPL has been accused of polluting the coastal seas of Thiruvananthapuram for nearly half-a-century. On earlier occasions when the PCB had ordered its closure for non-compliance with the Water (Prevention and Control of Pollution) Act, it was the government that came to its rescue. Ministers had directly intervened to prevent the company's closure and prosecution.

In October 2003, a division bench of the High Court allowed the company 30 months to set up an effluent treatment plant. Following the SCMC's orders, the KSPCB once again ordered the company to shut down. The High Court, however, quashed the closure order arguing that it was issued under the Water Act rather than the Hazardous Waste Rules. Community residents who are part of the Periyar Malineekarana Virudha Samiti (PMVS) say that going by the track record of the KSPCB and the state authorities in Kerala, this legal loophole may have been deliberate.

Activists contend that even the SCMC's well-intentioned interventions are fraught with problems, and do not come up with solutions commensurate with the problem.

"Even the SCMC and its simplistic solution to the problem of hazardous wastes — just dumping wastes from all the industries in a pit — has to be opposed," points out Professor M K Prasad of the Kerala Sastra Sahitya Parishad (KSSP), the organisation spearheading the people's science movement in Kerala. "What we need is not quick-fix solutions but some long-term thinking on future impact and options," says Prasad.

IT IS A FACT that all landfills leak. Many observers comment that the SCMC has been cowed down by the magnitude of the hazardous waste problem and has succumbed to the burn-or-dump mentality.

"Landfills and incinerators are like ticking timebombs — slow-motion Bhopals planted among communities. Unless pollution laws legally require industries to move towards safer raw material, products and processes, and force polluters to reduce the quantity and toxicity of their wastes, there is no hope for India," says R Sridhar, a toxics activist with the Thiruvananthapuram-based environmental group Thanal. "The SCMC has shown an integrity and dedication not evident in many government committees, and it is up to the SCMC to show the real way."

On October 17, community residents from Eloor called a Human Mass Gathering (Manushya Sangamam). At least part of the objective was to begin a dialogue with the labour organisations. Hearteningly, senior labour leaders like the CPI state assistant secretary Panyyan Raveendran acknowledged the labour movement's shortcomings in combating pollution and urged it to join hands with communities and environmental groups to hold polluters to account.

Community groups and environmental organisations like PMVS and Thanal say they are aware of the dilemma faced by workers. They say the trade union leadership has to bring the labour movement out of its 1950s agenda of fair wages and working hours. "The fight for a safe workplace and for a clean living environment for communities is one and the same. We are hopeful that trade unions will realise this and start viewing communities as their allies in the fight against pollution. What happened in Chaliyar should not happen again," says Sridhar.

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The law 20 years after: Significant absences

Bhopal brought to attention the absences in the law on industrial disasters. There was no way to extract vital information from the industry, no provision for interim relief, and no clarity on how to deal with an offending corporation. Since 1984, statutory law has moved, grudgingly, some distance, but it is in the courts that the law has been largely played out

USHA RAMANATHAN

INDIA'S UNPREPAREDNESS for mass disaster was stark in the immediate aftermath of December 2/3, 1984, when MIC gas poured out of the Union Carbide plant into the neighbourhood, reaching well into the township that housed the working classes of Bhopal. At the time there was no evidence that anybody recognised the magnitude of the havoc and destruction that could be caused off-site by the substances and processes employed in making the pesticide within the plant. Despite earlier episodes of worker injury and death in Union Carbide, there was, in 1984, no mechanism in place to acknowledge workplace accidents as portents of disaster. In 1984, workers, who were the closest observers of safety conditions, risk and harm in a factory, were not entitled by law even to an informed engagement with the safety aspects of their workplace; nor was there any legislated scope for them to participate in safety management.

This exclusion from information regarding safety and potential risk was even more pronounced where it concerned people living in the vicinity of a plant; so too the local authority, which would inevitably find the onus of responsiveness to disaster foisted on them, as happened in Bhopal in December 1984. The managers of industry were shielded from the need to disclose the harmful nature of their raw material, products or processes, even as industrial secrecy stood rooted in the law.

As risk precipitated into disaster on the night of December 2/3, 1984, the absences in the law regarding industrial disasters became striking. The industry was unresponsive to repeated, emergent enquiries about the nature of the substance that was killing people in droves, and there was no means of extracting the information from them. There was no provision in the law for recognising a community of victims: it was the individual who was felled by the disaster, even where there were thousands of victims. There was no provision for interim relief, while the survivors of a disaster battled a large and elusive corporation. The criminal law was opaque on how to deal with an offending corporation. A calculation of losses and damage sustained in a disaster could not be readily reckoned, as the demands of the traditional law of torts — which is the law for determining compensation where it is not already set out in a statute — for an individuated determination could not cope with mass disaster.

Safety

Matters of safety flew back onto the canvas of concern when oleum gas leaked into Delhi's environment from the Shriram Foods and Fertilisers factory on December 4, 1985. The gas spread across Delhi, resulting in the death of an advocate in the Tis Hazari courts, and causing temporary damage to many more. More than the extent of harm caused by the gas, it was the memory it evoked of the Bhopal gas disaster that spurred the Supreme Court, especially, into action. In a litigation launched in the public interest that was then pending in the court, where questions of safety in the plant had been raised, the court enunciated principles to enhance safety and provide a framework of deterrence. In 1987, a part of this was introduced by amendment into the Factories Act 1948. These included:

- The acknowledgement that the impact of accidents and disasters was increasingly likely to spill beyond the boundaries of factories, affecting "the general public in the vicinity" of the factory.
- Information regarding potential disasters should be communicated to the local authority and those in the vicinity of the factory; this should include information on what may be done to mitigate harm in the event of a disaster.
- A Site Appraisal Committee be established to decide on matters of safety and hazard every time a new factory is set up, or an old one expanded.
- Workers' right to participate in safety management, including the right to obtain information from the "occupier" relating to workers' health and safety at work; to get trained in matters relating to workers' health and safety at work; to represent to the inspector of factories or their representative when there is inadequate provision for protection of health and safety in the factory.

In an effort to tilt the balance in favour of safety, and away from the degree of pragmatism that industry had evidently practised in both the Bhopal and the oleum gas leak episode, the definition of "occupier" was amended. An "occupier", under the Factories Act 1948, is a person who "has ultimate control over the affairs of the factory". Prior to 1987, the factory management would designate a person as the occupier who would be the front person with whom the Inspector of Factories would deal when any law relating to factories was breached. The Bhopal gas disaster and the oleum gas leak showed the importance of not letting the buck stop at the lower rungs of the corporate hierarchy where the occupier would be a fall guy, while the real decision-makers got away.

So, in 1987, the definition of "occupier" was amended to read

that "in the case of a company, any one of the directors shall be deemed to be the occupier". [S.2 Proviso (ii)]

Interestingly, violations of the Factories Act are indeed offences in the eyes of the law, but they are not offences as understood in the penal law of crime/punishment. They are instead what the Supreme Court in 1996 called "absolute offences". Whereas in criminal law, the guilt of an individual would have to be established, with the knowledge and intention of the accused persons as a central theme while furnishing proof, absolute offences are different. These are recognised as inhabiting the region of the law which deals with regulations, where established norms are to be respected and, as in the Factories Act, where ignoring the norms could mean threat to the health, welfare and safety of a workforce. It is instead to be a measure of protection against callousness in operation as also of exploitation of a working class population.

Absolute offences are unlike offences in criminal law, where it is the guilt or innocence of an accused that is on trial and the inability to prove guilt beyond reasonable doubt is a prerequisite to pinning blame and prescribing punishment. For absolute offences, responsibility has to be fixed or pinned. Where the occupier is charged with an offence under the Factories Act, "he shall be entitled....to have any other person whom he charges as the actual offender" tried, and if "after the commission of the offence has been proved,..(he) proves to the satisfaction of the court

(a) that he has used due diligence to enforce the execution of this Act,

(b) that the other said person committed the offence in question without his knowledge, consent or connivance, and

(c) that other person shall be convicted of the offence...." [S.101, Factories Act]

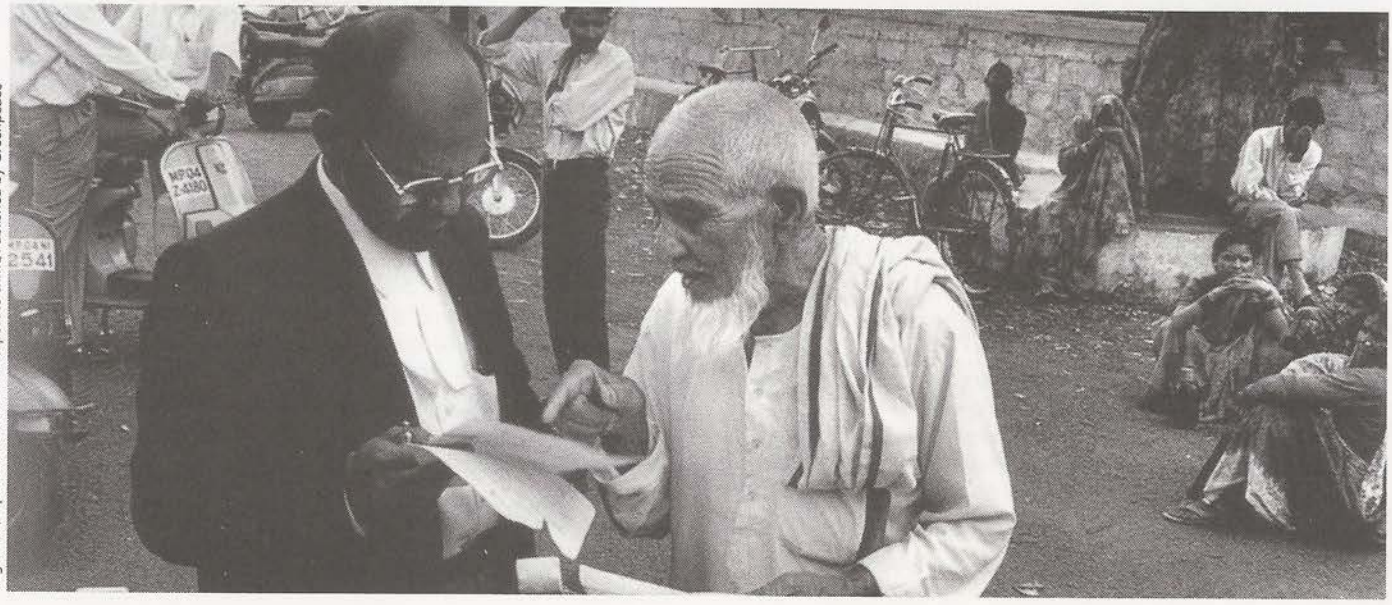
In an "absolute offence", then, someone is always responsible. This is not a development that followed on the heels of the Bhopal gas disaster; it has been in the law for decades. What Bhopal has changed in the law is the level of command that will be called in to answer charges under the Act. The change in the definition of "occupier" now calls to account not merely someone designated by the company to take the rap, but someone at a stage in the hierarchy who can call the shots.

Criminal conduct

The law governing criminal conduct, of omission and commission, by corporations and corporate directors and managers, has not evolved significantly. There has, in fact, been a certain regression that set in with the decision of the Supreme Court in *Keshub Mahindra v State of Madhya Pradesh (1996),* where the court reduced the charges in connection with the Bhopal gas disaster from "culpable homicide" to "rash and negligent" conduct. The knowledge of the harm likely to be caused by their conduct as corporate managers, and their intention, was watered down even before it could be judicially established whether the decisions made by them, and the practices they adopted in operating and maintaining the plant, could be considered to constitute criminal conduct. Given the number of people dead, disabled and harmed by the disaster, and the allegations of design defect, malfunctioning, reduced allocation of resources in matters of safety, and disinformation that followed on the heels of the disaster, the assumptions that underlie this change in the law are not easy to explain. The reluctance of Parliament to engage with enacting a law on corporate criminality, and the silence that the Law Commission adopted as its policy when revisiting the domain of criminal law in its 154th Report on the Criminal Procedure Code, are further evidence of the unwillingness of the Indian State to run the risk of corporate displeasure.

These significant absences continue to inform the law.

Yet, even as the Union of India was arguing in court for UCC to be held responsible for design defects and non-use of the information that the UCC had on matters of safety of the plant,



Raghu Rai/Exposure: Portrait of a corporate crime/Published by Greenpeace

Parliament amended the Factories Act, 1948. In 1987, without any public debate, Parliament legislated to absolve the designer, manufacturer, importer or seller of plant and machinery after the user to whom the plant and machinery were handed over gave an undertaking that, "if properly used", no harm would ensue. Seen in the context of Bhopal, had this amendment been in place before the disaster, Union Carbide Corporation could not have been held liable for the disaster. Rather, Union Carbide India Ltd would be solely responsible.

This was a strange provision introduced into the law, providing a pre-judgment of culpability. And this, in a law that had nothing to do with contracts and liability, but with standards being maintained at the workplace.

Industrial secrecy

The law has, for some time now, been protective of the right against disclosure in matters connected with industry. In the Factories Act 1948 (S.91), an Inspector of Factories is authorised to take samples of any substances used, or intended to be used, in the factory, where there is reason to believe that it is being used in contravention of the Act, or if "in the opinion of the inspector (it is) likely to cause bodily injury to, or injury to the health of, workers in the factory". Once tested, and found to constitute evidence that an offence under the Factories Act has been committed, a prosecution may be launched. But disclosing the results of the analysis otherwise would be a wrong, punishable with imprisonment for a term extending up to six months or with fine upto Rs 10,000 or both. It is interesting that even as disclosure of information was prescribed in Chapter IV A of the Factories Act in 1987 as being a necessary aspect of safety and preparedness for hazards, the punishment for disclosure of the results from analysing samples was actually increased from three to six months imprisonment, and fine from Rs 500 to Rs 10,000.

There is a further provision that has survived the Bhopal gas disaster which places restrictions on the disclosure of information. "No inspector shall," S.118 reads, "while in service or after leaving the service, disclose otherwise than in connection or execution, or for the purposes of this Act, any information relating to any manufacturing or commercial business or any working process which may come to his knowledge in the course of his official duties," unless it is with the written consent of the owner of the business, or it is for the purposes of legal proceedings. An inspector breaching this injunction may be punished with up to six months imprisonment, or with fine up to Rs 1,000 or both. It is the right against disclosure that informs the mood in this provision. It is striking that there is no provision that has been considered to make punishable the non-disclosure of all the information that is in the possession of the owner which may help in mitigating the effects of the disaster. The emphasis on industrial secrecy and the enforced silences rest uneasily with the dire need for disclosure and of information-sharing witnessed in the days, months and years following the Bhopal gas disaster.

Compensation

Among the multiple tragedies spawned by the Bhopal gas disaster was the issue of compensation. The District and High Courts directed that interim compensation be paid by UCC since they were prima facie liable. This was taken to the Supreme Court in appeal by UCC. The Supreme Court endorsed a settlement that was made in the name of the victims although the identities of the victims were nowhere near being conclusively established just yet. Despite the settlement, it was the problem of making interim provision to victims of industrial disasters that occupied the legislative mind. In 1991, the Public Liability Insurance Act (PLIA) was enacted to provide for interim compensation on a no-fault basis — that is, the person suffering harm or injury would only have to demonstrate that they had been affected by the disaster, but not have to be burdened by needing to prove that it had been due to the fault or negligence of the enterprise. In 1992 this was amended because insurance companies were unwilling to insure hazardous companies for a sum without an overall ceiling. This, although the PLIA already prescribed limits on the amounts to be paid to each affected person where death, serious injury, loss of work, or damage to property occurs.

The PLIA was an attempt to use insurance as a risk-spreading exercise, which would enable the immediate payment of minimal amounts as an interim measure. This would cover not only Bhopal-like incidents but the multitude of mini-Bhopals that are a regular occurrence. There is little evidence, however, that this account under the PLIA is being drawn upon.

In 1995 the National Environment Tribunal Act was enacted to set up tribunals to deal exclusively with the determination and disbursement of compensation. Nine years have passed since Parliament voted the law in, but it remains in the statute books. It has not been brought into force yet, and the word doing the rounds is that there are moves afoot to merge the idea of the environment tribunal (which, incidentally, has little to do with the environment and directly addresses compensation issues arising out of what are termed 'accidents') with that of the Environment Appellate Authority (EAA).

In the 20 years that have passed since Bhopal, statutory law has moved, grudgingly, some distance; but it is in the courts that the law has been largely played out. The Supreme Court's direction that the over Rs 1,503 crore that was being held by the State be given to its rightful receivers — the victims — is one of the few redeeming episodes in the litigation that emerged around Bhopal. The setting up of an independent medical commission to monitor the health effects of the affected population endorsed by the Supreme Court has been another. And the possibilities offered by the US Appeals Court that the soil and water contamination caused by UCC be cleaned by the polluter is a third. Maybe the tide is turning, and the wrongs inflicted on the victims by the system are gaining recognition. The victims have worked hard not to let public memory fade. Work on constructing a legal and judicial regime which can provide enhanced safety, rehabilitative care and deterrence is clearly overdue.

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The health effects of industrial pollution

Industrial activities are a major source of air, water and land pollution, leading to illness and loss of life all over the world. Pollution is a slow, continuous process. Some illnesses take 20 years to manifest

DR ARIN BASU

ONE OF THE worst industrial disasters of all time took place in Bhopal, India, in December 1984. In the three days after the first leak occurred, around 8,000 people died. Many thousands more still suffer the effects two decades on.

While Bhopal was a single event that caused the death of thousands of people in a very short period of time, pollution is often a slow, continuous process. An example is air pollution caused by industrial activity, motor vehicle exhaust and the burning of household stoves. Research on the relationship between levels of daily outdoor air pollution and the prevalence of diseases, based on hospital admission reports, shows that for every 10 microgram increment in the concentration of respirable particulate matter in the air, the risk of death from respiratory illness increases by 1%. Inside homes, air pollution caused by burning fossil fuel (such as coal or wood), used in many Indian households, is linked to tuberculosis and respiratory illnesses among women and children. Worldwide, indoor air pollution accounts for about 34% of all respiratory illnesses.

In all these situations an excess of substances in the environment is responsible for either death or illness among people exposed to them. In the case of Bhopal it was a gas that leaked out of a factory; in air pollution it is tiny particulate matter that penetrates deep into the lung tissue.

Pollution and pollutants

A simple definition of pollution could be the presence of high quantities of any entity in the wrong place. This indicates that a specific substance cannot in itself be labelled a pollutant. It becomes a pollutant when concentrations of the substance are too great to sustain health in any given place. For example, high concentrations of respirable particulate matter in lung tissue harm the respiratory system. Another example is inorganic arsenic. When concentrations of inorganic arsenic exceed 10 micrograms/L in the groundwater, significant adverse health effects occur in people who consume that water.

Pollutants are present everywhere in our environment and enter our body through the air we breathe (respiratory system), the food we eat and water we drink (gastrointestinal system), or through skin contact.

Health effects

Pollutants affect our health in several ways. These include direct irritation of target organs or metabolic changes within cells. For example, exposure to too much smoke, fumes or dust evokes a burning sensation in the airways, tightness in the chest and possible suffocation. Sometimes, the effects are subtler and may take years to develop. Asbestos fibres, for example, are small needle-shaped silicate crystals that penetrate deep into lung tissue and evoke reactions. It takes around 20 years for some illnesses to manifest.

Other health effects involve metabolic pathways in our bodies — pathways of chemical reactions in our cells — where they may interfere with energy production or cellular repair mechanisms. For example, exposure to inorganic arsenic is common among people who work in copper smelters or live around them. Exposure to inorganic arsenic also occurs among people who consume water from shallow tubewells in areas where the groundwater contains high levels of inorganic arsenic.

When it enters the body, inorganic arsenic is transformed through the same chemical reactions that are necessary to maintain the repair processes of DNA molecules within the cells. As a result of excess exposure to arsenic, and demands on these reactions, faulty repair of DNA molecules causes tumours to form.

How do we learn about the health effects?

Industrial pollution is non-specific. Exposure takes place subtly and the observed health effects are, often, common symptoms. Unless physicians are specifically aware of the 'industrial' causes of diseases and look for them, they are likely to miss the signs. Sometimes, though, the symptoms are severe enough to warrant a search for possible exposure to specific industrial pollutants. Therefore, a high level of awareness about the possible links between health and pollution is necessary to link symptoms to exposure to industrial pollutants.

Summary

Even though industrial pollution is harmful to health, both the sources of pollution and the resulting health effects are preventable. Prevention calls for the identification of polluting sources, awareness about the links between pollution and health, and steps to minimise the risks. These could be in the form of policy and regulatory controls by the government, improved technology to minimise industrial pollution and the adoption of personal protection.

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Bearing the body burden

Women's physiology and role in society make them bear the brunt of environmental toxins. There has been an alarming rise in endometriosis and cancers amongst women worldwide. A major source of the problem could literally be in the air

LAXMI MURTHY

EXCRUCIATING PAIN during menstruation; excessive bleeding; painful intercourse; infertility and bowel problems are a daily reality for women living with endometriosis, a puzzling disease in which the tissue of the endometrium (uterine lining) of some women is found outside the uterus — on the ovaries, intestines, bowels. This tissue responds to cyclical hormonal stimulation, bleeds and builds up into nodules and cysts. Women with endometriosis have a higher rate of allergies, asthma and chemical sensitivities and are also at higher risk for autoimmune diseases and certain cancers. Yet, this debilitating disease affecting an estimated 89 million women and girls around the world is still comparatively unheard of.

The mention of cancer, however, is sufficient to alarm. More disturbing is the rise in all types of cancer, especially breast cancer, over the last two decades.

While the exact causes of endometriosis and cancer are not yet known, a major source of the problem could literally be in the air. Several environmental pollutants including pesticides like DDT, PCBs and dioxin have the capacity to mimic and bind to oestrogen receptors. 'Xenoestrogens' or oestrogen-like substances foreign to the human body are endocrine disruptors. Elevated levels of oestrogen can promote cell proliferation which can lead to breast cancer and endometriosis.

The response of the medical establishment has been to cut, radiate or chemically eliminate tumours and surrounding organs, leading to an alarming rise in hysterectomies, ovarectomies (removal of ovaries) and mastectomies (removal of breasts). Women are increasingly going through painful, costly and useless surgeries in the name of 'treatment', desperate to eliminate pain, or more important, continue to live. The propaganda of medical 'miracles' in the shape of new drugs and sophisticated surgical techniques, overlooks the root causes of these diseases, and the possibility that these tragic deaths can be averted.

Women may be exposed to endocrine disruptors through environmental contamination from industrial or agricultural processes; dietary exposure from consuming contaminated fish or vegetables; in the workplace; traffic exhaust or drugs and contraceptives containing synthetic oestrogens.

To take one example, dioxin is a toxic byproduct of industrial processes that involve chlorine or incineration of chlorine-containing substances, such as PVC (commonly known as 'vinyl') plastics. Dioxins formed during incineration of waste are released into the air and contaminate the entire foodchain, from crops, to livestock to humans. Disturbingly, the Endometriosis Association's research registry shows that endometriosis is starting at a younger age and is more severe than in the past — a possible result of a rising 'body burden' level of dioxins and other endocrine disruptors which also contribute to the early onset of puberty.

Female physiology poses increased risk

Women's physiology and role in society makes them bear the brunt of environmental toxins — the so-called 'body burden' or the amount of synthetic chemicals found in the human body.

Physiological differences between women and men, including differences in hormonal structure, mean that women are susceptible to different health effects from exposure to toxins. Certain tissues in a woman's body contain receptors that latch onto oestrogen molecules. When oestrogen molecules are bound to the receptors, the cells of these 'target tissues' are stimulated to proliferate. The cells of the vagina, the uterus and the breast all contain large numbers of oestrogen receptors, and grow in the presence of oestrogen. Xenoestrogens bind to these receptors and disrupt the natural balance.

Because they derive from oil, xenoestrogens are fat-soluble and tend to accumulate in areas of the body where fat content is high — for example breasts — and may reside in the body for long periods of time. Storage of toxins in fat is a problem of greater importance for women because of their higher percentage of body fat and the hormonal changes that occur during menarche, menstruation, pregnancy, lactation, and menopause. These can mobilise internal stores of pollutants many years after the initial exposure.

Bone loss is accelerated during menopause at which time bone mass may decrease by 2-3% per year for several years. During this period, stored toxins may be released and cause damage to the nervous system and other organs. This problem is worsened when a woman's diet is calcium-deficient because this deficiency accelerates mineral release from bone. Lead is the most serious of several hazardous pollutants that affect bone, especially in countries like India that use leaded petrol.

In pregnant women, endocrine disruptors and harmful chemicals like lead and mercury can be passed through the placenta, exposing the foetus, or through breast-feeding, exposing the infant to significant levels of these chemicals. The tragic outcome of years of spraying endosulfan an extremely

hazardous pesticide on cashew plantations in Kerala is seen in the severely deformed babies. Besides chemicals, radiation hazards have a deep impact on the health of women and their babies. Almost half the women in villages around the Jadugoda uranium mine report disrupted menstruation, miscarriages and babies with partially formed skulls, missing eyes or toes and fused fingers. Alarmingly high levels of dioxin in breast milk portend an unhealthy future for infants of exposed mothers living near waste dumps where dioxin levels are high.

Low on the social ladder, high on health risk

Because of their social location, women are more likely than men to have early and prolonged exposure to water-borne pollutants, pollutants in the foodchain, and household pollutants.

Women are disproportionately clustered at the bottom of the socio-economic ladder — be it domestic labour, cooking and cleaning for the family, urban middle- class women exposed to toxic cleaning agents, and women at the bottom rungs exposed to wood-smoke from *chulhas.* Indoor air pollution, for instance, affects women, children and the elderly more since they sit close to polluting wood-stoves for hours, in smoke-filled, windowless rooms. Outside the home, women farm labourers are exposed to contamination from extremely dangerous pesticides and weed-killers. A large percentage of women work in the informal sector, a sector more vulnerable to contract, non-unionised labour, and at high risk of occupational hazards.

Why the silence?

Given that 50% of the world's population is disproportionately impacted by environmental pollution, why has so little been said, researched or done about it? Why has the potential of endocrine disruptors to wreak havoc with women's health not been considered sooner?

Endometriosis is starting at a younger age and is more severe than in the past — a possible result of a rising 'body burden' level of dioxins and other endocrine disruptors

One reason for the evidence of health hazards not coming to light earlier is located in the non-specific nature of oestrogenicity itself. Scientists cannot predict whether a chemical can attach to oestrogen receptors purely from the shape of the molecule.

Yet, the more obvious reasons are not hard to find: sexism in the medical system. The differential access of women and men to healthcare contributes to the invisibility of ill health among women. Socially and emotionally conditioned to put themselves last, women do not acknowledge their ill-health, ignore their symptoms and usually access healthcare when it is too late. Even when ill-health is diagnosed, limited family incomes are often not 'wasted' on getting treatment for women, who are not valued as primary earners.

Questions about women's health and pollution, until recently, were not examined, not taken seriously, and not followed up. In consequence, women's health has suffered and the opportunity for early detection of environmental degradation was often forfeited. Women community activists and researchers in the medical and environmental fields are increasingly effective in raising these issues and insisting that women's experiences of pollution be disaggregated from generalised studies of pollution impacts.

Also contributing to the cover-up about the hazards of certain chemicals is the role of vested commercial interests, and the link between industry and ill-health. While Zeneca Pharmaceuticals (as AstraZeneca HealthCare Foundation) is one of the principal sponsors of the Breast Cancer Awareness month in the US, the company earned millions of dollars from sales of insecticides, including the carcinogenic herbicide acetochlor until it sold its worldwide acetochlor herbicide business to Dow Agrosciences LLC! It also earns millions each year marketing tamoxifen, the world's 'best-selling' drug to treat breast cancer, despite indications that tamoxifen might harm the liver and an FDA warning about uterine cancer.

Where do we go from here?

Except for dramatic pollution incidents, such as oil spills or chemical factory explosions, the effects of pollution are often subtle and only slowly apparent; deterioration in environmental quality more typically shows up in small ways in the ordinary, lived environment. As a result of women's social location as managers of the ordinary domestic environment, they are also typically the first to notice the effects of pollution. As a result, everywhere in the world, women are now in the forefront of grassroots environmental organising.

Decision-making tools of risk assessment and cost-benefit analysis developed in the 1970s to bridge the gap between uncertain science and the political need for decision-making to limit harm are increasingly being found lacking in predicting harm in complex ecological and human systems. Nowhere is this more apparent than women's health. The burden of scientific proof has posed a monumental barrier in the campaign to protect the environment and health. The 'Precautionary Principle' might be a more useful concept than risk assessment. Instead of asking what level of harm (or level of exposure to toxic substances) is acceptable, the precautionary principle asks: How much contamination can be avoided? What are the alternatives to this product or process, and are they safer? Is this activity even necessary? The precautionary principle focuses on options and solutions rather than risk. It is perhaps this approach that can help us safeguard our health and that of our children, and also reclaim our 'stolen futures'.

Laxmi Murthy is the Editor of India Resource Centre and a Delhi-based freelance journalist specialising in development and gender. She has been active in the women's movement and other progressive movements

REACH: Chemicals under the microscope

The world is facing a mounting chemical crisis. REACH, a pioneering European Union initiative, will close the information gap on the world's most dangerous chemicals and make industry accountable for the safety of its products

SHAILENDRA YASHWANT

THE CHEMICAL-INDUSTRY-LED 'revolution' has spawned new and deadly chemical compounds and formulations for industrial processes and manufacturing that have wreaked havoc on all lifeforms. Man-made chemicals have irreversibly contaminated everything from the polar bear in the arctic region and the bees in your backyard to the blood racing through your body. Everyday household items like toys, cosmetics, TVs, washing powders, clothes and furniture also contain deadly chemicals.

The impact of these chemicals on the environment and on human health has, for some time now, been serious cause for concern.

The chemical industry, largely unregulated and deftly skipping through loopholes where laws do exist, has raked in large profits and grown into a huge political influence, effectively stalling any attempts at regulation and restriction on its unprecedented growth.

Non-governmental organisations, especially those working with human and environmental health issues, have been calling for strict chemical laws to ensure the phasing out of hazardous chemicals and their substitution with safer alternatives, wherever available.

Unfortunately, there is little or no health and environmental safety information on over 95% of the 30,000 to 100,000 chemicals in the world market today, although the chemical industry claims its products are safe despite this lack of information. Meanwhile, findings of contamination in humans and wildlife in remote regions and of house dust in homes confirm that the world is facing a mounting chemical crisis.

In 1998, the European Union (EU) admitted its failure and decided to reform the old legislation in order to close the information gap, control the worst chemicals and make industry accountable for the safety of its products.

In 2001, a commission appointed to research and recommend effective legislation presented REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) which received full support from the European Parliament and national governments, even requests to strengthen key aspects.

REACH is the biggest and most important reform of EU health and environment protection.

Once adopted by the commission, REACH will have to pass through the European Parliament and Council before finally becoming law at the end of 2005 or the beginning of 2006.

Then, chemical companies will for the first time have to start providing basic health and environmental safety data on all chemicals produced or imported before 1981. (Currently, only chemicals that started production after this date — 3% of all known chemicals — require such data.)

THE SCOPE OF REACH does not cover all 100,000 known existing chemicals. Those produced in the highest volumes and those known to have dangerous properties will be dealt with first. After 11 years (2016, depending on when REACH becomes EU law), REACH will be fully implemented and safety data on approximately 30,000 chemicals will be made available.

The REACH process will identify extremely hazardous chemicals and give them special classification as 'substances of very high concern'. These newly identified chemicals, which will be few in number (estimated at below 5%), will require a special licence for each specific use. This licence will be called an 'authorisation'. One of REACH's goals is to ensure that chemicals of very high concern are phased out and replaced by suitable, safer alternatives.

A chemical is classified as being of 'very high concern' if it causes cancer, damages genetic material, interferes with the body's hormone system or is a reproductive toxin. Any chemical that cannot be broken down by nature and builds up in the bodies of human beings or wildlife is also classified as being of very high concern.

A significant number of chemicals likely to be classified as substances of very high concern are present in a variety of consumer products. Greenpeace-commissioned research found nonylphenol (which disrupts hormones by mimicking oestrogen) in children's pyjamas, toys, household paints and cleaners. Brominated flame-retardants (which can interfere with thyroid hormones) are to be found in computers, televisions, carpets and upholstered furniture. Phthalates (which can damage the liver, kidneys and testicles) are in perfume, shampoos and PVC plastics.

The scope of the definition 'very high concern' should be welcomed as it includes:

- Chemicals that accumulate in our bodies and the environment and are known to be toxic (PBT — persistent, bio-accumulative and toxic).
- Chemicals that accumulate in our bodies and the environment but are not yet known to be toxic (vPvB — very persistent, very bio-accumulative).

- Chemicals that are of equivalent concern, including endocrine-disrupting chemicals.

REACH promises significant health benefits. A recent study estimated that it could lead to Europe-wide savings of upto 283 billion Euro, based on medical costs and lost productivity as a result of diseases thought to be linked to chemicals in the environment.

A further goal of REACH is to enhance the competitiveness of the European chemicals industry. The chemicals market, currently managed by scandal-response, would benefit from a predictable system agreed to by all players in the business. Regulation would provide safety information on all chemicals, enabling the industry to bear responsibility for its products.

REACH promotes competitiveness by:
- Reducing current hurdles to innovation and the development of new chemicals.
- Rebuilding trust among consumers, employees, local communities and investors.
- Minimising the risk of future liability lawsuits (as in the case of asbestos).
- Guiding innovation for safer and more environment-friendly products, and opening up new markets.

The commission's extensive impact assessment dismissed claims that the cost of REACH would cripple the chemicals sector and de-industrialise Europe. The estimated cost for chemicals producers is 0.05% of their annual turnover. (Chemical producers represent 2% of EU GDP.) Impact assessments carried out by the chemicals industry have been criticised by leading economists as being "methodologically unsound" and ignoring the positive impacts of the policy.

WILL REACH ENSURE an end to serious chemical pollution in the foodchain and the environment?

Currently, no. It contains a loophole (the principle of 'adequate control'), which means that even if a safer alternative is available at a comparable price, production of a chemical of very high concern can continue. This will stifle research into the development of safer products. Environmental NGOs argue that when a safer substitute is available at a reasonable cost, it should replace the hazardous chemical. This requirement to innovate is referred to as the 'substitution principle'.

The stated aims of REACH include:
- Making chemical companies provide health and environmental safety data on their products — 'no data, no market'.
- Identifying and substituting chemicals of very high concern.
- Increasing transparency.
- Enhancing the competitiveness of the European chemicals industry.

The commission's proposal is likely to fail because:
- Safety information requirements for only two-thirds of all chemicals would be insufficient.
- The loophole allows the continued use of chemicals of very high concern in consumer products despite the availability of safer alternatives.
- Excessive business secrecy prevails over the public's right to know about chemical safety.

These shortcomings, and other get-out clauses, are unlikely to boost innovation or create regulatory predictability — both pre-conditions to enhancing competitiveness.

STILL, THE WORLD SHOULD WELCOME the development of this new system as its general direction is positive. Although seriously deficient in a number of aspects, it will help identify the worst chemicals and deal with them through the new authorisation system. Unfortunately, however, it will identify the worst chemicals — those of very high concern — but the industry will be able to get permission to carry on using them even if safer alternatives are readily available. Clearly, the use of chemicals of very high concern (such as those that accumulate in breast milk) should only be allowed if industry demonstrates an overwhelming societal need for them, or if no safer alternatives are available and risk reduction measures put in place.

The current proposals would allow industry to keep large bits of information confidential regarding the production and use of chemicals. This is against the interests of both consumers and downstream users.

Unfortunately the global chemicals industry lobby, with help from the US government, is fighting hard to retain hazardous chemicals in everyday products. The industry lobby has already caused over a year's delay in getting the new system in place — another year of chemicals accumulating in our bodies and an estimated 4,000 occupation-related cancer deaths alone.

In October this year, the commission finally proposed the draft regulation to reform the existing flawed rules on chemical management. But it was a mere shadow of the plans drafted earlier this year, watered down to suit many unjustified industry demands.

Eleven years after the law is finally adopted, two-thirds of all chemicals on the registry might still not carry enough safety information. EU workers' protection and environmental legislation emphasises the need to eliminate and substitute hazardous chemicals, but the commission now proposes only to minimise exposure through 'adequate control', without getting rid of them altogether.

Shailendra Yashwant is Campaign Coordinator, Greenpeace India

For further reading, the following reports are available online:
- Consumer product tests: the results
- The health impacts of man-made chemicals — an overview
- Chemicals within reach — the principle of substitution
- Consuming chemicals — hazardous chemicals in house dust

See http://www.eu.greenpeace.org/issues/chem.html
- European chemicals policy reform — from paralysis to action

See http://www.eeb.org/activities/chemicals/Publication-EEB 013_02.pdf
- A new chemicals policy in Europe — new opportunities for industry

See http://www.eeb.org/activities/chemicals/New chemicalspolicyindustry-29-01-03.pdf
- Chemicals under the spotlight: From awareness to action

See http://www.eeb.org/activities/chemicals/Chemicals Awareness%20Final.pdf

6,000 kilometres on the toxic trail

A filmmaker's notes and observations as she travels through seven states of India, from the chemical factories of Eloor in Kerala to dust hills and ash ponds in Orissa, and the uranium mines of Jadugoda in Jharkhand. Everywhere her camera encounters crippled children, sick adults, filthy water, foul air and dead lands

NINA SUBRAMANI

AT FIRST SIGHT Bhopal was not at all what I expected. It was December 2002 and I was visiting the city for the first time. To me, Bhopal was a silent prayer at school assembly, a project report on the gas tragedy and, later on in adulthood, photographic images in a Raghu Rai book.

I expected therefore to see a city shrouded in haze, its people wearing sick, beaten expressions.

And so on a beautiful December day, after a night of driving from Nagpur, the bustle and cheer of Bhopal a day before the 19th anniversary of the gas tragedy seemed inappropriate.

In retrospect I shouldn't have been surprised, for the one lesson I learnt from my journey was that life does indeed go on. I was filming a trip by Greenpeace campaigners who were travelling almost 6,000 km (60 days by bus) through the four southern states and Orissa, Madhya Pradesh and West Bengal. The film we made on this long journey is titled *Miles To Go*.

FIRST STOP, TAMIL NADU. This is a state that is struggling to supply water to its people, yet it's doing nothing to prevent its rivers from dying. At the basin of the Palar river in Vellore, construction activity is going on at a frantic pace. The only water in sight is what is being discharged from huge, foul-smelling pipes. No points for guessing where the pipes come from: the common effluent treatment plant (ETP). At the plant we were taken through all the processes and assured that the water being released was clean. Why then was it muddy, smelly and red? The manager at the common effluent treatment plant in Ranipet insisted that the effluent was being treated according to international standards.

That obviously wasn't good enough for Kuppanga, a farmer whose field borders the ETP: "All the stuff goes into a pit where it is sieved and goes into a septic tank...Then it leaks out and affects my crop...Look at my field...the plants are drying up...one in five does well. I told them your effluents are spoiling my crop, but they don't care. I've been here since my childhood — all this was fertile land and now even weeds don't survive. When the water comes out and there is a heavy flow you can't see the chemicals in it. But once it goes into the earth you can see the residue, like scum on a pond."

The leather tanneries of Vellore are the main source of contamination. A few years ago the Supreme Court ruled that tanneries without ETPs would face closure. However, no one is analysing the released effluents. If they did perhaps they would realise that ETPs are not the answer.

Even when you see smoke billowing out of factories, as we did in the industrial area of Cuddalore in Tamil Nadu, or when you see fields lying fallow with pipes discharging effluents into them, it's difficult to fully appreciate the scale of the problem.

On the banks of the Uppanar river in Cuddalore, farmers scooped up handfuls of dirty water. The groundwater is equally contaminated. Many of the residents here suffer from skin diseases.

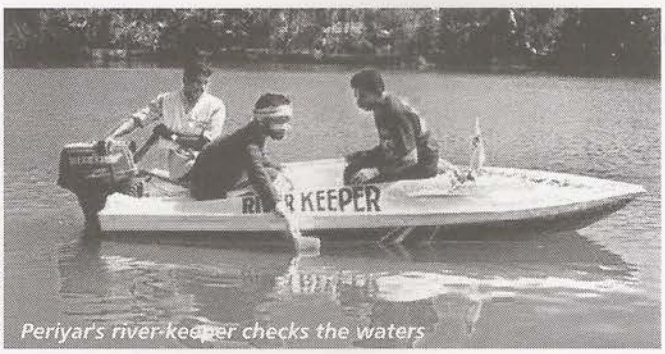
With the river in distress, there has been a decline in fishing activities. Local communities told us about their letters and visits to the authorities. But instead of addressing their problems, new factories are being planned in the area.

IN CUDDALORE I attended a people's tribunal for the very first time. We spent the day listening to testimonies from villagers who spoke in simple straight terms about the problems they face. Murthy, a fisherman from the village of Sonanchawadi, spent Rs 40 a day attending the three-day tribunal.

"There's been a chemical influx over here," said Murthy. "Because of this we can't fish and we're also physically affected, especially our children — they have breathing disorders, nausea, etc. Even if we take them to the government hospitals, there's no one to give them proper care. So where can we go? We went to the collector. He did nothing. We petitioned the government; it also didn't do anything. So right now no one knows what to do. How will our children grow up? Study? We don't even have faith in the fact that they'll live. Anyway, right now the situation is such that children are not being born. Even if a man and woman get together they can't have children. The children are not growing properly. It seems there is something wrong with their bones. A 14-year-old girl looks like she's seven or eight. We've spent a lot of money, but doctors are unable to tell us what the problem is. It's all because of the water — the water's not what it used to be."

His testimony was brushed aside as if it were irrelevant.

The next day we listened to doublespeak by industry representatives who appeared shocked at the mention of pollution. One official countered: "If for the past 10 years nobody suffered any deformity, then I'm at a loss as to why it's happening now, in the last one-and-a-half years. I have 29 years of work experience with SPIC. I have worked with pure mercury, holding it in my hands. I've handled 10,000 tonnes of ammonia. None of us have died. We're all very healthy and our companies are even monitoring the health of employees."



Nina Subramani

Periyar's river-keeper checks the waters

I'm no expert on pollution or contamination. My rule of thumb is that if it smells so bad that I throw up, or if I can't breathe, or if I suddenly get a rash (and these symptoms stay with me) then whatever I'm in contact with is definitely not healthy for me. Over the past eight years of filming, I have noticed one thing: the perpetrators of pollution are in denial. They insist that their factories are 'eco-friendly'; that their employees are 'healthy'. And why wouldn't they be? The chairpersons and management of Cuddalore's industries aren't living near their factories. They wait for 'lab results'. Do we really need to know the exact e-coli count of the Yamuna to know that we will never take a dip in that river?

THE 12 SQ KM ISLAND of Eloor, near Cochin (in the heart of god's own country, on the banks of the Periyar), with a population of 40,000, is also home to 247 factories, 106 of them chemical factories. Every day and every night, the factories release chemicals into the air. They manufacture DDT, endosulfan and other persistent organic pollutants (POPs) that are banned in most countries around the world.

Local residents complain that eggs and coconut water taste of chemicals. Many suffer respiratory illnesses, and cancer is a frequent cause of death. They have been engaging with local government and industry officials over this issue for years. But to no avail.

Kumnibibatu, 62, says: "I've been living here for 30 years. There's a lot of smoke now. Once the gas spread so much that people fled their homes thinking that death was imminent. We experience a lot of breathlessness...we feel ill because of that. The doctor says it's because of the place...he's told several others this. My grandson who is seven years old feels breathless often. It's like a routine. He falls ill once a month."

There are many industrial hotspots within the greater Cochin area. Take for instance the industrial regions of Binanipuram, Puthamthodu and Karimugal. The people of Karimugal, who suffer the serious effects of smoke emitted by a carbon black factory, march in a protest procession every evening. April 2004 marked their 1,000th march.

This is just the tip of the iceberg. Every day new factories are being planned. Is anyone examining the implications on the environment and on human health? How does one explain the large number of children born with deformities in such regions?

In Kerala, the aerial spraying of endosulfan in Kasaragode every year, for more than 20 years, is causing the birth of deformed children. While the debate between local communities, activists and industry on the continued use of pesticides rages on, there have been no systematic health surveys, no unambiguous reports to explain the birth deformities. In Kokkada, near Kasaragode, on the Karnataka bŏrder, local activists lined up 25 deformed children for us to see in one afternoon. We stopped after visiting the third child. Now, two years on, I wish I had visited them all. It's important to document such atrocities so that later no one can say they don't exist.

Like a whole village of children in Jadugoda who scarcely exist.

THE ROAD TO JADUGODA, on which we travelled, is made from uranium tailings. Here, after drinking crystal clear sweet water straight out of a well, we walked down a village street straight out of *National Geographic*. But, in house after house, children with swollen eyes and disfigured faces dragged themselves around on their haunches. They smiled at us and proudly called out their names: Duniya, Alobatti, Arjuna. Their parents stared at us coldly, reciting the number of years they had worked in the mines, when they quit, and when their problems began.

Radioactive tailings cannot be seen or smelt in the way gases had assaulted our senses in other places. But they were all around us. In the water, in the food, inside the children.

Jadugoda: Radioactive tailings are in the water and in the food

Nina Subramani

Vimla, a resident of Jadugora says: "We don't really understand what's going on. Yes, the mines are there but not everyone's making money from them. In a tribal family of 15, perhaps one person is employed in the mines. And things like the uranium being dumped on the roads, we have no clue how this could affect pregnant women and children. Most of our children are born handicapped, crippled — at least five in every village. We didn't know why. See, many tribals like us even used the uranium waste to make our stoves, to build walls. We didn't have any information on what this could do to us."

Little or nothing has been done for the past 20 years to ensure that uranium waste does not contaminate Jadugoda's water supply. Now, plans are afoot to mine uranium in Nalgonda district near Hyderabad. The proposed site is just four kilometres from the Nagarjunasagar dam and the Akampalli reservoir, which will supply water from the Krishna river to Hyderabad.

THE BREATHTAKING BEAUTY of Orissa is diminished by the anger and despair in the eyes of its people. The poverty and starvation hit you hard. In the background, night and day, black clouds emitted from factory chimneys block out the sunset over the river Brahminny.

In Angul we were met with the most surreal sight. Huge expanses of grey covered the land as far as the eye could see. In the distance, huge grey hills were covered in flying dust. Fountains of grey water set in ponds. Ash ponds and dust hills — waste from thermal powerplants. Covering land that was once used for agriculture. In a state where people starve to death. Toxins from ash ponds leach into the soil, contaminating groundwater, food, bodies.

Bishan Sawan, an angry man we met, says: "What was here earlier? Fields. Yes, even I grew crops here. When we gave up the land, people didn't get even a third of the compensation they should have.

"In March this year there were winds, and the dust reached Talcher, 10 km away. There was a foot of ash in the town. There was a 'kirtan'. All the food was spoiled. The stream got so choked with fly ash that no one could bathe there. There's no drinking water here, our little stream is totally choked. If you come in February-March you won't be able to stand here — people can't eat, there's so much dust.

"The children's health is affected — so many babies have TB. There are absolutely no medical facilities. You'll see a pump house further up — they're supposed to be cleaning the water before releasing it but you'll see effluents directly joining the freshwater stream."

The villagers say the dust causes "breathing problems and coughs". Most think they're suffering from tuberculosis, though it's actually silicosis.

Malaria is rampant in areas around the ash ponds. At night we stop at a village near Talcher to speak to the residents. Almost everyone in the village has malaria. Swarms of mosquitoes buzz around us. How do these people pay for treatment?

Even more surreal than the ash ponds are the stonecutters. Rocks are blown up, machines work ceaselessly cutting stone and spreading dust for miles. At night you can see the dust moving in beautiful ripples, hovering in lines above the ground. These stonecutting enterprises are located right above the villages.

Niti Das, resident of a village near Lokpal, says:
"Due to the crusher units there is dust rain in the village. The blasting causes cracks in the buildings. People are injured by falling stone. A lot of people are laid up with TB and the flu; some are even dying. Most people have respiratory problems.

"We face so many problems but when we object we are taken into police custody and harassed. There is one pond and one well that the whole village depends on. When we drink the polluted water we are laid up with many illnesses. Sometimes we walk kilometres for better water.

"When we tell them of our problems they say leave — go elsewhere. In any case, you'll are tribals, you have no right here, go away like others have."

Manoj, a seven-year-old child from the same village, says:
"I have admission in a school but everyone is so scared of the blasts — even our teachers don't come. The asbestos roof is cracking. My throat and chest burn all the time."

Do you remember even one day of quiet?
"No, we have no peace at all."

If you could go elsewhere, would you?
"No."

Why not?
"This is my birthplace. I will not leave."

Another amazing sight was a tender fresh green leaf emerging from a jet-black plant. The trees in the forest are dark, with the sunlight blazing above them. Agapeeth Katkatta, a villager living near the forest in Sundergarh, holds up a plastic bottle of water from his pond. It's black.

AS I READ THIS PIECE over I ask myself: What is it that I really want to say? That the water is dirty, the air foul, the land dead, and the people dying. I guess that just about sums up my journey.

But it doesn't, fully. Things cannot be all that simple or cruel. Not as long as there are people like Jose, Periyar's river-keeper who has been fighting the pollution at Eloor for over 20 years; the community at Karimugal that has marched for 1,000 evenings in a row; the people of Kodaikanal who come by bus to Chennai to ask HLL to stop dumping mercury in their hills; the women of Bhadravathi who want to start a club to stop the red smoke in their bright blue sky; the little boy in Orissa who will not leave his village... People everywhere who said to us: "Enough of our troubles, now let's sing some songs while your tea gets ready."

Bhopal was not the first 'Bhopal'. It was the first to explode in our faces.

Nina Subramani is a documentary filmmaker based in Chennai. She is the writer and director of Miles to Go, *a documentary film produced by Greenpeace. To order copies of the film or get in touch with the filmmaker, write to: mail@elephantcorridor.org*

Keeping Bhopal in the public eye

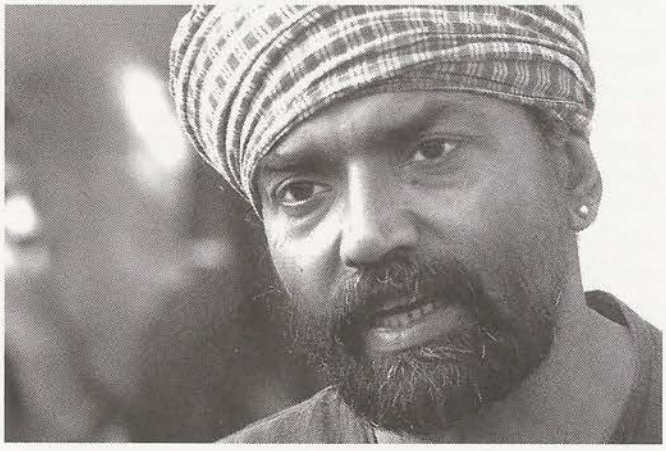
Satinath Sarangi arrived in Bhopal two days after the gas leak, 20 years ago. He has been there since, helping in the fight for the legal claims of survivors, in the mobilisation of communities, volunteers and international donors, and the provision of medical support. In this interview he explains why it is important to keep reminding the world that Bhopal happened

Satinath Sarangi is the managing trustee of the Sambhavna Clinic which provides survivors free medical care and undertakes community health work. The clinic is the only organisation currently researching the long-term effects of the Bhopal gas exposure. He is a founder of the survivors' support organisation Bhopal Group for Information and Action and interacts closely with survivors' associations. Sarangi has been involved with the multiple activities run by a network of local, national and international groups, pursuing health and economic needs, fighting legal claims, providing medical support and reminding the world that Bhopal happened.

In this interview, Sarangi explains how Bhopal has been kept in the public eye for 20 years, how communities, volunteers and donors have been mobilised, and what the do's and don'ts of a successful campaign are.

How did you get involved in the Bhopal campaign?
I was working for my PhD (in metallurgical engineering) in 1983 at the Council of Industrial and Scientific Research's Regional Research Lab in Bhopal. But I soon got disillusioned with the work and joined Kishore Bharati, an NGO working among tribal and semi-tribal people in villages about 150 km south of Bhopal. I helped organise village youth on social and political issues through songs, plays and meetings. On the evening of December 3, 1984, I and other villagers heard in a news broadcast from All India Radio that a gas leak had killed people in Bhopal. I don't remember whether the number of casualties was mentioned. If it was, it wasn't staggering. Dr Anil Sadgopal, founder and one of the leaders of the Kishore Bharati team, and I left for Bhopal later in the evening.

As I walked out of the Bhopal railway station I was shocked at how massive the problem was, how painful for people. I saw entire families huddled together, their eyes swollen, holding on to each other, groaning, people lying helpless on the wayside....What lifted my spirits and got me out of the benumbed state was the huge number of ordinary people who were trying to help the victims. Small makeshift booths had been set up by volunteers from religious and social organisations and ordinary citizens on the roadside and volunteers of every description were busy putting eyedrops, distributing different kinds of pills, providing milk and fruit, carrying unconscious and semi-conscious people to passing vehicles requesting them to take patients to the hospital. The spontaneous outpouring of humanity was as overwhelming as the grief and misery.



I joined one such group and for the next three-four days remained occupied with these relief efforts, even as I became increasingly sceptical about the efficacy of the eyedrops or the different pills. I met with a number of local volunteers and some who like me had come from outside Bhopal. On December 9, I attended a meeting of over 20 people at the house of a small-time lawyer where the Zahreeli Gas Kand Sangharsh Morcha was formed with the objective of leading the struggle for relief and rehabilitation and punishment of the guilty. That is how I got involved.

In early-1986 I left the Morcha and founded the Bhopal Group for Information and Action (BGIA).

What led to the formation of the Sambhavna Clinic?
I was always interested in the medical fallout of the disaster. In early-1985 four organisations active on issues of disaster — the Union Carbide Karmchari Sangh (the trade union of Carbide workers), Trade Union Relief Fund (a workers' support group from Mumbai), Nagarik Rahat Aur Punarvas Committee (a local survivors' organisation) and the Morcha — started a clinic together. I offered to manage the clinic. In June we administered sodium thiosulphate (a detoxificant) and monitored its remarkably positive effects with help from volunteer doctors. In 20 days the clinic administered more injections than all the government hospitals put together had in the preceding five months.

Then on the night of June 24 the police raided the clinic, arrested us, put us in jail for 18 days, and took away all the files with data on the efficacy of the drug. The reason for this was that Union Carbide did not want sodium thiosulphate to be

administered and the effects monitored because that would establish that the gases had injured not just the eyes and lungs (as the Corporation wanted people to believe) but almost all the organs by getting into the bloodstream (the drug was administered intravenously). I tried setting up two more clinics but there was too much police repression. The political nature of Bhopal's medical issues was rather stark in the first few years.

Several years had to pass before independent medical work could be carried out. In these years I was witness to the indiscriminate prescription of potentially harmful drugs (mainly antibiotics, steroids and psychotropic drugs), the absence of sustained relief in symptoms. I also saw the premature termination and winding up of medical research and an absence of community health initiatives. A study that BGIA did in 1990 to evaluate drug utilisation in government hospitals showed that in the two hospitals studied over 50% of the drugs prescribed had been banned in other countries or been considered for a ban by the Indian government.

With the deterioration in the health of survivors and the system of healthcare, research and monitoring, what finally made Sambhavna happen was the possibility of raising enough money through individual donations. I am strongly opposed to setting up/running a clinic with funds from corporate charities, governments or large funding agencies. Raising funds through individual donations was made possible through the involvement of Indra Sinha, an adman/writer in London, in 1994. The first ad that he published in December 1994 in *The Guardian*, London, raised over 50,000 pounds from over 3,000 people. The Sambhavna Trust was set up in June 1995 and the clinic building was purchased with part of the money raised through the advertisement.

What are Sambhavna's achievements?
First, by developing treatment protocols for specific symptom complexes that combine therapeutic intervention through modern medicine, ayurveda and yoga, we have demonstrated the possibility of developing safe, simple, inexpensive and effective therapies for exposure-induced health problems.

Second, we have developed a system of registration for continuous monitoring of health status and treatment efficacy. Third, ours is the only clinic in the city providing facilities for screening, diagnosis and treatment of cervical cancer. Fourth, in a paper presented at the World Asthma Congress in October 1999, we presented data on significant increase in lung function parameters among persons with exposure-induced chronic respiratory disorders through the practice of yoga and pranayama.

Through house-to-house surveys we generated important data on the health consequences to over 20,000 people of toxic exposure in 1984 and contamination of groundwater. Our research, published in the *Journal of the American Medical Association* (October 2003), was the first to show health injuries among children conceived and born to gas-exposed parents after the disaster.

We manufacture over 60 ayurvedic medicines mentioned in standard texts from locally collected or purchased herbs. We have developed a successful programme for control of tuberculosis based on the involvement of 'health leaders' who are recovered TB patients from the community. In four years the incidence of TB in the community came down 10 times.

Health education by Sambhavna's community health workers led to collective action by residents of the communities affected by groundwater contamination.

Through advertisements in newspapers in India and the UK we have been able to raise sufficient funds to run the clinic for the last eight years and have reason to hope that this support will continue.

Importantly, we have established a system of collective management based on participation of staff members and consensus decision-making.

We have been awarded the Japanese Tajiri Muneaki prize in 1999, the national Inner Flame award in 2001 and the international Margaret Mead award in 2002.

Your funding strategy is unique. Could you describe it?
Our fundraising is mainly done by placing full-page ads in newspapers such as *The Guardian* and *Independent* in the UK around the anniversary of the disaster each year. We spend about 8,000 pounds per ad and are able to raise 30,000-50,000 pounds per ad. We have over 8,000 donors including school children, workers, artists and others.

Our ads are as much about raising awareness about the disaster and crimes of corporations as about raising funds. They are markedly different from most fundraising ads that evoke pity and/or guilt among potential donors.

You've also been able to attract volunteers on a regular basis over the years. How?
We have had medical and non-medical volunteers from France, Ireland, Belgium, UK, Sweden, USA and Switzerland in addition to those from Bhopal and other parts of India who have done a great deal of work. Most of the people who volunteered came to know about us and our work from the first report we published and distributed in 1998 and through our website www.bhopal.org. We take great care to ensure that a volunteer enjoys and learns from her/his work at the clinic and also that the work contributes to the overall achievements of the clinic. We think people are attracted to our approach to healthcare of chemically exposed people because it's a combination of several systems.

You've managed to involve a lot of writers, artists and photographers in the Bhopal campaign. What do you think motivated them?
Writers like Dominique Lapierre, Indra Sinha, Suketu Mehta and Arvind Rajagopal have written for Sambhavna. Photographers such as Raghu Rai, Dayanita Singh, Prakash Hatvalne, Andy Moxon, Richard Grove (both from the UK), Maude Dorr (USA) and others have given their photos to Sambhavna.

I think what motivates people is the plight of the survivors (and those forced to drink contaminated water), the fact that the agencies responsible — namely Dow Chemical Company and

the Indian government — are doing little to alleviate the suffering of the people and our successful efforts in providing sustained relief and building community organisations. We help volunteers choose the kind of work that is relevant to the immediate situation so that she/he can see the significant contribution she/he is making. We also encourage the volunteers to see the situation in Bhopal as part of the much larger tragedy of destruction of human health, lives and the planet due to the commercial activities of corporations which aim at profit maximisation. Bhopal helps them develop a perspective on their own surroundings back home.

How did you keep Bhopal in the international eye? Was it the issue or the campaign? Would it have worked with another subject?

It is the Bhopal Group for Information and Action that has been working actively to keep Bhopal in the public eye. In the years after the disaster when media attention on Bhopal waned drastically, BGIA used to publish/distribute a newsletter in English for international distribution and a Hindi newspaper (with news from around the world) for distribution among survivors. The campaign tour of survivors and BGIA members to several countries, starting in 1989, the organisation of the Permanent People's Tribunal on Bhopal and the setting up of the International Medical Commission on Bhopal helped a lot in building contacts with community groups victimised by similar corporate crimes, trade unions, students, environmental, human rights, medical and other professional organisations. Organisations such as The Other Media in New Delhi contributed significantly to maintaining and promoting interest nationally. Once we set up the website it became much easier. I think it was more the issue than the campaign. It has been our experience that the word 'Bhopal' evokes strong memories in people, including non-activist people. Of course (because of a lack of media attention) many tend to believe that the disaster is over and all is well in Bhopal. But it is a rare person who does not recognise the name or remember how terrible it was. The other thing about the issue is that it touches most people, as concerns regarding environmental health are growing all over the world. I do not think it would have worked this well with so little effort with another subject which does not have such name recognition and immediate relevance.

So the do's and don'ts of campaigning according to you would be..?

Do's:

1. have a vision
2. have a democratic structure and consensus decision-making
3. make clear demands, backed by data, and repeat them over and over
4. encourage community participation at all stages
5. have a diverse range of activities
6. keep your sources of funding, accounts of income and expenditure and systems of fiscal accountability open to all participants
7. be creative in deciding on protest actions — use a combination of violent (against property not people) and non-violent action, legal and extra-legal means, mass and individual work
8. include all possibilities in defining your constituency
9. remember to add fun and laughter in political action
10. celebrate all victories

Don'ts:

1. stoop to make allies particularly with corporate/government bodies even though such alliances may seem to offer benefits for the campaign
2. forget that a vast majority of potential supporters particularly in India do not have access to computers/Internet
3. underestimate the power of a small group or even an individual either as an ally or an enemy
4. keep people in the dark
5. let the legality of any matter stop you from raising issues of morality
6. follow any leader unquestioningly
7. be lazy or careless about money matters
8. discourage criticism or silence dissent
9. use a 'higher purpose' argument to condone immoral actions
10. let defeat bring you down

Has the campaign concerned itself with general policy issues as well? Or has it focused on the specifics?

Along with raising issues about Bhopal and specific demands against Dow and the Indian government, the campaign has raised issues of corporate accountability, penalising corporate crime, public access to information on industrial activity, inherently unsafe technologies and products, and regulation of corporate activities.

Where does the Bhopal campaign go from here?

The BGIA along with survivors' organisations has been involved with several legal actions calling for improvements in medical care, disposal of toxic waste, stoppage of demolition of the factory by the management, and several other issues. The BGIA has provided legal assistance to survivor claimants who have been wrongfully denied compensation or have been paid inadequate sums. In the ongoing criminal case against Union Carbide and its officials, the BGIA is assisting the prosecution. In the class action suit against Union Carbide Corporation in the Federal Court in USA, the BGIA is one of the plaintiffs.

The movement as a whole is moving towards confronting Dow's 'original sin', which is chlorine chemistry (Dow invented/ commercialised technology for getting chlorine from brine wells around Midland, Michigan). This chlorine went into the production of highly toxic chemicals including PVC (Dow is the largest producer) and dioxin. The Bhopal survivors have joined forces with residents of Midland over the issue of dioxin contamination and with Vietnamese victims of Agent Orange/dioxin spraying by the US army (Dow was the biggest supplier of Agent Orange to the US army).

A history of hazards

Although there has been no tragedy on the scale of Bhopal in the last two decades, there have been innumerable gas leaks, explosions and accidents.

Young women, aged 17 to 20, die in match factories in Tamil Nadu. In Bhuleshwar, young boys working in cramped and crowded conditions cannot escape an inferno because the owner locks their rooms at night. Farmers in Sangamner choke as fumes are released during the night. But the reports are buried under reams of newsprint.

All over India, mini Bhopals unfurl with shocking regularity. The following listing is not comprehensive. It has been compiled from news reports in leading Indian newspapers and journals to give an indication of the myriad ways in which workers and communities are exposed to industrial hazards.

2004

September 30: Explosion kills 10 people at Bhushan Steel's factory in Sahibabad, Uttar Pradesh, when bombs contained in scrap originating in Iraq exploded. Indian law prohibits the import of scrap from war-zones.
July 29: Two matador trucks carrying cartons of date-expired drugs and pesticides were dumped and set ablaze by officials of Hindustan Antibiotics Ltd in Sankheri village, near Bhopal. Villagers residing within 200 metres of the site complained of breathing problems, stomach ache, diarrhoea, nausea and vomiting. Four people belonging to the family of a farm labourer living nearby fell unconscious and were hospitalised.
July 18: A chlorine leak at 6 pm from Chemplast Sanmar's chlorine plant in Mettur Dam, Tamil Nadu, sent 23 people, including a 22-day-old child, to hospital. More than 50 people are reported to have fainted after inhaling the chlorine fumes. The state regulatory authorities, police and district officials cooperated with the company to hush up the matter. No criminal proceedings have been initiated against Chemplast
July 13: Bombay High Court appoints retired judge D R Dhanuka commissioner to investigate possible toxic exposure among employees working or having worked for Monsanto India Ltd at its Lonavla and Silvassa plants.
July 6: A fire at Hindustan Insecticides Ltd's endosulfan plant in Eloor, Kerala, guts the plant. More than 250 people exposed to toxic fumes from the fire. The company had no onsite or offsite emergency plan, and the fire hydrant was not working. The company dismissed the fire as a major accident averted. No systematic medical monitoring or aid was offered to victims.
April 17: Three employees at the Waste Immunisation Plant in Tarapur, Maharashtra, exposed to radiation from a small bottle of diluted but highly radioactive waste.
April 6: One person killed and 29 affected following a toxic gas leak at the Jaipur Golden Transport Company's godown on Roshanara Road, north Delhi. Toxic gas is released after water used to douse a fire mixes with aluminium phosphide stored inside the godown. The police find that the firm does not have a valid licence to handle toxic chemicals. Three managers arrested.
February 24: Explosion at ammonium perchlorate facility in the SHAR complex, Sriharikota, kills 36 people. SHAR is India's premier space research station.
January 5: Residents of Gawanpada township in Chembur, a Mumbai suburb, complain of breathlessness after a whitish powder is emitted from the Hindustan Petro Chemicals Ltd plant. HPCL's general manager visits the township and sends sweepers in to clean up the powder. A representative from the public relations company hired by HPCL claims the silica powder is harmless.

2003

November 26: 150 villagers in Sangamner, near Nashik in Maharashtra, exposed to hydrochloric acid leak from Mangalam Drug & Organic Ltd plant. At least 55 people admitted to hospital. The Maharashtra Pollution Control Board earlier issued a notice for the unit's closure but the company went to court to prevent the shutdown.
August 1: Seven employees of the Viswesvaraya Iron & Steel plant in Bhadravati, Karnataka, die in a blast at the steel-making section. It is believed that water leaking into the converter solidified the upper layer of the hot metal causing the explosion.
June 12: Two killed, 19 hurt in a blast at the Ranbaxy unit in Mohali, Punjab. The accident occurs at a toluene distillation unit operating under high pressure. This is the second fire at a Ranbaxy unit.
March 12: Major fire at a chemical warehouse in Bhiwandi, Thane district, Maharashtra. The fire rages for 14 hours, requiring the efforts of 27 fire engines before it is finally put out. Residents complain of lax monitoring by authorities.
February 24: Three young girls employed at the biggest matchbox-making unit in Gudiyatham town, Tamil Nadu, die of asphyxiation. They had locked themselves into a bathroom when a fire broke out.
February 22: Six workers die in a fire at the Alang shipbreaking yard in Gujarat.
January 21: Six employees at Kalpakkam Reprocessing Plant, 50 km south of Chennai, were exposed to high levels of radiation inside the plant. No monitors were installed in the enclosed area where the workers were exposed. The management attributed the exposure to worker error.

2002

December 24: Three workers at a distillery at the Chittur Cooperative Sugar Mills in Palakkad, Kerala, die after inhaling carbon dioxide while repairing a pipeline. Workers allege absence of safety measures and medical facilities at the factory premises.
November 8: Three killed, two hurt in an explosion at Parakh Food Products at Kurkumbh Industrial Estate near Daund in Maharashtra. The fire starts when welders, repairing a pipeline connecting edible oil tanks, cause the oil to overheat. Workers are flung high into the air with the impact of the explosion.
September 22: Six young women, aged between 17 and 20, die and 54 suffer serious burns when a fire breaks out at a match factory in Mudukkumeidanpatti, near Kovilpatti in Tamil Nadu.
July 30: One person killed and 12 hospitalised following a gas leak at RPG Life Sciences Ltd's Pimpri facility located in the premises of Hindustan Antibiotics Limited, Pimpri, Maharashtra. The company claims the gas, emitted during manufacture of the drug Spirunolactone, is not poisonous.

2001

August 26: Five women employed at the Gujarat Clay Mills in Kurla, Mumbai, hospitalised after inhaling fumes caused by grinding a 'blackish' material. The dean of Sion Hospital, where the women were admitted, said they were suffering from methhaemoglobinia. Workers say there was no proper ventilation at the mill.
August 17: Twenty-two killed in a blast at the Tamil Nadu Industrial Explosive Ltd plant near Katpadi in Vellore. The accident occurred during the crimping process for making detonators used in quarries. Thirty-five thousand detonators were stored in the building at the time of the explosion. Two people had earlier died at the unit.
May 31: Twenty-two young labourers, mainly from Bengal, die after a gas cylinder bursts at a gold-processing unit in Mumbai's crowded Bhuleshwar area. The gas cylinder had been illegally procured and was fake. The labourers were unable to escape the raging fire as the owner had locked them in the room at night.

2000

December 8: West Bengal government orders the closure of the Frigerio Conserva Allana meat-processing factory in Mourigram, Howrah, two days after angry residents storm the plant. The residents claim toxic emissions on October 28 caused the death of one worker and affected four others.
November 21: Gujarat High Court raps the state for its apathetic approach, following the death of two labourers at an effluent treatment plant at Naroda Enviro Projects Ltd. The workers died on July 28 when they fell into toxic liquid at the treatment chamber. It is alleged that the workers were not provided proper safety equipment.
April 18: Thirty-one people, including several children, hospitalised in northeast Delhi following a chlorine gas leak from a water treatment plant of the Delhi Jal Board.

1999

October 16: Three persons killed and 17 badly affected after inhaling hydrogen sulphide gas from a storage tank at a unit near Kalyan, Maharashtra. Though there were 124 industrial units handling chemicals in the area, staff at the civic Rukminibai Hospital say they are not equipped to handle chemical asphyxiation and lack basic equipment like ventilators.
October 8: Thirty-seven women employees of Ravi Frozen Foods at Wagle Estate, Thane, faint when a hosepipe bursts in the cooling hall, releasing ammonia gas. The director, engineer, foreman and two others arrested on charges of gross negligence; later released on bail.
May 6: Five people killed in a flash fire at the hydro cracker unit of Indian Oil Corporation's Panipat refinery commissioned just three months earlier.

1998

July 10: Heavy rains in Bajwa, Gujarat, cause the sliding of a mountain of waste gypsum dumped by Gujarat State Fertilisers & Chemicals. The radioactive waste flows into the town affecting several residential areas. The government distributes food and water packets in response to protests by residents.
April 21: Four killed and 60 injured after several barrels containing chemicals catch fire at the Dasnagar Industrial Estate near Howrah. Three days later, residents near the site are forced to flee as the resultant aniline gas causes asphyxiation. Police blame the authorities for stockpiling chemicals without adequate supervision.
April 2: Five workers killed at the Nutra Plus factory at Boisar Industrial Estate, Gujarat. A faulty safety valve rendered the cooling apparatus ineffective. The ceiling collapsed. Factory workers allege that two chemical engineers meant to be operating the reactor were busy watching a televised cricket match.

1997

September 15: Thirty-seven persons killed in a blast at the Hindustan Petroleum refinery in Vishakhapatnam, Andhra Pradesh. Most victims were casual labourers employed on a contract basis. Environmental scientists at the Tata Energy Research Institute and the Indian Institute of Technology Delhi express fears that the blaze may have damaged crops and triggered respiratory diseases among the town's population. The A B Sathe Committee looking into the incident holds staff responsible for failing to close the valves of the sphere in the storage tanks, resulting in the blast.
May 22: Nine persons die in an explosion at a factory in Faridabad, Haryana. The chemical factory stored drums of methyl elkyl ketone peroxide.
March 13: Twenty people die at a gelatin godown in Sangamnagar in Satara town, Maharashtra.

1996

September 14: Eighteen children hospitalised in Narkheldanga, West Bengal, after inhaling poisonous fumes emitted at a paper and cardboard godown. It is believed the fumes spread when boxes that once had chemicals spread on top of them were being cleaned.

1995

August 7: Six people, including a supervisor, die after inhaling poisonous gas while cleaning a tank at the Marico edible oil plant in Jalgaon, Nashik. Among the workers is a 16-year-old boy.
July 10: Thirty people fall ill after a gas leak at the Hindustan Lever prawn-processing unit near Kolkata, West Bengal.
March 15: Two workers die after inhaling poisonous gas at the Mukund Iron plant in Kalwa, Thane, near Mumbai.

1994

November 13: Hundreds affected by a toxic cloud formed after a fire breaks out at a chemical store in Delhi.
January 25: Fifty-three miners die when a fire breaks out in a mine in Asansol, West Bengal.

1993

March 17: Nine residents of Chhota Shahad village in Ulhasnagar, Thane district, near Mumbai, die after being affected by hydrogen sulphide released by the Century Rayon factory into a nullah. About 140 villagers were affected. Four Century Rayon employees arrested. A Maharashtra Pollution Control Board (MPCB) report implicates Century Rayon for violating safety norms in the treatment of effluents.

On MPCB orders, closure operations begin on April 16 amid protests by the workers union. On April 24, the MPCB and Maharashtra government allow the company to reopen its plant provided it complies with MPCB orders.

Compiled by Freny Manecksha

Economic growth vs increase in pollution load

	Unit	1975[c]	1995[c]	% growth
GDP[a]	Rs. lakhs	10,49,680	27,61,320	163
Vehicular pollution load[b]	Metric tonnes	771,610 (57.3)	5,789,630 (74.4)	650
Industrial pollution load[b]	Metric Tonnes	575,081 (42.7)	1,995,636 (25.6)	247
Total pollution load	Metric tonnes	1,346,691	7,785,266	478

Notes: [a] Real GDP relative to 1980-1 prices;
[b] Pollution loads based on a study conducted by Centre for Science and Environment, Delhi
[c] Figure in parenthesis is the percentage contribution to the total pollution load
Source: Anonymous (1999), 'When Wealth is not Health' *Down to Earth*, vol. 7, no. 17, pp. 32-40.

Further reading

www.bhopal.net
www.thanal.org
www.cseindia.org
www.ipen.org
www.ilpi.com
www.gcmonitor.org
www.rachel.org
www.ourstolenfuture.org
www.toxicslink.org
www.no-burn.org
www.nlm.nih.org
www.sipcotcuddalore.com
www.greenpeaceindia.org

Red category (highly polluting) industries

There are 64 types of polluting industries/industrial activities which are identified by the Central Pollution Control Board in its newsletter *Parivesh* as 'Red Category' industries on the basis of their emissions/discharge of high/significant polluting potential or generation of hazardous wastes. These include large, medium as well as small-scale industries.

Seventeen of these are identified by the Ministry of Environment and Forests as heavily polluting and covered under the Central Action Plan:

1. Distillery, including fermentation, industry
2. Sugar (excluding khandsari)
3. Fertiliser
4. Pulp and paper
5. Chlor alkali
6. Pharmaceuticals (basic) (excluding formulation)
7. Dyes and dye intermediates
8. Pesticides (technical) (excluding formulation)
9. Oil refinery (mineral oil or petro refineries)
10. Tanneries
11. Petrochemicals (manufacture of and not merely use of raw material)
12. Cement
13. Thermal power plants
14. Iron and steel (involving processes from ore/scrap, and integrated steel plants)
15. Zinc smelter
16. Copper smelter
17. Aluminium smelter

Other industries in the list of 64 include:

18. Tyres and tubes vulcanisation/retreading/moulding
19. Synthetic rubber
20. Glass and fibreglass production and processing
21. Industrial carbon including electrodes and graphite blocks, activated carbon, carbon black, etc
22. Paints and varnishes (excluding blending/mixing)
23. Pigments and intermediates
24. Synthetic resins
25. Petroleum products involving storage, transfer or processing
26. Lubricating oils, greases or petroleum-based products
27. Synthetic fibre including rayon, tyre cord, polyester filament yarn
28. Surgical and medical products involving prophylactics and latex
29. Synthetic detergent and soap
30. Photographic film and chemicals
31. Chemical, petrochemical and electrochemicals including manufacture of acids such as sulphuric acid, nitric acid, phosphoric acid, etc
32. Industrial or inorganic gases
33. Chlorates, perchlorates and peroxides
34. Glue and gelatine
35. Yarn and textile processing involving scouring, bleaching, dyeing, printing or any effluent/emission-generating process
36. Vegetable oils including solvent extracted oils, hydrogenated oils
37. Industry or process involving metal treatment or process such as pickling, surface coating, paint baking, paint stripping, heat treatment, phosphating or finishing, etc
38. Industry or process involving electroplating operations
39. Asbestos and asbestos-based industries
40. Slaughter houses and meat processing industries
41. Fermentation industry including manufacture of yeast, beer, etc
42. Steel and steel products including coke plants involving use of any equipment such as blast furnaces, open hearth furnace, induction furnace or arc furnace, or any operations or processes such as heat treatment, acid pickling, rolling or galvanising
43. Incineration plants
44. Power-generating plants (excluding DG sets)
45. Lime manufacturing
46. Tobacco products including cigarettes and tobacco processing
47. Dry coal processing/Mineral processing industries like ore sintering, palletisation, etc
48. Phosphate rock processing plants
49. Coke making, coal liquefaction, coal tar distillation or fuel gas making
50. Phosphorous and its compounds
51. Explosives including detonators, fuses, etc
52. Firecrackers
53. Processes involving chlorinated hydrocarbons
54. Chlorine, fluorine, bromine, iodine and their compounds
55. Hydrocyanic acid and its derivatives
56. Milk processing and dairy products (integrated project)
57. Industry or process involving foundry operations
58. Potable alcohol (IMFL) by blending or distillation of alcohol
59. Anodising
60. Ceramic/Refractories
61. Lead processing and battery reconditioning and manufacturing including lead smelting
62. Hot mix plants
63. Hospitals
64. Mining and ore-benificiation

Groups working on toxics and pollution

1. Thanal, a public interest research, advocacy, education and action trust based in Kerala. Website: www.thanal.org. Email: thanal@vsnl.com

2. Community Environmental Monitoring. Based in Tamil Nadu and working specifically in Cuddalore, but providing information support to community campaigns in other parts of Tamil Nadu. Website: www.sipcotcuddalore.com. Email: nity68@vsnl.com

3. Paryavaran Suraksha Samiti, which works to combat unchecked pollution in Gujarat's Golden Corridor. Email: pss@narmada.net.in

4. Vadodara Kamdar Union, Vadodara, Gujarat

5. Corporate Accountability Desk, The Other Media, New Delhi. Email: mdutta@vsnl.net

6. Mines, Minerals & People. Email: samatha@satyam.net.in

7. Environment Support Group, Karnataka. Website: www.esgindia.org. Email: esg@esgindia.org

8. Sambhavna Clinic, working for the health rehabilitation of the Bhopal gas-affected. Website: www.bhopal.org. Email: sambhavna@sancharnet.in

9. International Campaign for Justice in Bhopal. Website: www.bhopal.net. Email: icjb@bhopal.net

10. Occupational Health and Safety Committee. Email: sujvij@vsnl.com or murlidharv@vsnl.com

Hazardous substances commonly used in industrial processes

Arsenic and compounds (metal)

Sources/Uses: Mining or smelting: Smelt lead, copper, zinc, cobalt, nickel, or gold.
Manufacturing: Pesticides (sheep dips, insecticides, herbicides, fungicides, algicides, wood preservatives, cotton desiccants); lead-arsenic alloys for solder, battery grids, or cable shielding; electronics (microwave devices, lasers, light-emitting diodes, photoelectric cells, semiconductors); clarified glass or ceramics; pigments.
Comments: Except for the electronics industry, the commercial use of arsenic is declining. Skin lesions, peripheral neuropathy, and anaemia are the hallmarks of chronic poisoning. Chronic exposure is associated with lung, liver and skin cancer. Liver function tests may be abnormal after chronic poisoning. Nasal septum perforation after dust exposure in the workplace has been reported. Encepahalopathy after chronic exposure has been reported. There is limited positive data for arsenic causing spontaneous abortions in humans and strong positive data for causing testicular damage, birth defects, and foetal loss in animals.

Lead (metal)

Sources/Uses: Mining or smelting: Produce lead fume by primary or secondary smelting — includes brass, copper, and lead foundries and scrap metal recycling operations.
Manufacturing: Lead-acid battery; crystal glass; lead joints/babbitt; pewter; fishing weights; leaded or stained glass; paint and ink; leaded plastics; ammunition; electronic components; electrical components using fritted glass; lead pipe, sheet, solder, type metal, cable shielding, or anodes; ceramics (mix glaze and fire kiln); mix and weigh lead powders.
Using: Weld, cut, braze, grind, sand or blast old paint: houses and buildings (painted before 1978); bridges; ships; steel towers; water, petroleum or underground tanks.
Comments: At blood lead levels above 90 ug/dl, poisoning can cause acute lead encephalopathy. Peripheral neuropathy results from levels above 60 ug/dl, and nerve conduction delays have been measured at levels as low as 30 ug/dl. Exposure to high air concentrations of lead can precipitate haemolytic anaemia. Suppression of heme synthesis leads to frank anaemia at blood lead levels above 80 ug/dl. Lead-exposed workers may develop proximal renal tubular damage and progressive renal insufficiency. There is strong positive data associating lead exposure with spontaneous abortions and prematurity in pregnant women, neurological dysfunction in children and decreased sperm counts in men. About 90% of pre-1940 homes contain lead-based paints, while about 60% of 1960-1979 homes contain significant amounts of lead in paint.

Asbestos (mineral)

Sources/Uses: Used to make cement pipe, vinyl floor tile, flooring felt, shingles, roofing felt, sealants and plasters, acoustic tile, paper products for insulation and filtering, brake linings and clutch facings, curtains, and spray-on products for fireproofing and insulation.
Comments: In the past, the highest exposure occurred in insulators, shipyard workers, and other workers manufacturing asbestos products. Today, construction workers are the most heavily exposed from maintenance, renovation, and demolition of buildings insulated with asbestos years ago. As a general rule, exposure to asbestos for less than 6 months is unlikely to cause interstitial fibrosis or pleural thickening. Among workers heavily exposed to asbestos more than 20 years ago, the chest x-ray will show interstitial fibrosis in 50% and pleural thickening in as much as 80% of the population.
Diseases associated with exposure to this agent: Asbestos-related pleural disease; asbestosis; oesophagus cancer; laryngeal cancer; lung cancer; peritoneal mesothelioma, pleural mesothelioma, stomach cancer.

Sulphur dioxide (toxic gas and vapour)

Sources/Uses: Formed as a byproduct of burning sulphur-containing materials; used for bleaching, disinfecting and fumigating. Used to preserve fruits and other foods; manufacture molasses, wine and beer; bleach textile fibres; tan leather; pulp wood; manufacture lithium batteries and glass; treat water; and refine oil and metal.
Comments: Very high exposure, eg from industrial accidents, can cause chronic obstructive pulmonary disease. Listed as one of "major irritant inhalants". Possible frostbite from contact with liquid. In the presence of water and acid, metabisulfite, a preservative, can generate toxic amounts of SO2. Exposure can cause toxic pneumonitis and chronic bronchitis.

Fluorides (chemical)

Sources/Uses: Occupational exposure to inorganic fluorides can occur during the primary production of aluminium, smelting operations (flux), welding (welding rods), and water treatment.
Comments: 50% of absorbed fluoride is excreted in urine within 24 hours; 99% of the remainder is taken up by bone with a half-life of up to 8 years; tooth mottling is caused by 2-4 mg/day; skeletal changes are rare at 8 mg/day, but can be crippling at 20 to 80 mg/day. Skin rashes and complaints of the gastric, intestinal, circulatory, respiratory, and nervous systems have been reported in workers exposed chronically to concentrations ranging from 11 to 24 mg F/m3.

Mercury (metal)

Sources/Uses: Mining, smelting or metallurgy: Cinnabar ore mining and crushing operations; gold extraction (cyanide leaching or amalgamation processes).
Manufacturing: Thermometers, manometers and barometers; dental amalgam; polyurethane catalyst; switches and rectifiers; dry cell batteries; paints. **Using or disposing:** Open mercury cells in chloralkali plant for maintenance; use mercury amalgams in dental office.
Comment: Elemental mercury vapour is toxic predominantly to the lung and central nervous system. Pneumonitis can result from exposure to high concentrations of mercury vapour not likely to occur in current industrial processes. Chronic exposure to inorganic mercury may produce proteinuria as evidence of kidney injury. Elemental mercury is combined with other metals without heating to form amalgams for dental fillings. Ammoniated mercury is a moderate skin sensitiser, and mercuric chloride is a strong sensitiser. The phenyl mercuric salts (used in herbicides, fungicides, antiseptics, and preservatives) are strong skin irritants. Organic mercury compounds are reproductive toxins that can cause CNS malformations and cerebral palsy in humans.

Chromium and compounds (metal)

Sources/Uses: Mining, smelting or metallurgy: Ore mining and crushing operations; alloy production; produce chromates from chromite. **Manufacturing:** Textile dyes; paint pigments; chrome plating; leather tanning; printing inks and toners; photoengraving; automotive and aircraft parts; joint prostheses; refractory bricks and kilns. **Using:** Heat or machine chromium alloys; arc weld stainless steel; spray paint Cr pigments; mix and lay cement or concrete; use water system corrosion inhibitors, wood preservatives, or glassware-cleansing solutions; use hexavalent chromates in hardeners for epoxy resin sealants.
Comments: Diseases associated with exposure to this agent include occupational asthma, chronic toxic effect of chromium, contact dermatitis, lung cancer and nasal sinus cancer, stomach cancer.

Source: Haz-Map: Occupational Exposure to Hazardous Chemicals (http://hazmap.nlm.nih.gov/). See also Health effects of chemicals found in SIPCOT air *(page 24)*

Bhopal: An update

ON DECEMBER 3, 1984, a poisonous gas leak from the US multinational Union Carbide's pesticide factory in Bhopal left more than 8,000 people dead, and nearly 500,000 injured. To date, more than 20,000 have died from gas-related illnesses. More than 50,000 survivors are too ill to work and rendered destitute.

The plant was obsolete, poorly maintained, with inadequate safety features and without skilled operators. It stored volatile toxic chemicals in a densely populated area. In other words, the Bhopal gas disaster was a Third World 'accident' waiting to happen.

The company withheld its own research on the leaked gases and their medical consequences. Government research and monitoring of the long-term health effects of the gases was eventually abandoned. Without information on the effects and antidotes, there are no treatment protocols for the gas-affected. People with gas-related ailments must choose between government hospitals without drugs, staff or equipment and expensive treatment from private practitioners.

Poisonous chemical wastes contaminate the groundwater around the factory, an area described in a Greenpeace report as a 'toxic hotspot'. About 5,000 families living in the area are forced to drink this water.

The Indian government has not made serious rehabilitation efforts all these years. In 1989, the Government of India negotiated a settlement directly with Union Carbide, which paid less than Rs 25,000 to each survivor. This year, the Supreme Court ruled that the balance compensation money (now totalling over Rs 1,567 crore) be distributed among survivors.

The 1989 settlement absolved Union Carbide of criminal liability, but this was revised by the Supreme Court following protests and a review petition. Still, the Indian government has refused to seriously pursue the criminal case against the company.

The company's senior officials have consistently dodged court orders. Union Carbide has refused to appear in the Bhopal court to face criminal charges even after the court declared Union Carbide an absconder and attached its assets.

In 2001, Union Carbide was bought by the US multinational Dow Chemical Company. Dow, which markets in India a pesticide banned for domestic use in the US, has refused to acknowledge liability for Bhopal.

Organisations of survivors and their supporters have fought relentlessly for the last two decades, using legal action, demonstrations (including at shareholders' meetings), negotiations, hunger strikes, etc. Survivors, environmentalists, media professionals, lawyers and health activists have worked to keep the pressure on Union Carbide and now Dow Chemical.

On the 20th anniversary of the Bhopal gas disaster, the campaign demands that the company:

Pursue the criminal case: Prime accused Warren Anderson, former chairman of Union Carbide, and the authorised representatives of Dow-Union Carbide must face trial in the Bhopal criminal court.
Provide medical care: The company must assume responsibility for the continuing and long-term health consequences on exposed people and future generations. This includes medical care, health monitoring and necessary research studies. The company must also provide all information on the leaked gases and their medical consequences.
Decontaminate the area: Clean the contaminated groundwater and soil in and around the abandoned Union Carbide factory in Bhopal and provide safe drinking water to the community.
Ensure economic and social support: The corporation must provide income opportunities to victims who cannot pursue their usual trade as a result of exposure-induced illnesses and income support to families rendered destitute due to death or incapacitation of the family breadwinner.

Alessandro Marongiu

Tank 610 from which the MIC gas leaked on December 3, 1984

Causes of the Bhopal disaster

The factory in Bhopal, one of the 14 facilities operated by Union Carbide, was set up in 1969. The first batch of MIC was imported from the USA in 1973 and a unit for manufacturing MIC was set up by the company in 1979. Although the design of the MIC unit was based on Union Carbide's Institute, West Virginia Plant, grossly lower standards were employed in the selection of construction material, monitoring devices and safety systems.

The immediate causes of the disaster are related to the cost-cutting drive started by UCC from its headquarters in Danbury, Connecticut, in 1980. The moves, directed at enhancing profits, included reducing personnel, use of low-quality construction material, cutting down on vital safety measures and adopting hazardous operating procedures. Workers had to pay the cost of these economy measures with their lives, health and jobs.

Between 1980 and 1984, the work crew of the MIC unit was halved from 12 to six, the maintenance crew from six workers to two. On December 26, 1981, a plant operator was killed by a phosgene gas leak. Another phosgene leak in January 1998 severely injured 28 workers, and in October the same year, MIC escaped from a broken valve and four workers were exposed to the chemical. Senior officials of the corporation, privy to a 'Business Confidential' safety audit in May 1982, were well aware of the 61 hazards, 30 of them major, and 11 in the dangerous phosgene/MIC units. On the night of the disaster, water being used to wash the pipelines entered the tank containing MIC through leaking valves. The refrigeration unit which should have kept the MIC at about 0 degrees Centigrade, had been shut off by the company officials to save on electricity bills. The entrance of water in the tank, full of MIC at ambient temperature, triggered an exothermic runaway reaction and consequently, the release of the lethal gas mixture. The safety systems, which in any case were not designed for a runaway situation, were non-functional and under repair. Lest the neighbourhood community be 'unduly alarmed', the siren in the factory had been switched off. Poisonous clouds from the Carbide factory enveloped over 20 square km before residents could run away.

— *Excerpted from 'Bhopal Gas Tragedy' by Satinath Sarangi,* India Disasters Report: Towards a Policy Initiative, *edited by Parasuraman S and Unnikrishnan PV*

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