THE BLIGHTED HILLS OF RORO

A REPORT OF THE FACT-FINDING TEAM TO THE ABANDONED ASBESTOS MINES IN RORO HILLS, CHAIBASA, WEST SINGBHUM DISTRICT, JHARKHAND

FEBRUARY 2003

Background

When the Ancient Greeks named a 'magic' mineral Asbestos—meaning indestructible in Greek—they perhaps had no idea that their magical substance would one day turn into a debilitating scourge for thousands of workers, their families and those living close to the asbestos mines.

The International Labour Organisation (ILO) estimated that at least 100,000 people died of asbestos related diseases last year. But the actual figure may well be over ILO's estimation since it accounts for only work related exposure deaths. The International Commemoration Day for Dead and Injured workers observed every year by the trade union movements across the world was devoted to the victims of asbestos last year.

In spite of hard scientific data and evidences associating asbestos fibres with fatal diseases like asbestosis and lung cancer, the issue of complete phase out of asbestos has remained controversial. The powerful corporate lobby in collusion with the governments and scientific establishments, have used 'bad science' to confuse and suppress information from the public. Although threat from inhalation of asbestos fibres was known as far back as 1924, it was not disclosed to the workers involved in the asbestos mines and factories. By the mid-1930s, it was proved that even a small amount of asbestos fibre in the lungs could cause fatalities.

There are six different varieties of asbestos fibres; all of them tend to break into microscopic sizes; sometimes 700 times smaller than human hair fibres. Because of their small size, once released, they remain suspended in the air.

In 2001, a scientific paper published in National Medical Journal India 2001 (Jan-Feb;14(1):43-6), titled "Carcinogenicity of asbestos: convincing evidence, conflicting interests", clearly stated, "A look at the history of corporate activities in asbestos-related research reveals a disturbing trend. Information that was made available, through legal interventions, clearly shows how for half a century the asbestos industry in collaboration with some academic leaders of occupational medicine successfully suppressed evidence against asbestos."

International scenario

Increased awareness about its dangers has led to over 36 countries banning all use of asbestos, while many countries have severely restricted its use. But these actions have mainly taken place in the developed world. Extensive and aggressive marketing of asbestos still continues in the developing world, especially by the corporations from countries where it has been banned. “There is renewed pressure on this part of the world since new use of asbestos has been almost completely discontinued in the developed countries as a result of public pressure and state prohibitions. In this scenario, relaxation of public health control over any form of asbestos should be opposed. It is extremely dangerous and scientifically untenable to say that chrysotile (white) asbestos can be used without risk. It has been identified as a potent human carcinogen, and remains so”, says S Chaturvedi of Department of Community Medicine, University College of Medical Sciences, Delhi.

ILO adopted the Asbestos Convention, No. 162 in 1986. Though the convention does not put a complete ban on asbestos, it bans certain types of asbestos and certain processes like spraying. But the text of the Convention clearly calls for a gradual elimination of asbestos. The ILO Convention has so far been ratified by 30 countries. Unfortunately, India hasn’t yet ratified the convention, which shows its lack of concern and apathy towards worker’s health. ILO is currently promoting “National Safe Work programmes”, and its director for Programme on Safety, Health at Work and the Environment, Mr. Jukka Takala said in an interview “ a campaign for a total ban on asbestos would well fit in such programmes. This is the simplest and cheapest preventive measure. We are also seeking joint action by the ILO and the World Health Organization”.

Most recent international action on asbestos has been the recommendation by the Interim Chemical Review Committee, a panel of government-appointed experts, that all forms of asbestos be placed on an international list of chemicals subject to trade controls, to the Intergovernmental Negotiating Committee of the Rotterdam Convention on the PIC Procedure for Certain Hazardous Chemicals and Pesticides in International Trade. The Rotterdam Convention-1988, under the aegis of the United Nation Environment Program and the Food and Agriculture Organization, helps importing countries identify hazardous chemicals and either blocks them from entering the country or place requirements on their labelling. The convention, signed by 72 governments and ratified by 18, is yet to be signed by India.

Asbestos was also subject of an international trade dispute in which the World Trade Organisation (WTO) passed a judgement upholding France's decision to ban asbestos imports from Canada in the interests of public health. WTO's landmark verdict of March 12, 2001 validated the right of EU member states to prohibit the import and use of goods that contain carcinogenic substances such as white asbestos.

National scenario

India uses asbestos extensively in the construction sector. Industry has tactically pushed and flooded the Indian market with asbestos as “poor man’s construction material”, killing the alternative market of safer and natural material. This has also led to almost non-existent R&D for safer and cheaper alternative material to replace asbestos that can be easily made accessible to people.

India annually imports about 1,56,500 metric tonnes (MT) from Canada, Brazil, Zimbabwe, and Russia. About 20,000 MT asbestos fibre is mined in Rajasthan and Andhra Pradesh. Chrysotile or white asbestos constitutes about 95 per cent of the world production and commercial use of asbestos. Most of the asbestos is used for manufacture of cement roofing sheets, pipes, brake lining and clutch, asbestos ropes, fire-proof textile, gloves etc.

Most of the asbestos mining and milling activity in India is concentrated in the small scale sector, whereas asbestos products are manufactured in small, medium and large scale sectors. There are about 13 large scale and 673 small scale asbestos factories in the country. The annual turnover of the asbestos industry is around Rs 800 crores and gives direct employment to 6000 workers and indirectly to 100,000.

While there is hardly any concern or health reporting of worker’s death due to asbestos exposure, the Supreme Court of India in recognition of its hazards in a PIL filed by Consumer Education and Research Centre (CERC) directed the Union and state governments "to review the standards of permissible exposure limit value of fibre... in tune with the international standards reducing the permissible limit". It also mandated the asbestos industry to monitor the health of workers for 40 years. (AIR 1995)

In India, a technical committee appointed by the ministry of industry had considered the restrictions on use of asbestos and asbestos products by 43 countries including India. The committee, headed by A K Mullick, submitted a report to Government of India in January 1995.

In September 2002, the Central Pollution Control Board submitted a policy paper to the Ministry of Environment and Forests, recommending a complete ban on mining and milling of amphibole variety of asbestos, which is mined in Rajasthan. It has further recommended allowing mining and milling of Chrysotile asbestos only when fitted with ‘state-of-art’ technology for pollution control and occupational safety of workers as per respective codes laid down by the Bureau of Indian Standards. It has also asked the Ministry of Commerce to amend the Export and Import Policy (EXIM) to put Chrysotile Asbestos under restricted item, to be allowed import only by actual user against a registration certificate under the Environment Protection Act, 1986. Even the worker’s exposure limit has been made stricter. Under the Factories Act, CPCB has recommended the Ministry of Labour to reduce the work place exposure standards for asbestos to 0.5 fibre/cc (fibre per cubic centimetre) with immediate effect and to 0.1 fibre/cc from

January 2004. (Policy to control pollution from asbestos industry, CPCB, September 30, 2002)

Background to Roro asbestos mines and the fact finding team

For the last two decades a massive pile of asbestos waste mixed with chromite has been lying on hilltops in Chaibasa, west Singhbhum district of Jharkhand. Over the years this 'indestructible' waste has seeped into the water, soil, vegetation and bodies of people living around the abandoned mines, poisoning the local community and the environment.

In the last 20 years, nobody—the local administration, the mines and safety department and the mining company—bothered to assess the fate of the waste dumped improperly on top of the Roro hills. This is common practice in most operational and abandoned mines in India. However, in this case, the health risks to humans and the environment are far greater because asbestos and chromium are known carcinogens.

To assess the impact of this abandoned chromite and asbestos waste, a fact-finding team (FFT) was constituted by the ***mines, minerals & People*** *(mm &P*) and Jharkhandis' Organisation for Human Rights **J.O.H.A.R.** in December 2002 to:

1)Undertake a visit to the site

2)Explore the history of operation and subsequent closure

3)Identify the Implications to the local ecosystems

4)Identify health implications of mining on the workers at the time of operation

5)Identify the nature of efforts needed to ameliorate the impacts of the waste on local population and restoring the mining area.

Following members formed the FFT:

Mr Sreedhar Ramamurthi, Geologist, Director, Academy of Mountain Environics and member of mm &P, Delhi

Dr Arin Basu, Epidemiologist and a medical doctor, Calcutta

Dr V P Chatterjee, Geologist, Delhi

Madhumita Dutta, member- Ban Asbestos Network of India (BANI) and mm&P, Delhi

The FFT was accompanied and assisted by the following individuals:

Mr Samit Kr. Carr, mm&P, regional office, Jamshedpur

Ms. Itwari, J.O.H.A.R., Chaibasa

Mr Shyam, J.O.H.A.R.., Chaibasa

Methodology of Inquiry

6)Meeting between FFT members, mm&P and J.O.H.A.R.

-Agreement on the Terms of Reference

-Briefing on background information

-Planning of: site visits, meeting with villagers, local government administrations

7)Site inspection

- FFT visited the Roro hills on 12th and 13th December, accompanied by Shri Doraiburu (*munda*-village headman) from Tilaisud village and other villagers.

-Rock and waste samples were collected by the FFT from the site

-FFT took photographs of the site

8)Meetings

-Informal interaction with local villagers and village heads (*mundas*)

-Meeting with villagers (Roro, Tilasud)

-Meeting with the Deputy Commissioner, Chaibasa

-Group interaction between FFT, J.O.H.A.R., mm&P, former editor of Singbhum Ekta (Ajay Mitra), experts (Prof Upadhay, Jamshedpur)

Preliminary observations by the FFT

Area Inspection and Observed Physical Impacts

Roro hills is located about 20 kilometers west of Chaibasa, the district headquarters of West Singhbum, Jharkhand.

The region has had an active history of mining operations for about seven decades starting with the mining of magnetite. Roro hills were mined for chromite and asbestos by major industrial houses like Tatas and Birlas. This hill range is contiguous to Jojohatu hill which is also mineralized with chromite. TISCO, which used to mine chromite from Roro, stopped operations before 1958 as they struck better deposits elsewhere. Asbestos mining was started by Hyderabad Asbestos Cement Products Ltd. after the area was abandoned by Tatas and Kesri, who were mining magnetite and chromite.

The highest elevation of the Roro hill is approximately 600 meters above the level of the plains where the settlements of Roro and Tilasud village are located. The entire hill range is well wooded.

The FFT inspected six mine entrances (adit). Some of the adits are partially closed or filled. The highest adit is approximately 400 m from the plain. These adits enter the hill and extend to several tens of meters. Ground water trapped inside the tunnels of the mines contain significant quantum of water, atleast in two of the inspected adits.

Each adit has a dump site located next to it.

FFT visited two major sites where units for crushing asbestos ore and spinning were located along with adits. One such site, which is directly facing the Roro village, is the biggest dump site, which can be sighted from a few kilometer distance from the road.

The waste dumped at this particular site at highest point spreads across 100 meters. The waste is composed of grinded host rocks – serpentines, clotted peridotites, chromite-peridotite rocks along with left over asbestos. Several cycles of dumping boulders and finer materials for a prolonged period has changed the entire landscape of this section of the Roro Hill Range. The slope is beyond the angle of repose but because of the low density of the materials has not snowballed into a slide downstream.

The second crushing site has relatively less of finer material but has equally spoiled the slope below.

The waste material lying at these spots have undergone years of disintegration and fluvial action. The waste material has extended several meters down slope spreading into small alluvial fan into the paddy fields on the foothills of Roro. About 40 cms thick silty waste of crushed rocks is spread over the paddy fields. There is a variation in size of the waste deposited and it becomes as fine as clay at the farther edges of the fans.

All the dumpsites can potentially contaminate the streams flowing down the hills and ponds located in the villages with suspended and dissolved material. The stream carries the particles probably even few kilometers downstream. Naturally occurring chromites can contaminate the water in the form of hexavalent chromium and nickel.

The dumpsites pose proximate exposure to children and elderly who tend cattle, crossing this route to graze animals at higher parts of the hill which are thickly forested. Also of

graver concern is the fact that the relatively soft waste material over the slope is a matter of entertainment for children who slide down the slope raising dusty clouds of lethal wastes.

Interestingly, although the hill slopes has thick vegetation, there are hardly any worms, birds or insects in the forest area.

Health Impact Assessment

FFT held a meeting at the Tilaisud village, which was mostly attended by the ex-workers (approximately 50-60 people) from the Roro mines.

Interview with ex-workers from the Roro mines from Roro and Tilaisud villages revealed that most of them had suffered or are suffering from low back pains, blindness or severely reduced vision, and respiratory illnesses. Several of those interviewed complained of coughing blood in sputum. FFT examined three chest radiographs (taken between 1998 and 2000) of workers who complained of chest pain and respiratory distress. The chest radiographs revealed several radio-opaque opacities in the middle and lower lobes of both lungs. These suggest some form of interstitial lung disease (pneumoconioses, pulmonary tuberculosis as comorbid conditions). Physical examinations were not carried out. Most patients described their conditions as tuberculosis but given their occupational histories, pneumoconiosis as either the principal diagnosis or a co morbid condition cannot be ruled out and merits further investigation. Several workers with history of working in the asbestos mines complained of low back pain. One worker, who had worked at the pumping station for over 10 years was suffering from epigastric hernia These findings suggest presence of ergonomic musculoskeletal disorders.

Several workers complained of significantly diminished visions. Some had cataracts, and evidence of eye injuries. A few workers complained of deafness subsequent to their exposure to loud sounds in the mines – reportedly secondary to exposure to loud noise with no protection of ears during blasting operations.

FFT observed that it was quite likely that workers who were relatively healthier than other workers attended the meeting at Tilaisud village. This phenomenon is known as “healthy worker effect”, which indicates that in an occupational setting, workers who are healthy are less likely to present with significant health complaints. On the other hand, workers who had suffered severe illness, because of the severity of their illnesses were likely to be too sick to attend the meeting.

Subsequent to the visit of the FFT, J.O.H.A.R. and mm&p carried out an indicative health survey of the area and testing of environmental samples (soil and water). The analyses of these surveys are given in the following sections.

It should be noted that a much more detailed epidemiological study and analysis of water and soil samples needs to be done to assess the extent of health and environmental risks being posed by this waste on local population.

Workers Issues

Hyderabad Asbestos Cement Products Ltd. (now known as Hyderabad Industries Limited owned by the Birla group), which closed operation through a lock-out more than a decade ago has till date failed to deliver some of the basic post retrenchment facilities that should be available to the workers as mandated under the law. The most grievous is the non-payment of Provident Fund Dues. There could be a significant proportion of the total 2500 employees who were employed with the mines at the time of closure, who are yet to get their PF dues.

Also workers need to be given health compensation since their health has deteriorated due to occupational conditions inside the mines.

Legal violations by the Asbestos mining company in RORO hills

The current situation in which the mine and its dumps exist violates several laws. The Company and the State Government are liable for the damages caused to the environment, workers and the local community. However this would require a strong case to be made against these institutions. The violation occurs at various levels and can be argued at various levels depending upon the quality and details of information available from the local area and the local community.

Some of the specific provisions highlighted here are related to:

a) The legal provisions related to the abandonment and restoration of mines

The Mineral Conservation and Development Rules (1988) in article 23 lays down conditions for the abandonment of any mine and indicates the need for providing a plan of dealing with the environment.

*"23. **Abandonment of mines**:*

(1) The owner, agent, mining engineer, or manager of every mine shall not abandon a mine or a part of mine during the subsistence of the lease except with prior permission in writing of the Controller General or the authorised officer.

(2) The owner, agent, mining engineer, or manager of every mine shall send to the Controller General, Controller of Mines and the Regional Controller under registered cover, a notice in Form-D of his intention to abandon a mine or a part of a mine so as to reach them at least ninety days before the intended date of such abandonment.

(3) Such a notice shall be accompanied by plans and sections on a scale of not less than 1 cm = 10 metres setting forth accurately the work done in the mine upto the time of submission of the notice including the measures envisaged for the protection of the abandoned mine or part thereof, the approaches thereto, and ***the environment****." (emphasis added).*

Further, the section on environment clearly states

31. **Protection of environment:**

Every holder of a prospecting licence or a mining lease shall take all possible precautions for the protection of environment and control of pollution while conducting prospecting, mining, beneficiation or metallurgical operations in the area.

32. **Removal and utilisation of top soil**:

(1) Every holder of a prospecting licence or a mining lease shall, wherever top soil exists and is to be excavated for prospecting or mining operations, remove it separately.

(2) The top soil so removed shall be utilised for restoration or rehabilitation of the land which is no longer required for prospecting or mining operations or for stabilising or landscaping the external dumps.

(3) Whenever the top soil cannot be utilized concurrently, it shall be stored separately for future use.

33. **Storage of overburden, waste rock, etc.**:

(1) Every holder of a prospecting licence or a mining lease shall take steps so that the overburden, waste rock, rejects and fines generated during prospecting and mining operations or tailings, slimes and fines produced during sizing, sorting and beneficiation or metallurgical operations shall be stored in separate dumps.

(2) The dumps shall be properly secured to prevent escape of material there from in harmful quantities which may cause degradation of environment and to prevent causation of floods.

(3) The site for dumps, tailings or slimes shall be selected as for as possible on impervious ground to ensure minimum leaching effects due to precipitations.

(4) Wherever possible, the waste rock, overburden etc. shall be back-filled into the mine excavations with a view to restoring the land to its original use as far as possible.

(5) Wherever back-filling of waste rock in the area excavated during mining operations is not feasible, the waste dumps shall be suitably terraced and stablised though vegetation or otherwise.

(6) The fines, rejects or tailings from mine, beneficiation or metallurgical plants shall be deposited and disposed in a specially prepared tailings disposal area such that they are not allowed to flow away and cause land degradation or damage to agricultural field, pollution of surface water bodies and ground water or cause floods.

34. **Reclamation and rehabilitation of lands:**

Every holder of prospecting licence or mining lease shall undertake the phased restoration, reclamation and rehabilitation of lands affected by prospecting or mining operations and shall complete this work before the conclusion of such operations and the abandonment of prospect or mine.

35. **Precaution against ground vibrations**:

Whenever any damage to public buildings or monuments is apprehended due to their proximity to the mining lease area, scientific investigations shall be carried out by the holder of mining lease so as to keep the ground vibrations caused by blasting operations within safe limit.

36. **Control of surface subsidence**:

Stoping in underground mines shall be so carried out as to keep surface subsidence under control.

37. Precaution against air pollution:

Air pollution due to fines, dust, smoke or gaseous emissions during prospecting, mining, beneficiation or metallurgical operations and related activities shall be controlled and kept within 'Permissible Limits' specified under various environmental laws of the country including the Air (Prevention and Control of Pollution) Act, 1981 (14 of 1981) and the Environment (Protection) Act, 1986 (29 of 1986) by the holder of prospecting licence or a mining lease.

38. Discharge of toxic liquid:

Every holder of prospecting licence or a mining lease shall take all possible precautions to prevent or reduce the discharge of toxic and objectionable liquid effluents from mine, workshop, beneficiation or metallurgical plants., tailing ponds, into surface water bodies, ground water aquifier and useable lands, to a minimum. These effluents shall be suitably treated, if required, to conform to the standards laid down in this regard.

39. **Precaution against noise** :

Noise arising out of prospecting, mining, beneficiation or metallurgical operations shall be abated or controlled by the holder of prospecting licence or a mining lease at the source so as to keep it within the permissible limit.

40. **Permissible limits and standards**:

The standards and permissible limits of all pollutants, toxins and noise referred to in rules 37, 38 and 39 shall be those notified by the concerned authorities under the provisions of the relevant statutes from time to time.

41. Restoration of flora:

(1) Every holder of prospecting licence or a mining lease shall carry out prospecting or mining operations, as the case may be, in such a manner so as to cause least damage to the flora of the area held under prospecting licence or mining lease and the nearby areas.

(2) Every holder of prospecting licence or a mining lease shall

(a) take immediate measures for planting in the same area or any other area selected by the Controller General or the authorised officer not less than twice the number of trees destroyed by reason of any prospecting or mining operations;

(b) look after them during the subsistence of the licence/lease after which these trees shall be handed over to the State Forest Department or any other authority as may be nominated by the Controller General or the authorised officer and;

(c) restore to the extent possible, other flora destroyed by prospecting or mining operations. (emphasis added)

b). Worker Related Issues

The Mines Act, 1952 seeks to regulate the working conditions in mines by providing measures to be taken for the safety of the workers employed therein. To ensure the implementation of the Mines Act, 1952, the Union Legislature has framed the Mines rules, 1955, Metalliferous Mines Regulations, 1961, and the Maternity Benefit (Mines) Rules, 1963, etc.

The Mines Act, 1952, prescribed duties of the owner (defined as the proprietor, lessee or an agent) to manage mines and mining operation and the health and safety in mines. It also prescribes the number of working hours in mines, the minimum wage rates, and other related matters. The Mines Rules, 1955, provide the procedural aspects.

Both penal and pecuniary punishments are prescribed for contravention of obligation and duties under the Act.

The non-payment of Provident Fund Dues attract several provisions under the PF Act as well as Company Law Acts.

A brief analysis of the health survey conducted by J.O.H.A.R. and mm&P

The population for the indicative cross-sectional health survey was randomly selected from villages around Roro hills. The survey clearly showed that working at mines or the asbestos mines increased the likelihood of developing low back pain, shortness of breath, coughing of blood with sputum, deafness and blindness. Of these health outcomes, low back pain and deafness were not significantly associated with working at the mines; persistent breathlessness or shortness of breath was significantly associated with asbestos mining work history. Coughing of blood with sputum and blindness were associated with both – history of working at mines and history of working at asbestos mines for the respondent population. These associations need to be further investigated in a detailed health study. The FFT also examined three X-ray films with copies of diagnosis reports of worker who had expired due to lung ailments. One of the film contained radio-opaque patches in the left middle lobe of the left lung, with suggestive pleural thickening of the left lung base. From the other two films, no definite impression could be deduced. In contrast to the accompanying diagnosis reports, none of the X-ray films contained any evidence suggestive of pulmonary tuberculosis. The films were independently reviewed by two physicians, besides the FFT.

Generally, the population in the area showed signs of gross malnutrition. The FFT identified the following possible health problems prevalent in the area:

9) Pulmonary Tuberculosis

10) Pneumoconioses including asbestosis

11) Orthopedic and surgical complications related to physical labor in an industrial setting with minimal facilities for ergonomically effective designs of equipments, and health protective equipments – these include epigastric hernia, and different types of arthritis, and injury to the eyes

12) Sensorineural Deafness secondary to exposure to loud noise during the mining operations

It should be noted that the Roro asbestos mines had closed down almost two decades ago and many of the workers have died since then. Old news paper clippings, Singbhumi Ekta, a weekly from Chaibasa, published between January to August 1981, carries a press release by late Shri P. Mazumdar, leader of United Mines Workers Union (AITUC), states about 30 workers from Roro mines had died due to asbestosis .

Methodology

Population under study: The population for the analysis included adult household members living in and around the Roro Hills. Households were randomly selected and a member in each household was interviewed.

Questionnaire: The interview was administered by trained interviewers using a scientifically drawn questionnaire. (appendix: Sample questionnaire) The questionnaire was drafted after holding group discussions with the community and experts familiar with the demographic and social structure of the region. The questionnaire was initially drafted in English and then it was translated into local language. It contained both open and closed-ended items as questions.

Method of analysis: Following completion of the household interviews, the data from the questionnaire were entered into a spreadsheet program and then transferred to a statistical analysis program for further data pre-processing, analysis, and data mining to identify key knowledge areas. The purpose of this analysis was to examine whether the health problems narrated by the respondents had significant association with their being exposed to mining activities. This is primarily a descriptive health report. Deeper analysis of the data hasn't been done at this stage.

Results

The preliminary analyses show that the age of this population varied between 40 years through 90 years, with a preponderance of population between 40 and 69 years. About 75 percent of the population was less than 65 years of age and about 80 percent of the population was less than 70 years of age (Tables 1 & 2). Men and women were approximately equally represented in the population. About 50 percent of the population were smokers or users of alcohols, and about 53 percent of the respondent population reported that they worked in mines. A little less than half the respondent population reported that they had at some point of time, worked at Roro asbestos mines (Table 2).

Table 1: Five point summary for age structure of this population (Legend: Q1, Q2, and Q3 indicate the first, second (median), and the third quartile of age distribution respectively)

Age in years		N
		251
	Missing	1
Minimum		40
Maximum		90
Percentiles	Q1	45
	Q3	55
	Q3	65

Low back pain, blindness, and difficulty in respiration were predominant health complaints in this population. Nearly half the population complained of low back pain, about 22 percent of the population complained of blindness or significantly diminished vision, and a little less than 20 percent of the population complained of difficulty in breathing. About 7 percent of the population (or one in 13 respondents) complained of blood in sputum (coughing blood with sputum). Similarly, about 7 percent population complained of deafness (Table 2).

Table 2: Basic variables investigated

Variable	Category	Count	Percentage
Age in years			
	Less than 50	80	31.7
	50-59	63	25.0
	60-69	70	27.8
	70-79	25	9.9
	80 and above	13	5.2
	Missing	1	0.4
Gender			
	Male	128	50.8
	Female	124	49.2
Smoking Status			
	Smoker	114	45.2
	Never-smoker	128	50.8
	Ex-smoker	10	4.0
Alcohol intake status			
	Consumes Alcohol	136	54.0
	Never Consumed Alcohol	110	43.7
	Ex-user of alcohol	6	2.4
Whether ever worked in mines			
	Yes	134	53.2
	No	117	46.4
	Missing	1	0.4
Whether worked in asbestos mines			
	Yes	114	45.2
	No	133	52.8
	Missing	4	1.6
Whether complains of low back pain			
	No	125	49.6
	Yes	125	49.6
	Missing	2	0.8
Whether has difficulty of breathing			
	No	206	81.7
	Yes	44	17.5
	Missing	2	0.8
Whether coughs blood with sputum			

	No	232	92.1
	Yes	18	7.1
	Missing	2	0.8
Whether complains of deafness			
	No	231	91.7
	Yes	19	7.5
	Missing	2	0.8
Whether complains of blindness			
	No	193	76.6
	Yes	57	22.6
	Missing	2	0.8

Preliminary analysis revealed that low back pain was higher among older population and increased with increased age groups, and among people who had worked in the mines. However, these figures were not significantly high (Table 3).

Table 3: Relationship between different factors and low back pain

Variable	Category	Low Back Pain Count (Percent)	Significance
Age Categorized			0.58
	Less than 50	35 (43.75)	
	50-59	31 (49.21)	
	60-69	37 (54.41)	
	70-79	14 (56.00)	
	80 and above	8 (61.54)	
Gender			0.80
	Male	64 (50.79)	
	Female	61 (49.19)	
Smoking status			0.90
	Never Smokers	63 (49.61)	
	Ever Smokers	62 (50.41)	
Alcohol intake status			0.61
	Never alcohol	52 (48.15)	
	Ever alcohol	73 (51.41)	
Whether ever worked in mines			0.09
	No	52 (44.44)	
	Yes	73 (55.30)	
Whether ever worked in asbestos mines			0.56
	No	65 (48.51)	
	Yes	59 (52.21)	

Complaints of breathing difficulty were higher among older age groups, men, smokers, and mine workers.

The prevalence of breathing difficulty was significantly higher among smokers and those who had history of working in Asbestos mines (Table 4). Prevalence of coughing of blood in the sputum (hemoptysis) was higher among men, smokers, users of alcohol, and among miners. The prevalence was significantly high among the men, and those who had history of working at mines, particularly asbestos mines. Men were about 3 times likely to complain of coughing of blood in their sputum. Compared to those who never worked at the mines, those who worked at the mines were about 3 times as likely to complain of coughing of blood in their sputum. This association was particularly high with workers who had worked in Roro asbestos mines. Compared to those who had never worked at Roro asbestos mines, those who had history of working at Roro asbestos mines were about 5 times more likely to complain of coughing of blood in their sputum (Table 5).

Table 4: Relationship between different factors and breathing difficulty (dyspnea)

Variable	Category	Dyspnea	Significance
Age in years			0.758
	Less than 50	13 (16.25)	
	50-59	12 (19.05)	
	60-69	11 (16.18)	
	70-79	4 (16)	
	80 and above	4 (30.77)	
Gender			0.109
	Male	27 (21.43)	
	Female	17 (13.71)	
Smoking status			***0.035***
	Never Smokers	16 (12.60)	
	Ever Smokers	28 (22.76)	
Alcohol intake status			0.735
	Never alcohol user	18 (16.67)	
	Ever alcohol user	26 (18.31)	
Whether ever worked in mines			*0.059*
	No	15 (12.82)	
	Yes	29 (21.97)	
Whether ever worked in asbestos mines			***0.009***
	No	16 (11.94)	
	Yes	28 (24.78)	

Table 5: Relationship between different factors and coughing blood

Variable	Category	Blood in Sputum	Significance
Age in years			0.666
	Less than 50	4 (5)	
	50-59	6 (9.52)	
	60-69	6 (8.82)	

	70-79	2 (8)	
	80 and above	0 (0)	
Gender			***0.016***
	Male	14 (11.11)	
	Female	4 (3.23)	
Smoking status			0.124
	Never Smokers	6 (4.72)	
	Ever Smokers	12 (9.76)	
Alcohol intake status			0.380
	Never alcohol user	6 (5.56)	
	Ever alcohol user	12 (8.45)	
Whether ever worked in mines			***0.029***
	No	4 (3.42)	
	Yes	14 (10.61)	
Whether ever worked in asbestos mines			***0.005***
	No	4 (2.99)	
	Yes	14 (12.39)	

Due to lack of clinical study, it can not be established at this point whether the above population, ailing from lung problems as reported in the survey, have asbestosis or lung lung cancer, but it is an established fact that cigarette smoking combined with occupational exposure to asbestos fibers acts multiplicatively and increases the incidence of lung cancer manifold (IARC V.2, 1973; IARC V.14, 1977; IARC S.1, 1979; IARC S.4, 1982).

Self-reported deafness was higher among older age groups (particularly among the age group 80 years and above), smokers, alcohol users, and those who reported to work in mines. Deafness was significantly higher among people 80 years of age and above, and compared to people who have never used alcohol, who have used alcohol (ever users) were approximately three times likely to report deafness. Compared to those who never worked at the mines, those who did were about twice as likely to report deafness; However, this was not statistically significant at 5% level (Table 6).

Table 6: Relationship between different factors and complaint of deafness

Variable	Category	Deafness	Significance
Age in years			***0.001***
	Less than 50	1 (1.25)	
	50-59	2 (3.17)	
	60-69	9 (13.24)	
	70-79	3 (12)	
	80 and above	4 (30.77)	
Gender			0.840
	Male	10 (7.94)	
	Female	9 (7.26)	
Smoking status			0.205

	Never Smokers	7 (5.51)	
	Ever Smokers	12 (9.76)	
Alcohol intake status			***0.043***
	Never alcohol user	4 (3.70)	
	Ever alcohol user	15 (10.56)	
Whether ever worked in mines			*0.060*
	No	5 (4.27)	
	Yes	14 (10.61)	
Whether ever worked in asbestos mines			0.883
	No	10 (7.46)	
	Yes	9 (7.96)	

Self-reported blindness was significantly higher among older aged, smokers, alcohol users, those who worked at mines, and those who worked at Roro asbestos mines. Compared to those who never used alcohol, those who did were over three times as likely to report blindness. Compared to those respondents who never worked at mines, those who did were almost three times likely to report blindness. Also, compared to those who never worked at Roro asbestos mines, those who did, were about 2.5 times likely to report blindness (Table 7).

Table 7: Relationship between different factors and complaint of blindness

Variable	Category	Blindness	Significance
Age in years			***<0.001***
	Less than 50	6 (7.5)	
	50-59	21 (33.33)	
	60-69	13 (19.12)	
	70-79	9 (36)	
	80 and above	8 (61.54)	
Gender			***<0.001***
	Male	41 (32.54)	
	Female	16 (12.90)	
Smoking status			***0.001***
	Never Smokers	18 (14.17)	
	Ever Smokers	39 (31.71)	
Alcohol intake status			***0.000***
	Never alcohol user	10 (9.26)	
	Ever alcohol user	47 (33.10)	
Whether ever worked in mines			***0.000***
	No	14 (11.97)	
	Yes	43 (32.58)	
Whether ever worked in asbestos mines			***0.011***
	No	22 (16.42)	
	Yes	34 (30.09)	

A BRIEF FINDING OF THE SOIL AND WATER SAMPLE ANALYSIS

The analysis of soil and water samples were conducted at ESKAPS (India) Private Limited, Calcutta. Two soil samples were collected from agricultural field in Roro and Tilasud villages and two water samples were collected from the Roro river and a pond between Roro and Tilasud villages.

Soil analysis

The analysis of the soil samples showed that both samples were mainly composed of Magnesium Silicate. The mineral composition of asbestos is Magnesium Silicate. Therefore it clearly shows that the agriculture fields, from which samples were collected, are contaminated with asbestos.

Sample 1: Agricultural field Roro village

Silica (as SiO_2) - 34.53

Magnesium (as MgO) - 34.31

Nickel - 0.070

Manganese - 0.065

Chromite (as Cr_2O_3) - 2.190

Sample 2: Agricultural field Tilaisud village

Silica (as SiO_2) - 46.72

Magnesium (as MgO) - 9.62

Nickel - 0.037

Manganese - 0.308

Chromite (as Cr_2O_3) - 2.710

(Note: All results in % by mass)

Water analysis

The results of the water analysis were inconclusive. It showed presence of chromite in the pond water (sample 2).

Sample 1: Roro River water (East of Roro Hill)

Asbestos - Nil

Nickel - Nil

Manganese - Nil

Chromite (as Cr2O3) - Nil

Sample 2: Pond water in between Roro and Tilaisud

Asbestos - Nil

Nickel - Nil

Manganese - 0.06 ppm

Chromite (as Cr2O3) - 0.058 ppm

Conclusion and recommendation

The Jharkhand Government is inviting investments from all over the world to expand mining industries in the state. The scale of mining is likely to increase and so are the problems associated with mine closures and abandonment. Unless the State and Civil Society organisations take up measures to ensure that the workers are not unceremoniously dumped and the environment is safeguarded the Roro situation is bound to be multiplying.

The fact finding committee is unanimous in concluding that the closure of the mine has been undertaken in a callous manner. The company has cited labour union problems for closure and has distanced itself from its duties as a leaseholder and mine operating agency. The lack of focused effort until now has meant that neither the problem of the workers, particularly their financial dues and health aspects, nor the environmental have been addressed.

The State has an obligation to ensure that the payments due to workers, which is a part of their hard-earned savings, is made to them. The Director General of Mine Safety has the duty to ensure that mines that are closed are devoid of any hazards.

Recommendation for mm&P

13)Take up the issue of contamination and restoration with the State Government.

14)Demand immediate action plan from the Directorate of Mine safety for proper closure and remediation of the site.

15)Request National Institute of Miner's Health, Nagpur, to conduct a proper health survey in the area so as to be comparable with information on other asbestos mining areas in the country.

16)Provide all support needed by J.O.H.A.R./mm&P to interface with Provident Fund Authorities.

17)Seek for a State Policy on Abandoning Mines, Enforcement of the provisions under Mineral Conservation and Development Rules

18)Provide Inputs for comprehensively addressing abandoned asbestos mines at a National level.

Recommendation for

J.O.H.A.R./J.O.H.A.R.

19)Document Employees Record for Retrieving Provident Fund Dues.

20)Identify local Support and hand-holding for new occupations such as sericulture, horticulture etc.

21)Complain to National Human Rights Commission to hold the company liable for violating the right of community to breath clean air, drink clean water, contaminating their land and forest.

22)Failing normal efforts with the State Government Authorities and the Director General of Mine Safety, file a writ petition in the High Court.

Appendix 1:

"Roro mines – Death pit for workers"

The Indian Express, 23/02/83

Express news service, Calcutta.

The Roro asbestos mines run by the Hydrabad Asbestos cement products, a Birla on company, at Chaibasa in Bihar, is the largest asbestos mines in India. But for the 1500 tribals working in it the mines is nothing less than a death pit.

The mines authority have flaunted every sign of safety rules. The mines do not have danger notices in the first place. Situated on an altitude of 2000 feet the workers have to drill, blast timber often in a crawling position. The annual yield is 4 to 5 lakh tones of the best asbestos in the country.

Adjacent to the mines is the crusher plant, where the raw asbestos is graded and packed. The asbestos is dumped in the open. The dust from the mines and the crusher plant is spread over the mines area and the tribal populated villages surrounding it. With the results the most of the tribals are victims of TB. And worse still, several more are victims of asbestosis or lung cancer. In the absence of work uniforms, the workers live and work in the same clothes adding to the hazards.

The survey conducted by Mr. Robert John Hamilton of International Labour Organization and Dr. B.K. Sengupta, assistant director- general of mines, in November 1978, proved that the mines endangered not only the lives of the workers, but also of those living in the surrounding arrears. The accidents and deaths make no difference on December 18, 1981 a miner succumbed to his injuries sustained within the mines. The miners agitation organized by the United Mines Workers Union (AITUC) for an inquiry resulted in the dismissal of eight workers.

The mines hospital has no X-ray machine or a dust analysis machine. The hospital receives no fund allotments from the center either. Bereft of all hospital amenities it is just a structure. With four doctors for about 3,000 mines and colliers in India the asbestos miners get no medical facilities whatsoever.

Most of the cement factories in the south and other parts of India are understood to have employed thermal precipitators for stoppage of dust nuisance. However, in the case of Roro mines, the Bihar state medical inspectors of factories and Director-General of mines Safety Government of India, Dhanbad, have taken no such precautions.

Besides the Roro Mines, the Jhinkpani ACC factory nearby release everyday an average of 100 tonnes of dust. The rivers in the area too are polluted because of it. The result is that about one lakh tribal residence in the nearby villages of Kabragutu, Sasandiri, Purnapani, Roro, Sajakbera and Byhati are all affected by the cement dust.

So far no phenomocisis survey has been undertaken either by the Bihar Government or the director- General of mines, Government of India.

In the prevailing conditions, by the turn of century, most of the tribals may fall victims to asbestosis or some other form of lung cancer. Apart from that the salary and living conditions are no better. The daily average pay of most of the workers range between Rs. 7 to Rs. 10 only. Besides they get no DA, uniforms, living quarters or transport to carry them to the mines a top the hill.

The villages have no electricity or any welfare programs. In 1978 asbestos producing companies of 24 countries had met and decided to put danger signs on all types of asbestos. The signs are yet to appear in the Roro mines.

The miners union have put several demand to the Union Government. They include survey of the mines and surrounding areas by the Health Ministry and immediate filling up of abandoned mines. They have also demanded immediate installation of thermal

precipitators, and implementation of the ILO directives of 1978. it is now for the Government and the Director General of Mine Safety to act.

Appendix 2: Sample questionnaire for Cross sectional health survey for the deceased based on the responses of the next of kin.

Identification Code (unique key)		
Identification code of the respondent		
Relationship of respondent with the dead	Spouse	
	Sibling	
	Offspring	
Last name of the deceased		
First Name of the deceased		
Age in years at the time of death		
Gender	Male	
	Female	
Was he or she a smoker?	Yes	
	No	
	Gave up smoking	
	Can't say or don't remember	
Did he or she consume Alcohol	No	
	Yes, Rice Beer	
What did he or she do for a living?		
Did he or she ever worked at the mines?	Yes	
	No	
Did he or she ever work at the chromite mines?	Yes	
	No	
	Do Not Remember	
If yes, ask: How long do you remember him or her working at the chromite mines?	Do Not Remember	
	Less than 5 years	
	Between 5-10 years	
	More than 10 years	
Did he or she ever work inside the Asbestos mines?	Yes	
	No	
	Do not remember	
How long had he or she worked at the Asbestos mines?	Not worked at all	
	Less than 5 years	
	Between 5-10 years	
	More than 10 years	
Each day, about how long did he or she worked at the Asbestos mines?	Not worked at the mines	
	Less than 6 hours	
	More than 6 hours	
	Do not remember	
What work did he or she do at the asbestos mines? (You can select more than one option)	Water Pump	
	Timbering	
	Underground Mining	
	Crushing or milling	
	Spinning Fibers (Plant)	
	Cooking or Washing	
	Transporting Asbestos	

	Others (Specify:)
While working inside the mines, did he or she use protective equipments (for example: helmets, masks, or others) [select all responses]	Did not work inside the mines
	Was not provided
	Helmets
	Respirators (Mask)*
	Any other (Specify:)
	Boots
	Headlights
Was there provision of *gur*?	Yes
	No
	Do not remember
Do you think he or she washed himself or herself or change clothes after coming out of the mines and before coming home	Always
	Sometimes
	Rarely or Never
Do you remember, whether, since starting work at the asbestos mines, or after stopping work at the mines, he or she experienced any of the following: (You can select more than one choice for each participant)?	Backache or Neck pain
	Persistent cough for three months or more
	Difficulty in breathing
	Chest pain
	Blood in sputum
	Blood in stool
	Fever
	Difficulty in hearing
	Loss of vision
	Abdominal Pain
	Any other: (specify)
Did he or she ever see a physician for the health problems?	Yes
	No
If yes, ask to see if they have any prescriptions or doctor's notes for the dead person, or Xray films etc. From those documents, note down, if any, diagnoses given and dates. Also, ask for the death certificate, if available. If the respondent fails to produce the death certificate, ask if a certificate was ever issued. If you cannot obtain a death certificate, type death certificate not available and include the reason. Else, write down the date of death	
Where did he or she usually seek treatment when ill?	Local Primary Health Care Center
	Local Healers
	Private Doctors
	Government Hospital
Date of Interview	

Appendix 3: Diseases related to asbestos exposure

Asbestosis: It is an irreversible and progressive lung condition which results from the inhalation of asbestos fibres. Cases have been reported from 6-9 months' duration of heavy exposure. In asbestosis, lung tissue is scarred and thickened by the action of the asbestos fibres in the alveoli, the air sacs. The latency period for asbestosis is usually at least ten years and higher the exposure,

the greater the chances of developing the disease. Asbestosis tends to be linked to occupational exposure although cases of asbestosis among those not occupationally exposed have been known. It can be detected by X-rays results only. Coughing and difficulty in breathing are the typical symptoms of asbestosis. There is no cure or treatment for this disease. People suffering from asbestosis could ultimately develop lung cancer or mesothelioma.

Mesothelioma: Mesothelioma is a cancer rare in the general population, it is almost always associated with past exposure to asbestos. Pleural mesothelioma, clearly attributed to asbestos exposure, is cancer of the thin membrane enclosing in the lungs. Mesothelioma is not a associated with smoking. Peritoneal mesothelioma, on the other hand, is a tumour of the membrane also made up of mesothelial cells, which envelops the abdominal organs. It can be contracted from low exposures to asbestos and accounts for many victims who contract an asbestos-related disease through environmental exposure. The latency period for mesothelioma is generally between thirty to fifty years, from the onset of exposure to asbestos. The diagnosis for the patient is affected by the cell type and the size, stage, extent and susceptibility of the tumour to treatment. Early diagnosis and the various different treatments such as chemotherapy, radiotherapy, surgery and surgery in combination with photodynamic therapy can prolong survival. But treatments for mesothelioma are so far of and has very limited effectiveness. On an average, patients suffering from mesothelioma survive for about eighteen months to two years following diagnosis. There is no known cure for this fatal disease.

Lung Cancer: An article in The Lancet in 1934 presented evidence of a link between asbestos and lung cancer. Asbestos-related lung cancer is a prescribed disease provided the patient exhibits another clinical sign of asbestos exposure such as asbestosis, or pleural thickening and evidence of occupational asbestos exposure. Studies of particular groups of asbestos exposed workers suggest that the number of excess lung cancers produced is - roughly and with considerable variation from study to study - double the number of mesotheliomas. Though many of these go unrecognised by doctors and patients. Asbestos-related lung cancer can occur from occupational or environmental exposure. The risk of lung cancer is especially great for asbestos workers who smoke cigarettes. The risk is 5 times as great as it would be from smoking alone, and 50 times as great as that for people who neither smoke nor work with asbestos. Smokers who work with asbestos can decrease their cancer risk by quitting smoking.

Besides these commonly occurring diseases, there are diseases such as Bilateral Diffuse Pleural Thickening which can sometimes produce serious impairment of lung function. Thickening of the pleura may reduce lung function and victims can experience severe shortness of breath. Diffuse pleural thickening can occur on one side of the lungs or on both sides (bilateral). Pleural Plaques, while not classed as a disease, is usually regarded as a marker of past asbestos exposure.

(*Source: Asbestos: Fibres of subterfuge, Toxics Link, Briefing paper, January 2001*)

Appendix 4: Health studies in asbestos industries and mines in India conducted by National Institute Occupational Health, Ahmedabad, Gujarat.

Type of Industry	Study done by	No. of workers examined	Prevalence of Asbestosis	Levels of asbestos fibre/ml

Asbestos cement industry				
Bihar (1968)	DP Banerjee	254	30% symptoms and signs	NA
Harayana	Harwant Singh, Central Labour Institute	900	58 workers (checked only lung functions, no X-rays were taken)	NA
Ahmedabad (1976)	NIOH	205	5%	>2
Hyderabad (1979)	NIOH	355	4.5%	>2
Coimbtore (1982)	NIOH	424	3.9%	<2
Mumbai (1985)	NIOH	279	3%	<2
Asbestos textile industry				
(1980)	NIOH	65	9%[a]	>2 [b]
Mumbai (1983-84)	Central Labour Institute	455	5.2%	Increasing with duration of exposure
Asbestos mines				
Cuddapah, Andhra Pradesh (1991) (Chrysolite asbestos)	NIOH	633	11%	
-Mines			3%	<2[c]
-Milling units			21%	>2[d]
Devgarh, Rajasthan (1992) (Tremolite asbestos)	NIOH	140		
-Mines				<2[e]
-Milling units			5%	>2[f]

a The prevalence of asbestosis was observed, i.e. 9% inspite of duration of exposure <10 years

b fibre levels were varying from 29 f/ml to 418 f/ml

c The low prevalence was observed i.e. 3% due to wet drilling and low content of asbestos fibre in parent rock

d The highest leveks observed were 224 f/ml at vibrator

e The levels were below 0.5 f/ml

f The highest levels observed were 33.96 f/ml

(*Source: Asbestos: Fibres of subterfuge, Toxics Link, Briefing paper, January 2001*)

Appendix 5:

"Controlled Use" of Asbestos

Barry Castleman, Sc.D., USA., April 2002

The term "controlled use" has been used by the asbestos industry to present a picture of an industrial hazard that is not a threat to health because of precautions taken in the manufacture and use of asbestos products. This is a critical review of the use of that term as essentially sales propaganda, having never been reflected in actual practice where asbestos and asbestos products have been used to this day. Particular attention is directed to asbestos-cement (A-C) products, which now account for over 90% of asbestos use worldwide.

Prior to the era of regulation starting in the 1970s, which Hyderabad Industries' Dr. Rao incorrectly refers to as a "period of ignorance on asbestos health hazards" (Letter, *Indian J.O.E.M.* 5: 66-70, 2001), members of the Asbestos Cement Producers Association in the US worked to develop a brochure for users of A-C products. There was strong reluctance by some firms to include any health warning information, and in 1970 the group rejected a recommendation by some members to put a warning about the hazards of sawing A-C products in the brochure (Castleman BI, *Asbestos: Medical and Legal Aspects* 4th Ed, New York: Aspen, 1996, pp. 671-74). Most of those companies have since been forced into bankruptcy proceedings over US liabilities from their longstanding failure to place health warnings on their asbestos products.

The Era of Regulation

In the beginning of the 1970s, the US Occupational Safety and Health Administration (OSHA) and the US Environmental Protection Agency were established, and similar new laws establishing governmental regulatory powers were enacted in Europe and elsewhere. As OSHA moved to issue a special standard for asbestos, the industry vigorously objected to every aspect of the proposed rules. Requiring cancer warnings on asbestos products, the companies said, would devastate the makers of asbestos products, especially A-C pipe producers whose main market was sale of conduits for drinking water supply systems. The proposed exposure limit of 2 f/cc already adopted in Britain in 1969 was objected to as prohibitively costly, and it was warned that the asbestos textile industry was most at risk of losing US jobs to "foreign competition".

It was true that by the end of 1973 a clear pattern had emerged, showing that asbestos textile production was being reduced in the US and imports were increasing – but to a considerable extent, the companies supplying the US market from Mexico and Venezuela were US-based asbestos companies. Other US asbestos textile imports came from the affiliate of a Japanese company in South Korea.

The companies were able to get most of their objections to the 1972 OSHA asbestos standard satisfied by the Nixon administration. The words "cancer" and "danger" were not required in the text of the warning labels, and not all asbestos products were even required to bear labels. OSHA did not require warnings on all asbestos products, but relented to industry pressure and left it to the manufacturers to determine whether the short-term (15-minute) peak limit of 10 f/cc or the 8-hour-average limit of 5 f/cc (scheduled to be lowered to 2 f/cc in 1976) could be exceeded by product use. If the manufacturer determined that foreseeable use of his product would not exceed OSHA's permissible exposure limits (PELs), above, "caution" labels were not required by OSHA. For products where the asbestos content was "modified by a bonding agent, coating", or other material that would limit the release of respirable asbestos dust to exposures

within the PELs, OSHA required no warning labeling at all. The warning requirement followed the PELs in a manner that makes sense only to lawyers: a product that could cause a daily average exposure of, let us say 4 f/cc, would not have to bear warning labels in 1972 but would have to starting in July 1976, according to the regulations issued in 1972. This marked the time when the descriptive words “locked-in” and “encapsulated” began to appear in the mouths of the representatives of the asbestos industry. Additional regulations on asbestos were issued within the next few years by the US EPA and Food and Drug Administration, and the US Consumer Product Safety Commission banned asbestos in widely sold, wallboard patching compounds.

Hyderabad Asbestos regularly ran full-page advertisements from 1976-1980 in *Asbestos* magazine, which closely reported on regulatory developments in the US and the world. By March and April 1980, *Asbestos* featured an international industry review on occupational health and safety too large for one issue of the trade magazine. Frequently, Hyderabad ads ran in the same issues of the magazine that contained full-page ads from Asbestos Corporation Limited (Canada) picturing the World Trade Towers, and intoning, “When life depends on it, you use asbestos.” (April and October, 1976; April 1977; October, 1978) Asbestos-cement products manufacture in India was up in 1975 (to over 50,000 m.t./yr), the magazine reported, by more than 50% over the volumes for the previous years (Oct. 1976). In 1975, US asbestos consumption started its long decline, which would be most precipitous in the 1980s.

Exposure of Workers Using Asbestos-Cement Products

A-C products were among those referred to in industry statements as one example of products where the asbestos was "locked in" by a cement matrix that would, it was said, prevent significant exposures to airborne asbestos. In the 1970s asbestos exposure data emerged, mainly from industry sources, showing the high exposures that could occur from certain common practices used in construction with A-C products. At a government-industry conference in 1976, a Johns-Manville official reported that use of power saws on A-C sheets could cause exposures over 250 f/cc; with well designed and operated local exhaust ventilation, he said, this could be reduced to 0.8 f/cc. Such a system would entail a properly designed metal hood fixed over the saw blade, connected with an exhaust hose to a fan ducted to a high efficiency particulate air filter unit. Pictures of the hoods and hoses on power tools with local exhaust ventilation attachments appeared for a short time in (1980-81) advertisements in *Asbestos* magazine, but these special saws and drills were rarely if ever used in the construction industry. When I wrote to the environmental protection chief of the government of Brazil in 1986 to ask him about this, he replied that such devices were not in use in his country and criticized the Labor Ministry as ineffective in protecting workers from such hazards as asbestos.

The Asbestos Cement Pipe Producers Association in the US released reports in 1977 showing that abrasive disc saws, commonly used in construction work involving A-C pipe, created exposures measured at 26-109 f/cc in saw operators and 10-49 f/cc among saw operators’ helpers. The industry trade association thereafter officially recommended against the use of abrasive disc saws, although the effect of this on actual practices in the construction industry, if any, is questionable. Within the next 5 years, most of the plants making A-C products in the US closed down, as public awareness and concern led to a collapse in demand and a shift to safer substitute products. Japanese scientists reported quite high exposures more than 10 years later, from field cutting of A-C pipe. Exposures from repair work on A-C pipes using high-speed disc cutters inside and outside of holes dug in the ground to gain access to the pipes were recorded as: 49-170 f/cc (mean value 92) inside the hole, and 1.7-15 f/cc outside (Kumagai et al. "Estimation of asbestos exposure among workers repairing asbestos-cement pipes used for conduits,"

Sangkyo Igaku 35: 178-187, 1993). If this kind of extreme exposure has continued until so recently in Japan, it is reasonable to expect that it is widely prevalent in Asia and other parts of the world where A-C pipes are still widely used and there are no product stewardship efforts by manufacturers.

In the late 1970s there was a scandal in Puerto Rico over housing for poor people that the government had constructed with A-C flat sheets and corrugated roofing from an asbestos company in Colombia. Even before the people learned that asbestos was deadly, there was much concern about the dust from winds disturbing the interior ceiling panels over the family rooms and from occasional needs to break through the structures to do plumbing repairs. After the cases came to court, the A-C houses were ordered to be carefully taken down, and 1300 families were relocated to other housing. When I visited one of these communities, I saw a house where the man had broken an archway through one of the walls to open up the space between two of the rooms. No one had told him this was dangerous. The doctor had diagnosed his infant child with bronchitis, caused by breathing the dust created by this renovation. That child may have developed asbestosis or cancer by now. What government can hope to reach such people and extend to them the protection of public health regulations? This case demonstrates the futility of controlling the hazards of A-C materials once they are used in the construction of housing, schools, commercial, public, and industrial structures.

Substitute Products for Asbestos-Cement

Under pressure from regulatory authorities, companies in Europe and Australia developed asbestos-free, fiber-cement products, using fibrous glass, polyvinyl alcohol (PVA) and aramid fibers, and cellulose. The Swiss Eternit Group's affiliate in Costa Rica was forced to use local materials when the government rejected the idea of spending hard currency to import asbestos in 1984. The firm developed a new product using wood pulp from an indigenous tree, giving it the same product warranty as the former asbestos product. The Australian multinational James Hardy developed a process using wood pulp from New Zealand to make fiber-cement sheets at its plant in Ipoh, Malaysia, which I visited in 1987. Hardie has more recently introduced pipes for non-pressurized uses in the US and elsewhere. The French multinational Saint-Gobain has introduced PVA-cement technology recently in Brazil.

Encouraging results have also been reported with blast furnace slag wool and vegetable fibers such as coconut coir, sisal by-products, waste of eucalyptus pulp, and fibrous banana wastes (Savastano H, Warden PG, Coutts RSP. "Brazilian Waste Fibres as Reinforcement for Cement-Based Composities", *Cement and Concrete Composities* 22:379-384, 2000, "Ground Iron Blast Furnace Slag as a Matrix for Cellulose-Cement Materials", IBID 23: 389-397, 2001; and H Savastano. "Sustainable Cement Based Materials and Techniques for Rural Construction" holmersj@usp.br). Commercial development is going forward to make corrugated sheets, with 100 percent Brazilian ownership.

The Central Building Research Institute in India has reported favorable results with coir and bagasse (two paper authored by LK Agarwal: "Bagasse-Reinforced Cement Composities" *Cement & Concrete Composities* 17:107-112, 1995; and "Studies on Cement Bonded Coir Fibre Boards', *Cement & Concrete Composities* 14: 63-69,1992). Both papers reported successful development of technique and composition that would make boards that met international (ISO) performance standards.

The use of abundant plant fibers and wastes to make fiber-cement building materials-in addition to making safer products than asbestos-cement---can significantly reduce the enormous environmental burden of the construction industry. Countries can also reduce their outlays of hard currency for imports, instead using locally available materials.

The International Program on Chemical Safety Report on Chrysotile Asbestos

In 1993, a process began that would result in the issuance in 1998 of *Chrysotile Asbestos*, an Environmental Health Criteria Document (EHC-203) by the International Program on Chemical Safety (IPCS). IPCS was housed at the World Health Organization headquarters. Criticism of the improper influence of business interests at IPCS came to a head in 1993, when the US National Institute for Occupational Safety and Health (NIOSH) severed its link with IPCS partly over the dominance of scientists with ties to the asbestos industry in the IPCS Task Group selected to draft EHC-203. There had been continuing controversy into 1996, but still no document emerged. A distinguished group of 81 scientists wrote to the IPCS criticizing corporate influence in the development of IPCS documents on asbestos and chemicals, arguing that there was nothing new on chrysotile's toxicity that warranted the effort of a new review.

At this point, the US government agencies with links to IPCS met, and a letter issued from the US State Department June 24, 1996, detailing ways that IPCS could better disclose and prevent the harm from reliance on outside experts having financial conflicts of interest. The IPCS convened a more balanced panel of experts a week later in Geneva to complete work on the asbestos document, which existed only in a very incomplete, unreferenced draft. As the expert panel set about its work, the government of France announced that it was banning asbestos products. The EHC-203 report ultimately was published in 1998, concluding that there was no level of chrysotile exposure that was free from cancer risk and recommending in particular that chrysotile asbestos *not* be used in construction materials.

The WTO Asbestos Case

The government of Canada reacted to the French asbestos ban by bringing a trade dispute at the World Trade Organization (WTO). This claimed that under regulations to protect workers, consumers, and the environment, there was no need to ban asbestos. Central to this claim was the idea that with "controlled use" of asbestos, the remaining risks to public health were insignificant. WTO empaneled four scientific experts and arranged to hold a day of hearings in January 2000. As a scientific advisor to the European Commission defending the French ban, I attended the hearings.

In a statement filed on December 13, 1999—one month before the scientific hearings were scheduled to take place—Canada explained its use of the phrase "controlled use." The statement began with a qualification never expressed before: "Canada has advocated the use of chrysotile in high-density products only; textiles are not of that category." (During the scientific hearings in January, 2000, Canada's senior attorney went so far as to assert that "Canadian asbestos is not used, cannot be used these days in the manufacture of textiles, because nowhere do we know are these textiles being now manufactured.") This unprecedented declaration did not include any explanation of how Canada restricts exports to makers of "high-density products" only. Indeed, the Canadian asbestos company Cassiar was advertising "high quality weaving fibre" later in 2000.

Canada's December 13 statement continued:

With regard to downstream use sectors, "controlled use" implies that

> all distributors/manufacturers of asbestos will be required to have an import permit. This permit will be withdrawn if the company does not meet the following commitments:
>
> — to distribute its products only to companies (users) licensed to purchase these products. Those companies must have workers trained and licensed to install products, and must be in compliance with regulations. Approved users shall not resell to third parties, and any unused materials must be returned to the manufacturer;
>
> — to provide a list of users to the responsible government agency;
>
> — to provide products cut to specification and to establish centres equipped to cut the products to size, and where persons cutting the products are trained and are licensed to work with asbestos;
>
> — to police downstream users in cooperation with the government. The product manufacturer visits, monitors and reports on the performance of the downstream users at regular intervals. There are penalties for failing to provide this product stewardship.

Canada's statement does *not* advocate a stewardship role for Canada and other countries that export asbestos. Nowhere does it state that asbestos-exporting countries and companies have any responsibility to assure that manufacturers meet minimum safety requirements or that violators will be cut-off from supplies. Instead, the Canadian statement places the burden of surveillance and punitive action on the product manufacturing industry (and importing governments)—even though the industry has never done such things anywhere in the world. Why are nations that import asbestos obligated to assume the cost of restraining the abuses of the asbestos industry? Presumably, so Canada can enjoy unrestricted freedom (from product stewardship) to export asbestos.

Canada's suggestion that asbestos suppliers would establish field fabrication centres to cut products is wholly implausible. One need only spend a short time in the dense traffic of Delhi, Bombay, or Bangkok, for example, to doubt that the asbestos industry would provide any number of such centres—or that construction companies would regularly interrupt work to use them. Similarly, it is difficult to imagine that product manufacturers would conduct industrial

hygiene surveillance of their customers, let alone report miscreants to the government. Again, not a single asbestos product manufacturer has ever done such policing.

Even in the case of asbestos manufacturing industry and product use where regulatory restrictions had been in place for many years, WTO was told that asbestos problems remained out of control. One of the scientific experts appointed by WTO, Dr. Peter Infante of the US, testified that that OSHA, where he worked, had issued 4000 citations in the years 1996-1998 for violations of the OSHA asbestos standard. A brake manufacturer had been fined $125,000 for exceeding the PEL, not providing respirators, and dry sweeping the floors, only months before the WTO hearing. None of the scientific experts appointed by WTO thought that Canada's portrait of "controlled use" bore any relation to reality.

Canada lost the case, lacking proof that "controlled use" was a practical way for France to reduce the hazard of using asbestos to insignificance. WTO concluded that in the case of something whose deadly dangers were so thoroughly known as chrysotile asbestos, each country has the right to determine its own acceptable level of risk, even to the extent of banning the product from trade. The WTO, it should be noted, was a forum where those claiming that there was such a thing as "controlled use" of asbestos should have had the most receptive treatment, since Canada was arguing for the elimination of trade barriers. As an example of this bias, the WTO gave very limited consideration to the availability of alternatives to asbestos-cement other than those products using alternative fibers (PVA, aramid, and cellulose) in a cement matrix. Other alternative products, such as high-density polyethylene pipe and ceiling tiles made of lightweight concrete and clay, were hardly considered at all in WTO's decision.

The Politics of Controlling Asbestos Hazards

In the early 1990s, the government of India supported research into development of fiber-cements using plant fibers. Since then, India has established relatively high duties (70.6%) on the importation of one substitute for asbestos (duty 32.6%), polyvinyl alcohol (PVA) fibers. This was a decisive disadvantage last year when Eternit Everest converted one plant in Maharashtra to make PVA-cement roofing. Eternit Everest was also starting to make flat sheet products using coir and other vegetable fibers that were competitive with A-C sheets. Eternit Everest was then 52% owned by the Belgian multinational, Etex, which had a global policy of not continuing to own interests in asbestos. Etex recently sold its interest to Associated Cement Companies, an Indian firm that previously owned 26% of Eternit Everest. Now that Indian asbestos interests have bought out Etex, Eternit Everest is going back to asbestos 100%.

The situation in India contrasts dramatically with that in Brazil. Unions, political leaders, asbestos victims' groups, and public health activists have combined to press for bans on asbestos nationally and locally. With the failure to incite prosecution of the leader of the ban asbestos movement, labor inspector Fernanda Giannasi, for "criminal defamation", the dominant French multinational Saint-Gobain announced that it would get out of the asbestos mining and manufacturing business in Brazil by 2005, as it was required to do throughout Europe. Starting with the asbestos ban in Osasco, Brazil in September, 2000, bans on asbestos have been put into effect in major cities and states including Sao Paulo and Rio de Janeiro. The Brazilian government is continuing a strong research effort into the use of locally available waste plant fibers, and Brazilian businessmen are starting to invest in making this technology a commercial reality.

The difference between India and Brazil is deeply tied up with the issues of freedom of speech and the integrity of the public health system. In India, the leading proponent of banning asbestos is Dr. TK Joshi, a highly credentialed, respected and dedicated physician in the field of occupational health. Dr. Joshi faced tremendous opposition for just raising the issue of banning asbestos at the February, 2001 meeting of the Indian Association of Occupational Health, IAOH (B Castleman, "Heroism in Occupational Health", Internat. J. Health Serv. 31: 669-672, 2001). Since then, he has persuaded many of his colleagues, including his successor as IAOH President, Dr. GK Kulkarni ("Asbestos - to Ban or not to ban?" Indian J. Occup. Health 5: 2, 2001). For his efforts to protect the people of India from asbestos, Dr. Joshi has been threatened with the severance of his job at Lok Nayak Hospital by the Health Minister and has not been paid for the past 6 months. If the asbestos interests in India are able to get the government to fire Dr. Joshi, that would carry grave implications for the future of health protection of workers in India. There has begun an international campaign in support of Dr. Joshi, which is now reaching a critical phase, and this matter will have to be resolved by India.

Fernanda Giannasi was also targeted by asbestos interests in her country, but the courts rebuffed efforts to harass her, and her bosses in the government did not give in to pressures to take punitive measures against her. She had widespread public support both in Brazil and internationally, and the media in Brazil covered the asbestos story avidly. Having survived harassment and death threats, Fernanda Giannasi went on to receive many awards and honors for her public health work on asbestos.

Conclusion

It is noteworthy that the largest multinational corporations that controlled the global asbestos business and operated major interests in India 20 years ago have since gone into bankruptcy proceedings over the liabilities from so many lives asbestos destroyed. The businesses remaining in asbestos product manufacturing in the world today are smaller, usually national, business entities. They are not so widely known, nor are they as sensitive to bad publicity as the multinational asbestos companies were. Some are run by former intelligence officers of deposed military dictatorships. Some asbestos investors and managers are opportunistic businessmen who got in when the multinationals got out of asbestos. Whether long established or new to asbestos, these people are in effect betting they can run a discredited, hazardous technology for a few more years, then cash in the companies and not pay significant disability compensation to anybody. Some are betting their blood money can corrupt governments and destroy anyone who dares to stand up to them. Some are doing quite a brisk business in India, answering critics with the mantra of "controlled use".

“Controlled Use” of asbestos is the asbestos industry’s way of referring to business-as-usual with a fantasy face. Really well-controlled use of asbestos has never existed anywhere in the world, and it isn’t being invented in India today. If the remaining countries using asbestos today are unable to even halt the continuing use of it in new construction material and vehicle brakes, what hope can there be that they will ever attain that elusive, much changed and most desired state of existence, “Sustainable Development”? Currently available technology of vegetable waste fibers in cement composites is an especially encouraging alternative to asbestos-cement.

Appendix 6:

Collegium Ramazzini calls for an International Ban on Asbestos

To eliminate the burden of disease and death that is caused worldwide by exposure to asbestos, The Collegium Ramazzini calls for an immediate ban on all mining and use of asbestos. To be effective, the ban must be international in scope and must be enforced in every country in the world.

Asbestos is an occupational and environmental hazard of catastrophic proportion. Asbestos has been responsible for over 200,000 deaths in the United States, and it will cause millions more deaths worldwide. The profound tragedy of the asbestos epidemic is that all illnesses and deaths related to asbestos are entirely preventable.

Safer substitutes for asbestos exist, and they have been introduced successfully in many nations. The grave hazards of exposure to asbestos and the availability of some safer substitute materials have led a growing number of countries to eliminate all import and use of asbestos. In the United States, there has occurred drastic reduction of asbestos usage. Asbestos has been banned by Sweden, Norway, Denmark, The Netherlands, Finland, Germany, Italy, Belgium, France, Austria, Poland, and Saudi Arabia.

The Collegium Ramazzini

The Collegium Ramazzini is an international academic society that examines critical issues in occupational and environmental medicine. The Collegium is dedicated to the prevention of disease and the promotion of health. The Collegium derives its name from Bernardino Ramazzini, the father of occupational medicine, a professor of medicine of the Universities of Modena and Padua in the late 1600s and the early1700s. The Collegium is comprised of 180 physicians and scientists from 30 countries, each of whom is elected to membership. The Collegium is independent of commercial interests.

Background

The health consequences of the use of asbestos in contemporary industrial society have been amply documented in the world scientific literature. The toll of illnesses and deaths among asbestos workers in mining, construction, and heavy industry is well known. The pioneering work of British, South African, and Italian investigators (1-3) laid the foundation for the definitive investigations by Irving Selikoff and his colleagues of insulation workers in the United States. Selikoff's monumental studies showed, first, the greatly increased mortality experience of insulation workers (4), and later, the synergistic relationship between tobacco smoking and asbestos work (5). Men who were followed more than 20 years from first onset of exposure sustained excessive risks of lung cancer and mesothelioma, as well as risks of other neoplasias (6). These risks affect not only asbestos workers, but their families and neighbors (from material on clothing or plant emissions), users of products that contain asbestos, and the public at large.

Asbestos is a general term applied to certain fibrous minerals long popular for their thermal resistance, tensile strength, and acoustic insulation. Asbestos minerals are divided into two large groups: serpentine and amphibole. There is only one type of asbestos derived from serpentine minerals, chrysotile, also known as white asbestos. Amphibole minerals include five asbestos species: amosite, crocidolite, tremolite, anthophyllite, and actinolite. Two of these are the most commercially valuable forms: amosite, or brown asbestos, and crocidolite, or blue asbestos. The other amphibole minerals are of little commercial importance.

All forms of asbestos cause asbestosis, a progressive fibrotic disease of the lungs. All can cause lung cancer and malignant mesothelioma (7,8). Asbestos has been declared a proven human carcinogen by the U.S. Environmental Protection Agency (EPA) and by the International Agency for Research on Cancer of the World Health Organization (9,10). Early indications that chrysotile might be less dangerous than other forms of asbestos have not held up (11). The preponderance of scientific evidence to date demonstrates that chrysotile too causes cancer, including lung cancer and mesothelioma (12,13). Canadian chrysotile that is amphibole-free still is associated with mesotheliomas (14).

A leading asbestos researcher, Julian Peto, and his colleagues predict that deaths from mesothelioma among men in Western Europe will increase from just over 5,000 in 1998 to about 9,000 by the year 2018. In Western Europe alone, past asbestos exposure will cause a quarter of a million deaths from mesothelioma over the next 35 years. The number of lung cancer deaths caused by asbestos is at least equal to the number of mesotheliomas, suggesting that there will be more than a half million asbestos cancer deaths in Western Europe over the next 35 years (15). In Sweden, Jarvholm has reported that the number of deaths caused each year by malignant mesothelioma is greater than the number of deaths caused in that country by all workplace injuries (16).

The Need for a Ban

An immediate international ban on the mining and use of asbestos is necessary because the risks cannot be controlled by technology or by regulation of work practices. The strictest occupational exposure limits in the world for chrysotile asbestos (0.1 f/cc) are estimated to be associated with lifetime risks of 5/1,000 for lung cancer and 2/1,000 for asbestosis (17). These exposure limits can be technically achieved in the United States and in a few other highly industrialized countries, but the residual risks still are too high to be acceptable. In newly industrializing countries engaged in mining, manufacturing, and construction, asbestos exposures are often much higher, and the potential for epidemics of asbestos disease is greatly increased (18,19).

Scientists and responsible authorities in countries still allowing the use of asbestos should have no illusions that "controlled use" of asbestos is a realistic alternative to a ban. Moreover, even the best workplace controls cannot prevent occupational and environmental exposures to products in use or to waste. Environmental exposure from the continued use of asbestos still is a serious problem. A recent study of women residing in communities in Canadian asbestos mining areas found a sevenfold increase in the mortality rate from pleural cancer (20). Large quantities of asbestos remain as a legacy of past construction practices in many thousands of schools, homes, and commercial buildings in developed countries, and are now accumulating in thousands of communities in developing countries.

An international ban on mining and use of asbestos is necessary because country-by-country actions have shifted rather than eliminated the health risks of asbestos. The asbestos industry has a powerful influence over many countries. Even in the United States, the asbestos industry succeeded in 1991 in overturning the EPA's recommended ban and phase-out of asbestos by a technical ruling in the courts. Canada, Russia, and other asbestos-exporting countries have developed major markets in the newly industrializing nations. Conditions of current asbestos use in developing countries now resemble those that existed in the industrialized countries before the dangers of asbestos were widely recognized.

The commercial tactics of the asbestos industry are very similar to those of the tobacco industry. In the absence of international sanctions, losses resulting from reduced cigarette consumption in the developed countries are offset by heavy selling to the Third World. In similar fashion, the developed world has responded to the asbestos health catastrophe with a progressive ban on the use of asbestos. In response, the asbestos industry is progressively transferring its commercial activities and the health hazards to the Third World.

Multinational asbestos corporations present a deplorable history of international exploitation. These firms opened large and profitable internal and export markets in Brazil, elsewhere in South America, and in India, Thailand, Nigeria, Angola, Mexico, Uruguay, and Argentina. Brazil is now the fifth largest producer and consumer of asbestos in the world, after Russia, Canada, Kazakstan, and China (21). While asbestos use in the United States amounts to less than 100 g per citizen per year, asbestos use in Brazil averages more than 1,000g per citizen per year. In third-world countries, use of asbestos has been increasing at an annual rate of about 7 percent.

Conclusion

The grave health hazards of asbestos are entirely preventable. The health risks of asbestos exposure are not acceptable in either industrially developed or newly industrializing nations. Moreover, suitable, safer substitutes for asbestos are available. An immediate worldwide ban on the production and use of asbestos is long overdue, fully justified and absolutely necessary.

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Further readings: Roro Public Hearing Report