ASBESTOS AND ASBESTOS RELATED DISEASE
IN SOUTH AFRICA: AN UPDATE

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Saldu Working Paper No. 71

Cape Town
October 1987
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The aim of this review is to update the 1980 Saldru working paper on asbestos and asbestos-related disease in South Africa [Myers, 1980].

The changing attitudes to asbestos over the last few years will be reviewed. Costs paid by workers, industry and society as a result of past use of asbestos will be examined.

Pointers to the changing attitude towards asbestos include the following:

Organised campaigns and lobbies by workers and consumers

There has been much public awareness of and concern about the hazards of asbestos, both environmentally and in the workplace. People affected by asbestos at work and at home have organised themselves into strong anti-asbestos lobbies in many countries and have won significant gains in the limitation of asbestos exposure. Community organisations, environmental groupings and trade unions have done much to publicise the hazards of asbestos. On the other hand, asbestos promoting agencies representing asbestos producers such as the Canadian Asbestos Information Centre (CAIC), the American Asbestos Information Association, and the South African Asbestos Producers' Advisory Committee have sought equally to counter the adverse publicity given to asbestos.

Stricter exposure limits by Regulatory Bodies

The health hazards of asbestos have been scientifically demonstrated at increasingly lower levels of occupational exposure. Increasingly severe stances have been taken by regulatory bodies in the USA, the UK and Europe with respect to safety standards in the workplace, resulting in restrictions upon the use of asbestos. Considerable costs to the asbestos industry could be incurred as it is forced to comply with more stringent health standards, or as asbestos products are banned.

Litigation by victims of asbestos-related diseases

Over the past few years in the USA, there has been a wave of litigation against asbestos companies seeking compensation for damage to the health of employees. Johns Manville Corporation, the largest asbestos producer and
one of the largest companies in the USA has been forced to declare
bankruptcy as a means of escaping the demands of claimants [Brodeur P,
1985; Glaberson and Atchison, 1985].

**Planned removal of previously installed asbestos fixtures**

Regulatory agencies in the USA and local councils in the UK are now faced
with the costly and dangerous task of removing friable asbestos from
schools, hospitals and houses.

**Decreased consumption of asbestos-containing products**

As a result of these developments and compounded by an economic recession
in recent years, a huge drop in asbestos consumption in Western countries
has occurred. Decreased production of raw fibre, depressed prices, severe
competition between suppliers, mine closure and retrenchment of workers has
resulted.

**Decreased demand/substitutes**

The decreased demand for asbestos consequent upon its adverse health
effects has stimulated the development or application of substitutes for
asbestos in manufacturing industry.

**Industrial relations developments**

Most of the asbestos producing and manufacturing companies, particularly
in South Africa, have a bad track record in industrial relations, and in
supplying the public with the necessary information to prevent asbestos-
related disease. The responses of these companies to demands for safer and
better working conditions from their employees have included large-scale
victimisation, dismissals and strong resistance to unionisation of their
workers.

In some instances, hardline company attitudes have changed in the "face of
worker and consumer organisation and pressure. Such changes have usually
occurred in conjunction with international pressures on company
headquarters, or those emanating from internationally agreed procedures on
working with asbestos, underwritten by organisations like the International
Labour Office [ILO, 1986]. Consequently there have also been some gains for health and safety as asbestos companies, in an attempt to enhance their public image, have concentrated on an improvement of health standards and working conditions and industrial relations practices in factories and mines. This has gone together with substitution for asbestos in the manufacturing sector and the retention of jobs.

Defensive moves by the asbestos industry

In general terms company defenses have involved information campaigns designed to promote asbestos (particularly chrysotile) as a safe material, a tendency to promote nationalisation of asbestos mines (as in Canada), and a fragmentation of ownership of asbestos firms rendering the industry less vulnerable to potential litigation [ICEF, 1984].

The legacy of sick workers, premature loss of life from asbestos-related disease, emission of asbestos fibres from materials used in the construction of public buildings, enduring environmental pollution of water and air resulting from past work with asbestos, high costs to the taxpayer of asbestos removal and costs of future litigation and compensation will continue to constitute a considerable burden on society for some time.

What follows is divided into two parts. Section A attempts to provide an update of the health hazard profile of asbestos since 1980, and reviews the international and South African scientific and industrial relations literature to this end. Section B updates the economic profile of the asbestos industry in South Africa and examines this in the light of developments within the international asbestos market.

Both sections are relatively self-contained and may be read independently of each other.

1.2 ACKNOWLEDGEMENTS

We would like to thank Mr H. Rice for the use of his report of July 1984, entitled INDUSTRIAL PROFILE OF THE SOUTH AFRICAN ASBESTOS INDUSTRY, and Ms Gill Findlay of Mathison and Hollidge Inc for access to her report of 13 October 1983, entitled ASBESTOS.

Glaberson WB, Atchison S (1985) Manville's asbestos victims may have won the store. Business Week 12 August.


2 SECTION A: ASBESTOS HAZARD PROFILE UPDATE

2.1 INTRODUCTION

The case against asbestos usage from a health point of view has already been concluded. What remains is a host of arguments and positions that have little to do with the health sciences, but rather more to do with politics, economics and the technology of substitution. In the 1980 summary of the epidemiological evidence [Myers, 1980], it was already plain that there were no safe levels for occupational exposure to asbestos, and that the regulatory machinery in countries like the United Kingdom and the United States and elsewhere was gearing up for the imposition of severe restrictions on exposure for workers leading to an ultimate phasing out or banning of asbestos usage.

The asbestos related diseases - asbestosis, lung cancer, mesothelioma, and other cancers - are all incurable and mostly fatal. There has been a change in the prevalent pattern of these diseases at the current lower levels of exposure. Lung cancer is now the most common, with asbestosis less common than formerly as a result of the reductions in the dust levels to which people are exposed at work.

In South Africa and other countries workers are still being exposed to asbestos at levels which have been scientifically demonstrated to be unsafe. The current position in the scientific community and in governments like that of the UK, is that there is no safe threshold for asbestos exposure where lung cancer excess is preventable.

Excess mortality that exposure to asbestos continues to cause at current levels of exposure in most countries is becoming increasingly unacceptable. The increasing costs of controlling dust at the workplace, the increasing availability of substitutes, and the gathering storm surrounding victims of asbestos exposure and disease have all led to a move away from asbestos usage in the advanced countries.
2.2 ARGUMENTS FREQUENTLY HEARD CONCERNING ASBESTOS AND THE ARD'S

2.2.1 The dose-response relationship

A common position taken by the asbestos industry is that a dose-response relationship which has been shown for asbestosis, lung cancer and less certainly for mesothelioma, is proof that a safe level exists. This is a fallacious argument.

A dose-response relationship simply means that a proportional relationship exists between exposure to asbestos and the risk of asbestos-related disease. The greater the exposure level the greater the resultant prevalence of disease given time. There is nothing intrinsic to the dose-response relationship that says that at low levels of exposure the risk of lung cancer is insignificant or small enough to be acceptable.

The whole aspect of the dose-response relation is, however, fraught with problems [Corm, 1984; Rappaport, 1984; Stellingwerf, 1984]. The reasons for this are that many assumptions have to be made along the way in order to be sure that this relation is what it claims to be. These assumptions and their effects 20 to 30 years later can seriously invalidate attempts to relate measured exposures to disease rates [Atherley, 1985; Myers, 1980]. Existing correlations based upon measurements from the past are of doubtful validity in most studies.

This does not, however, absolve scientists from taking a position that is conservative of public health on the question of asbestos hazards. What remains clear is that in exposed groups of workers there is a significant excess of ARD's when compared with unexposed populations. This is the bottom line.

2.2.2 Threshold or safe level of exposure

A perusal of the history of the so-called 'safe level', which has to do with the setting of occupational exposure limits, demonstrates a worldwide tendency to continually revise these levels downwards as 'safe levels are found to be unsafe. Hitherto all 'safe levels' have produced their crop of asbestos-related diseases. In other words no safe level has been demonstrated in terms of which prevention of all asbestos-related diseases is feasible.
The question of a safe level of exposure is an entirely separate issue from that of a proportional relationship to the rate for ARD's, which is all that the term dose-response relationship implies. In order for a safe level of exposure to exist, the risk of developing an asbestos cancer would have to tail off to zero at a certain level of exposure. The level of exposure at which the risk of excess cancer becomes zero is called a threshold value. So what the asbestos industry means when they talk of a dose-response relationship is actually a non-zero-threshold-dose-response relationship.

This is shown graphically in Figure 1a.

The problem is that the model which actually fits the data for asbestos and asbestos cancer, is a no-threshold-dose-response relationship. This is the commonest model for carcinogens, and the currently accepted model for asbestos-related cancer in the scientific community [Guess and Hoel, 1977; Mowe and Gylseth, 1984; Peto, 1979; Schneiderman et al, 1979].

This is shown in Figure 1b.

Sometimes the fact that there are long latency periods of between 10 and 35 years between first exposure to asbestos and the development of an asbestos-related disease has been ignored. All the ARD's have long latency periods of between 10 and 35 years. Because of this long period many studies have reported safe levels of exposure (i.e. no excess of asbestos-related disease). When the latency effect has been adequately taken into account in the study design, the excess disease rates invariably appear [Finkelstein, 1984].

2.2.3 The dose-latency relationship

Some investigators [Browne, 1983] have argued for a dose-latency relationship between asbestos exposure and the latency period to the development of cancer. This would mean that a proportional relationship exists between amount of exposure and the length of the latency period from first exposure to development of cancer.
FIGURE 1A  DOSE-RESPONSE RELATIONSHIP SHOWING A THRESHOLD VALUE

THRESHOLD - DOSE-RESPONSE - RELATION

EXCESS LUNG CANCER DEATHS/1000

REGULATION FIBRES/ML AIR

FIGURE 1B  DOSE RESPONSE RELATIONSHIP WITH NO THRESHOLD

NO-THRESHOLD - DOSE-RESPONSE - RELATION

EXCESS LUNG CANCER DEATHS/1000

REGULATION FIBRES/ML AIR
They have argued that in terms of this relationship, at very small exposures the latency period would be lengthened to so many years that exposed workers would already be dead from other causes before developing an ARD.

This has no basis in fact and studies have shown that there is no relationship between cumulative exposure or dose and the latency period for either mesothelioma [Mowe and Gylseth, 1984] or lung cancer [Liddell, 1980].

In summary then, there is no safe level of exposure to asbestos that will not produce excess cancers, and at higher exposures, more people among the exposed groups will develop ARD's.

2.2.4 The burden of the past or the burden of the future??

New evidence [Finkelstein, 1984] that has emerged since the late nineteen seventies has finally put paid to an often heard re-assurance that the current disease burden is mainly attributable to heavy exposures in the past before the days of strict regulation and modern standards.

A person's cumulative exposure, or the level of fibres to which they were exposed multiplied by their years of exposure, constitutes their dose of asbestos.

Many people worked at high exposures for short periods only, or at low exposures for long periods. Their doses of asbestos have been close to, and generally lower than, those doses permitted by current standards regulating exposure to asbestos in the advanced countries. Despite this low level of exposure which is assumed by the industry to be safe, these people have already been shown to have developed excess asbestos-related disease after sufficient time had elapsed for the effect of the latency period had come into operation.

Subsequent to the 1980 summary, results of epidemiological surveys conducted among workers with cumulative lifetime exposure (50 years) to asbestos dust levels, at and well below, 2 fibres per millilitre (or 100 fibre-years/ml) have shown substantially elevated rates for the various asbestos-related diseases [Dement and Harris, 1983a and 1983b; Finkelstein, 1983].
These surveys include asbestos-cement workers in Canada [Finkelstein, 1984], and South African mineworkers [Irwig and du Toit, 1984]. 2 fibres/ml is the current unofficial standard for the asbestos mines and the asbestos-cement industry in SA, the official standard in the USA, and the 1983 standard in the UK.

The excess mortality that exposure to asbestos continues to cause at levels of exposure that are now current in most countries is clearly unacceptable. The lung cancer mortality rate among workers exposed to low levels is about 5 to 6 times greater than in the unexposed population. The death rate from non-malignant respiratory diseases is elevated about threefold, and there are relatively many cases of mesothelioma in exposed workers. This fatal cancer is extremely rare in the general population.

Bearing in mind the limitations of data used to generate dose-response relationships, Table I shows recent projections made by the Occupational Health and Safety Administration in the USA for the excess deaths rates at different levels of exposure over a lifetime of 50 working years:

**TABLE 1: EXCESS DEATHS AT DIFFERENT LEVELS OF EXPOSURE**

<table>
<thead>
<tr>
<th>Regulation fibres/ml air</th>
<th>Excess deaths from cancer per thousand exposed compared to non-exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>64</td>
</tr>
<tr>
<td>0.5</td>
<td>17</td>
</tr>
<tr>
<td>0.2</td>
<td>7</td>
</tr>
<tr>
<td>0.1</td>
<td>3</td>
</tr>
</tbody>
</table>


Hence it seems highly likely that at current levels of exposure in industry there will be a considerable burden of excess disease in the future.

### 2.2.5 Disentangling the effects of asbestos from those of smoking

The asbestos industry has tended to try to ascribe the elevated lung cancer mortality rate to smoking and to minimise and obscure the role of asbestos as a cause of cancer [Everi, 1986a].
However, the effect of smoking on lung cancer prevalence has been repeatedly shown to be independent of that of asbestos, the elevation of the mortality rate being of the order of 5 to 6 times higher in exposed populations compared with unexposed populations with similar smoking habits (smokers and non-smokers) [Doll and Peto, 1985; Finkelstein, 1984; Newhouse and Berry, 1985; Hilt et al, 1985].

Cigarette smoke is in its own right a carcinogen, and causes lung cancer. It has no effect on the ARD's asbestosis and mesothelioma. Smoking has been found to have a multiplicative effect on the relative risk for lung cancer in those exposed to asbestos [Finkelstein, 1984; Hilt et al, 1985; Newhouse and Berry, 1985]. This effect has been misunderstood to mean that there is no lung cancer risk to non-smoking asbestos workers (Everite handout).

What is often not realised is that a multiplicative effect means that the effects of smoking and asbestos on lung cancer are independent of each other [Doll and Peto, 1985]. This means that exposure to asbestos multiplies the additional risk of lung cancer for non-smokers and for smokers by the same factor. Illustrated numerically it would look like this:

**TABLE 2 RELATIVE RISKS FOR LUNG CANCER**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Risk Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>If non-smoking non-asbestos-exposed workers have a lung cancer risk of 1</td>
<td>5</td>
</tr>
<tr>
<td>Then non-smoking asbestos workers have a risk of</td>
<td></td>
</tr>
<tr>
<td>If smoking non-asbestos-exposed workers have a lung cancer risk of</td>
<td>11</td>
</tr>
<tr>
<td>Then smoking asbestos workers have a risk of</td>
<td>55</td>
</tr>
</tbody>
</table>

There is evidence to show that the effect may actually be less than multiplicative and closer to an additive effect [Acheson and Gardner, 1984; Newhouse and Berry, 1985]. This means that the combined effect asbestos and cigarette smoke is a bit less carcinogenic than the independent effects of the two multiplied with each other.

Of course the fact that both are potent causes of cancer means that whatever the exact nature of the relationship between them, in absolute terms, the risks of exposure to both are substantially higher than the risks of exposure to either one separately.
The conclusion to be drawn is that smokers (or anyone else for that matter) should not be exposed to asbestos and that asbestos-exposed people should not be smoking, and that preferably neither should be happening.

2.2.6 Blaming the victim

The smoking habit is a convenient handle with which to blame the victims - the exposed workers - for their own elevated death rates because of their lifestyle. Irresponsible exposure of workers to carcinogens in the workplace by their employers, thereby recedes from public view.

It is important to add that there is a fundamental difference to the social context in which people are exposed to these two carcinogens. It may be argued that smokers smoke by their own volition and take the risks involved freely. Workers are exposed involuntarily to asbestos by another party, the employer, who furthermore has real economic and legal power over employees, who wields authority and who has responsibility for the health and safety of employees. This is so even if the employer takes pains to warn the employee of the risks involved. Exhortation of employers to change their personal behaviour in the absence of effective preventive measures tends often to degenerate into a victim-blaming exercise which is of no benefit to anyone and results in the primary issue (the asbestos hazard) taking second place to subsidiary issues (carping about personal protective equipment and workers' smoking and working habits). What often happens in this negative context is that focusing on the errant individual worker removes attention from more important and basic issues like the possibility for substitution of material or alteration of process or plant to improve safety.

2.2.7 Disentangling the effects of asbestos from those of other carcinogens

One view tends to see asbestos as a promoter rather than an initiator of lung cancer. This means that it will encourage the development of cancer once the cancer is initiated by something else. By implication smoking or some other agent is seen as the real cause, while asbestos just helps it along.
This view of the role of asbestos in the causation of cancer is based on a study which has not been supported in the scientific literature [Browne, 1983]. This study found that there was no correlation between the latency period for lung cancer and the years since first exposure to asbestos. Although the group of workers studied were shown to have an excessive risk of developing lung cancer, this finding was interpreted to mean that some other factor, like years of smoking, would correlate better with the latency period for lung cancer. Therefore it was concluded that the smoking factor must be the initiating factor with asbestos promoting the effect of the initiator to produce excess cancers.

Other studies [Mowe and Gylseth, 1984; Liddell 1980] have however found that there is a strong correlation between the latency period and the years since first exposure for both lung cancer and mesothelioma thereby making this hypothesis very unlikely.

In addition a recent study has shown that asbestos fibres bind the carcinogens from tobacco smoke [Harvey, 1984]. These carcinogens bind to asbestos fibres and are then carcinogenic experimentally. As asbestos fibres, particularly amphiboles, are mostly trapped in the lungs, this would suggest that the argument is perhaps the other way round i.e. asbestos is the initiator and smoking the promotor. Studies have also (73,62 in references) shown that the same relationship holds between radiation from radon daughters(by-products of radioactive, decaying Radon gas) and smoking in the causation of lung cancer. These studies support the view that it is smoking rather than asbestos that is the promoter.

2.2.8 Different fibre types and their health effects

It is by now very well established that the amphiboles amosite and crocidolite are the most dangerous fibres to work with from the point of view of their carcinogenicity [Doll and Peto, 1985]. Amphiboles are principally responsible for mesothelioma and in those cases discovered in workers exposed solely to chrysotile, the amphibole tremolite is the predominant type of asbestos found in the lung on post-mortem [Mowe and Gylseth, 1984]. Tremolite is a contaminant of chrysotile ore.

In consequence, crocidolite is legally or effectively banned in many developed countries. As it is amphiboles which have the special qualities resulting in the demand for asbestos, one wonders whether the case for
substitution has not been very much strengthened. Chrysotile with its inferior qualities could be more easily substituted with the use of non-fibrous materials.

2.3 WHO IS EXPOSED TO ASBESTOS?

The problem with asbestos is that it is even worse than radiation hazard firstly because it is indestructible, and secondly because there is no control over who becomes exposed as a consequence of consumption of primary secondary and tertiary asbestos products and the creation of waste materials. There is a type of inverse pyramid effect.

TABLE 3: EXPOSED GROUPS

Obvious occupational groups exposed:

Miners
Millers (usually at the mines)

Processors in the manufacturing industry
asbestos-cement
asbestos-textile
friction products(brakes, clutches)
paint and chemical industry
wine and beer filter making

Installation trades like construction
plumbing
heat insulators
ventilation engineers

Repair and maintenance trades like car mechanics
roof repairers/cleaners
house repairs/painters

Waste and garbage disposal workers.
Then there are **environmentally exposed groups** such as:

School children and hospital patients in buildings containing:
- sprayed insulation
- insulation with asbestos felts/textiles
- vinyl asbestos floor tiles
- asbestos-cement ceiling boards
- asbestos-cement roofing without ceilings

Residents of geographical areas near the mines, mills and factories

Home repairers and fixit-people
- guttering and roof fitting
- scraping and painting roofs
- occupants and neighbours during hose cleaning/removals

Busy traffic intersections and stopping places - cars
- trains

Consumers of water borne by asbestos-cement pipes
- or stored in asbestos-cement tanks

It is clear that the pyramid widens out considerably and uncontrollably.

The construction trades are a current focus of concern in scientific research. Figures calculated in the USA for future disease consequent on past exposures are high. This disease burden is rarely taken into account when cost-benefit calculations are made for substitute materials.

The USA figures for numbers of workers exposed are tremendously high [Nicholson and Perkel, 1981]. In South Africa figures for those occupationally exposed are only available for the mines (see Table 4a and 4b).
### TABLE 4a

**NUMBERS OF WORKERS ON THE ASBESTOS MINES 1977 AND 1983**

<table>
<thead>
<tr>
<th></th>
<th>TOTAL</th>
<th>WHITES</th>
<th>AFRICAN</th>
<th>COLOURED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OPERATIVE WORKERS</td>
<td>SURF U/G</td>
<td>SURF U/G</td>
<td>SURF U/G</td>
</tr>
<tr>
<td>TRANSVAAL</td>
<td>2</td>
<td>358</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>7235</td>
<td>267</td>
<td>137</td>
</tr>
<tr>
<td>CAPE</td>
<td>5</td>
<td>5204</td>
<td>269</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>14430</td>
<td>573</td>
<td>191</td>
</tr>
<tr>
<td></td>
<td>% UNDERGROUND WORKERS</td>
<td>12</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28</td>
<td>51</td>
<td>23</td>
</tr>
<tr>
<td>TOTAL</td>
<td>5562</td>
<td>314</td>
<td>5075</td>
<td>173</td>
</tr>
<tr>
<td></td>
<td>21665</td>
<td>1168</td>
<td>19928</td>
<td>569</td>
</tr>
<tr>
<td>% WORKERS BY RACE</td>
<td>100</td>
<td>6</td>
<td>91</td>
<td>3</td>
</tr>
</tbody>
</table>

**Source:** *1983 Mining Statistics*

*1977 Mining Statistics*
TABLE 4b  WAGES OF WORKERS ON THE ASBESTOS MINES 1977 AND 1983

<table>
<thead>
<tr>
<th></th>
<th>TRANSVAAL</th>
<th></th>
<th>CAPE</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>White</td>
<td>Coloured</td>
<td>African</td>
<td>White</td>
</tr>
<tr>
<td>% labour force</td>
<td>3</td>
<td>-</td>
<td>97</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>0.2</td>
<td>94</td>
<td>5</td>
</tr>
<tr>
<td>% total remuneration received</td>
<td>31</td>
<td>-</td>
<td>69</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>0.3</td>
<td>65</td>
<td>32</td>
</tr>
<tr>
<td>Index of salaries (African = 1)</td>
<td>14</td>
<td>-</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>2.5</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td>Monthly wage</td>
<td>1469</td>
<td>-</td>
<td>105</td>
<td>1953</td>
</tr>
<tr>
<td></td>
<td>915</td>
<td>250</td>
<td>100</td>
<td>911</td>
</tr>
<tr>
<td>Average salary per year</td>
<td>17631</td>
<td>-</td>
<td>1262</td>
<td>22477</td>
</tr>
<tr>
<td></td>
<td>10974</td>
<td>3000</td>
<td>1196</td>
<td>10935</td>
</tr>
</tbody>
</table>

Source: 1983 Mining statistics
1977 Mining statistics

Figures for the non-mining asbestos industry are not readily available, however there would appear to be a 33 to 50% decrease in employment since 1979. In other words, there are between 2000 and 3000 workers in the asbestos-cement manufacturing industry at present. The principal firms now as in 1980 are Everite, Turnal and Superocla.

There is no overall figure for those working with or handling asbestos in South Africa. Figure 2 gives an idea of the relative consumption of local asbestos for different industries and products.

FIGURE 2  SOUTH AFRICAN CONSUMPTION OF ASBESTOS BY MASS IN 1982
Source: Minerals Bureau of South Africa, 1983
FIGURE 2: CONSUMPTION OF ASBESTOS IN SOUTH AFRICA
BY MASS IN 1982

Source: Minerals Bureau of South Africa, 1983
2.4 WHO BEARS THE BURDEN OF DISEASE?

Because of the extensive 'reverse pyramid' effect of exposures to asbestos in the general population it becomes difficult to accurately describe this burden. There have been attempts in the US [Nicholson and Perkel, 1981], but in SA it is difficult due to the absence of a statistical database. The bottom line is that the seeds of future ill-health are continually being sown, and the fruits will continue to be reaped over many years to come. It is easy to be exposed to asbestos. Once exposed, however, people are subject to illnesses that are incurable and progressive even in the absence of further exposure. If exposure were to be absent all these diseases would be entirely preventable.

The disease burden is then borne mainly by those with occupational exposure - i.e. workers [Doll and Peto, 1985; Beritic et al, 1984]. There are also a number of non-occupationally exposed people who will develop these diseases. The social cost is borne mainly by the victims and to some extent by the state. Because of the latency period most disease develops when people are no longer at work. In SA this is aggravated by the migrant labour system, poor homeland health services and infrastructure, and the high prevalence of tuberculosis to which any chest illness suffered by Black workers is often attributed [Myers et al, 1985]. There is widespread medical ignorance about the ARD's and the majority of cases is likely to be missed.

A serious obstacle to victims is the workman's compensation system here and abroad [Myers et al, 1986]. It is universally difficult to obtain compensation for an occupational disease, and there are considerable bureaucratic obstacles in the path of workers who are mostly illiterate. In general only a small percentage of claims are for occupational diseases and only a very small proportion of these are successful. There are no published figures available for SA, but to go by USA and UK figures, around 2 - 3% of all occupational disease claims are successful [Boden, 1982; Hughes, 1982; Sagan, 1982].

In SA lung cancer is not compensable for workers exposed to asbestos in industry, nor are lung cancer, asbestosis, or mesothelioma for heavily environmentally exposed people in the areas where asbestos is mined. Financial compensation for miners is very poor and racially discriminatory [Myers et al, 1986].
The level of proof required to obtain compensation for an ARD may be interestingly compared with the level of proof required from industry in demonstrating compliance with safe work conditions. Such conditions in South Africa are neither legislated nor regulated by the state, neither are industrial hygiene measures in routine operation in all places where asbestos is used. Proof of safe working conditions is very seldom required and such legal requirements as there are, are inadequately policed, whereas proof for purposes of workers' compensation is invariably rigorous.

2.5 OTHER LATENT SOCIAL COSTS

Latency does not only apply to the unfortunate victims and their ARD's. It also applies to the social burden that asbestos use incurs. Of all the tons of asbestos used annually, some will at some stage be released into the breathing space of people. The notion of fibres being locked into a particular product is facile and obviously untrue at some stage or another in the life cycle of all asbestos products. Even in the case of vinyl floor tiles dangerous amounts of fibre may be released into the air by ordinary wear and tear [Sebastien, 1982]. The fibres from weathered or cleaned asbestos-cement roofing, crumbling cladding, roofing, insulation, tiles, disintegrating paint and coating surfaces, waste dumps, demolitions of buildings will carry some of the burden into the future.

Mesothelioma incidence is one useful marker of the specific carcinogenic effect of asbestos. Even cases who are unable to give a history of exposure to asbestos have statistically significantly more asbestos in their lungs than those without mesothelioma [Mowe and Gylseth, 1985; Mowe et al, 1985]. This means that mesothelioma is almost always caused by asbestos exposure.

A recent Norwegian study [Mowe and Gylseth, 1986] found a significant regional association between the incidence of mesothelioma and the proportion of the population employed in industry.

The incidence of mesothelioma is on the increase in developed countries [Churg, 1985; Morrison and Band, 1984; Armstrong and Musk, 1984]. South African figures [Solomons, 1984] despite the incomplete nature of the statistics and the mesothelioma register are of the same order as those from Canada and Australia. This is no doubt due in part to the increasing
awareness of and ascertainment of the disease entity, as well as the increasing utilisation of asbestos this century. With mesothelioma at least we have a reliable if limited marker of the carcinogenic potential of asbestos usage.

How much of the epidemic of lung cancer and other cancers in the general population in industrial countries is due to asbestos pollution is unknown. There is, however, every reason to suspect that with the ubiquity of asbestos products, it could be a major culprit along with smoking and other carcinogenic chemicals. Asbestos could well have played a considerable role in the epidemics of lung and other cancers in this century. Unfortunately because of the multiplicity of other causative agents for cancer, its true contribution will never be known. As the responsibility for treating these conditions falls on the general health services and the state, society must bear the costs.

The costs of litigation surrounding compensation claims where these are possible, and damages awarded to victims constitute another load on society's resources. There are currently 25,000 lawsuits against manufacturers pending in the USA [Brodeur, 1985; Joyce, 1984].

The costs of removing asbestos from state buildings is staggering. In the USA 0.6 billion US$ have been allocated over the next 6 years for this purpose while the figure in the UK runs at 113 million pounds to clean up hospitals, schools and council housing [Bell, 1984].

All these potential future costs should be considered when conducting 'cost-benefit' analysis.

2.6 POLITICS, ECONOMICS AND THE HEALTH SCIENCES

Perhaps the events in the USA are most illustrative of these relationships. Permitted levels of exposure in that country have been static for about 10 years now at 2f/ml. This is so despite the emergence of studies referred to above, many of which have been done in the USA, declining usage of asbestos in industry, burgeoning lawsuits and increasingly stringent control limit levels of dust exposure in other countries during the same period.
This may be partly due to the effect of the Reagan administration which has been openly against regulation, and has been very active in a process now entitled deregulation.

Very few standards have come into being since the existence of the Occupational Safety and Health Act (OSHA) in 1970 and a number of existing standards have been overturned in the courts. Examples of standards turned down are the noise standard [Occupational Health and Safety Newsletter, 1984b] and the emergency temporary standard [Occupational Health and Safety Newsletter, 1984c; Occupational Health and Safety Newsletter, 1983; Occupational Health and Safety Newsletter, 1984d] on asbestos.

The ETS of 0.5 fibres/ml for asbestos, was thrown out on a technicality. It was not submitted to a public hearing before passage by OSHA, and despite the fact that industry was prepared to meet this standard, it successfully took OSHA to court.

2.6.1 Cost-benefit analysis

Under the Reagan administration, since 1981, proposed standards must first go before an administrative body, which is not open to the public, called the Office of Management and the Budget (OMB) [Sheehan, 1982]. Here cost-benefit analysis is applied, and a determination is made as to whether the standard can proceed to public hearings or not.

Such an application of cost-benefit analysis is problematic (ethics book) since cost-benefit may only be properly applied to the same agent, and not, as is the case with the OMB to two different parties who furthermore have conflicting interests. In such a context the 'cost' does not include factors not borne by industry - the societal and individual disease burden and compensation. In any case costs to the workers in terms of 'acceptable disease risks' are incommensurate with costs to the employers in terms of controlling exposures to toxic substances.

The cost to industry is often conceived in a static way, and is difficult, if not impossible, to truthfully ascertain. In a now famous case the vinyl chloride monomer industry claimed that it could not maintain production if increased costs due to lower exposure levels were to be forced upon them. After the standard for exposure was changed the industry continued to survive and make profits. Substitution costs may appear
falsely high initially (also due to management exaggerating them), only to turn out cheaper than using asbestos later when demand increases.

This type of process has very little to do with the health risks involved, and much more to do with questions of power in society and the manner in which decisions are taken.

2.6.2 Who decides, who shall live and who shall die?

One is forced to turn from scientifically and morally indefensible notions like cost-benefit [Selikoff, 1986] analysis to the real question involved. Who decides what is an acceptable risk?

Management perspective sees society as homogeneous with themselves or technical experts having the right to decide who pays the price of hazardous exposures, and who benefits under the homogenised rubric of the public good/general good. This kind of utilitarianism pays no attention to the specificity of groups in society and to the central role played by group or sectional interests in the determination of the general interest. In the process the power relations embedded in the outcome of this decision are obscured and the most powerful group's interest appears to be at one with the general interest.

By way of example, fewer lung cancer deaths may be caused in society as a whole by asbestos than by smoking. Yet in a population of asbestos workers this is not the case. Here asbestos is as important a cause of cancer as smoking. In fact, because of the multiplication of risks indicated above asbestos exposure is deadly to smoking workers. Hence something must be done for this group. It is not sufficient to state that smoking is so much more of a problem, that priorities need to be set and that all attention should rather be devoted to smoking.

The risk of dying from asbestos cancer may, for instance, be equivalent to that of a pedestrian being knocked down by a car and killed. Yet as asbestos exposed workers are also pedestrians they bear additional risk in consequence of being exposed to a known cause of excess mortality like asbestos by their employers. This definite and significant excess risk cannot be prioritized or compared away.
Society's managers whether they be in industry, political office or in health and welfare administration, are fond of "putting things in perspective" [Mets, 1984] often by means of misleading comparisons by which real hazards to important sections of the population tend to be overlooked or minimised. It is very important to tease out the hidden assumptions behind "perspective-creating" exercises. All depends on whose perspective it is that informs relative risk assessment. Because workers are the least powerful constituent of society it is easiest to actively submerge their interests in the concept of the general good, by these and other comparisons. Hence the concept of the general good must always be disaggregated in power terms before being applied. If this is not done, a section of society becomes the scapegoat for others (many of whom may gain materially in the process). For instance a recent talk by a speaker brought out from the UK by the asbestos industry stressed the safety of asbestos from an environmental pollution point of view [Cummins, 1986]. No attempt was made to link the "safety" of environmental exposures to the hazards faced by production workers with asbestos in industry, while considerable efforts were made to compare the risks to health with a range of other obscure hazards like passive smoking, drinking beer and the like.

2.6.3 The Environmental Protection Agency - An example of politics and the health sciences

In the USA, the Environmental Protection Agency (EPA) is the authority empowered to protect the environment from pollution from dangerous substances by means of submitting proposals for standards to be legislated. The EPA has considerable powers in regulating hazardous substances under US law. A similar state body which regulates hazardous exposures in industry is the Occupational Health and Safety Administration (OSHA). OSHA submits proposals for regulations, but has less power to enforce these regulations once they have passed into law.

In 1979 the EPA first proposed regulating asbestos [Joyce, 1984]. Draft regulations were produced in 1984. There were plans to issue the proposal in October 1984 and the final rule in October 1985. Promulgation of the regulations were delayed because of objections by the White House Office of Management and Budget [Occupational Health and Safety, 1984; Staying alive, 1984]. Taking advantage of the fact that the Reagan administration won the elections in 1984, the EPA management reversed their position by trying to pass the issue on to OSHA (with weaker enforcement powers) for
regulation in 1985. There were protests from the staff of EPA who had been involved in drafting regulations and who had obtained an assurance from the Director of the EPA that the asbestos ban would not be passed on to OSHA. After threats of a congressional investigation of the OMB for corruption (giving preferential access to the asbestos industry in taking the decision to hand over the issue to OSHA), the decision to drop the ban was recently rescinded [Chemical Week, 1985; Starfield, 1985]. This entire process had little to do with health science considerations and more to do with deregulation politics within the Reagan administration [Petersen, 1984].

In South Africa, the Managing Director of Gencor was quick to be quoted in the press saying that the EPA decision to drop the ban was evidence that asbestos was safe for workers [Rand Daily Mail, 1985; Financial Mail, 1985]: There have been no pronouncements from Gencor to the effect that it is now not safe for workers since the decision has been reversed.

2.6.4 The moral or ethical basis to regulation

The asbestos story [Gee, 1984] illustrates very well the underlying reality principles at work in the social control of known (asbestos) or strongly suspected (manmade mineral fibres) hazards to human health in the workplace.

The historical reality has been the factory-laboratory with its worker-guinea pigs. Positive evidence of hazard has in the past been equally weighed with negative or inconclusive evidence.

An alternative principle - that of giving those likely to be exposed the benefit of the doubt - would be much more appropriate to developed societies committed to humanitarian values and possessing the technological wherewithal to substitute for hazardous substances. Such a starting point would weigh positive hazard evidence more heavily than negative studies, subject negative studies to excessively strict scrutiny, and most importantly await the elapse of sufficient time for suspected illness manifestations to appear (latency) before pronouncing upon the safety of the substance or a safe level at which dangerous materials can be handled.

The world has already had a bad experience with asbestos, where successive 'safe levels' had to await successive harvests of death, disease and misery
before the previous safe levels were declared unsafe and downwardly revised. This grim harvest has never yet failed to appear for workers exposed to asbestos.

2.7 CONTROL OF ASBESTOS

Because ARD's are incurable and because compensation is inadequate and difficult for resulting disability, the most rational health policy is to prevent them. The only way to do this consistent with current scientific knowledge is to stop using asbestos. In other words asbestos use should be prohibited.

Because of political and economic factors alluded to at the beginning, and the weight of powerful vested interest groups and lobbies, the simple imperative to stop using asbestos has become transformed into a process of regulation.

2.7.1 Regulation of asbestos exposure in other countries.

UK
There has been a progressively stricter regulation of asbestos usage over the last few years. In three years there have been three downward changes in the exposure limit. Currently the limit is the lowest in the world at 0.5f/ml for white and 0.2 for blue. Asbestos spraying of insulation has been banned for many years.

Scandinavian countries and Holland
Sweden [Bell, 1984], which stopped asbestos-cement production some years ago, and has had a total ban on the importation of products containing asbestos since 1982, qualified the ban in 1985 by linking it to the availability of substitutes. By June 1986 all asbestos-containing brakes will be banned except for heavy duty trucks. By 1988 a total ban is envisaged. The other Scandinavian countries and Holland are all following suit by banning imports of asbestos and asbestos-containing manufactured goods.

EEC
The limit is 1f/ml for white and 0.5 for blue. Paradoxically the UK has militated against the adoption of levels in Europe higher than its own limits.
USA
OSHA made attempts in 1983/4 to lower the limit to 0.5 or even lower to 0.2 in the form of an emergency temporary standard. These were stopped in the courts.

There is a new proposed permanent standard which envisages 0.5 for all fibre types. Industry is evidently not opposing this. Included in the standard are recommendations for education about hazards and warning labels on products.

The EPA has in the past banned asbestos patching compounds. After several twists and turns, EPA has proposed a long range program to protect the public from asbestos. Five widely used asbestos products will be banned as soon as the rule setting up the program goes into effect. These are asbestos roofing and flooring felts, vinyl-asbestos tiles, asbestos-cement pipes and fittings and asbestos clothing. These constitute a third to a half of all asbestos production in the US. All other mining, processing, manufacturing and importing of asbestos would gradually be eliminated over 10 years. Labelling of all products will be required.

The EPA is currently also considering a ban on friction products which is being opposed by Canada, the US Asbestos Information Association (an industry grouping) and the OMB. The EPA is charged with removing asbestos from the nation's schools, and funded by congress to do so to the tune of 0.5 billion to achieve this end.

ILO
The ILO has just produced a code of practice on asbestos use [ILO, 1986] setting out conditions for the protection of workers.

All of the controls above depend upon the ability to quantify exposure precisely. As we have seen above there are many unproved assumptions in the dose-response relationship, and attempts at quantification and precise risk assessment are rudimentary. It is for this reason that the recent Doll and Peto report refers to "regulation fibres" [Doll and Peto, 1985]. These are what are envisaged in the different countries' limits. Whatever measurements of these fibres tell us, it is not the whole story, and accordingly the risks associated with these limits must be interpreted cautiously.
2.8 TRENDS IN THE USE OF ASBESTOS IN OTHER COUNTRIES

2.8.1 The trend away from asbestos production in the USA and EEC countries is very clear. Imports to the EEC countries have dropped by half between 1980 and 1982 [Bell, 1984], and the same is true for the US between 1975 and 1980 [Occupational Health and Safety Newsletter, 1984a]. Large multinational asbestos companies like Eternit and Cape Industries which are based overseas have been for some years now getting rid of their investments in the asbestos mines in SA. Asbestos usage in the developed countries is on the way out. It is a matter of time before asbestos is banned outright, totally substituted for, or both.

2.8.2 A disturbing trend is the relocation of production to the less developed countries thereby shifting the risks and damage to areas where it is easier to get away with bad work hazards and practices.

2.8.3 There is increasing use of biologically safe (non-fibrous) substitutes for asbestos [Ewing et al, 1985].

Technically, adequate substitutes now exist for virtually all applications of asbestos. There is a long list of patented substitutes in the USA for most asbestos applications [EPA, 1980; Pye, 1982; Royal Canadian Commission, 1984].

As the bulk of asbestos worldwide goes into asbestos cement this is where substitution is most important. In late 1983 [New Scientist, 1983] Turner Brothers Asbestos Company in the UK announced the discovery of polyvinyl alcohol fibres as a substitute in cement products which would not require a change in production machinery. Natural organic fibre substitutes have also been developed as substitutes. Next in importance are the friction products where economically and technically effective alternatives have been available for several years now.

Economically, cost-effective substitutes may not always be available initially. The political economy of asbestos production is interesting in that as pressure increases for the phasing out of asbestos, substitutes are constantly being found. Many appear to have been in existence for many years, and are being pulled out of cold storage. When these are mass-produced in the future their relative costs should decline implying that a static view of substitution and its practicability is misleading.
2.8.4 New production technology or plant, and new processes may create unemployment for some workers and put some firms out of business, but may also create new employment.

2.8.5 The structure of the industry is also being changed [ICEP, 1984] in such a way as to make it less vulnerable to public pressure and damaging litigation. This is being done by means of the fragmentation of firms into many smaller ventures, and the nationalisation of production, notably in Canada and the USSR. Depending on the nature of the government and society it may be very difficult for the public to lobby or campaign against asbestos production and use.

2.9 THE SOUTH AFRICAN SCENE

There have been some dramatic new developments in South Africa since late 1979 [Myers, 1980].

2.9.1 The Local Asbestos Industry

By 1986 all the foreign-based transnational corporations investing in the asbestos mining industry, which is mainly crocidolite or amosite, had sold their investments to local mining houses. They have however continued to be involved in manufacturing asbestos products.

Most asbestos is still exported, emphasizing the importance of transport workers handling it in the ports and on the railways. As most internally consumed asbestos goes into the construction industry, construction workers are also an important target group.

2.9.2 Information about the asbestos hazard

SA workers and members of the public are exposed to the more dangerous varieties of asbestosis (crocidolite, amosite) as far as mesothelioma and lung cancer are concerned.

Over the last few years there have been news media revelations of serious occupational and environmental hazards in the two SA mining areas - the North Western Cape province [The Argus, 1981a; The Argus, 1981b; The Cape Times, 1981a; The Cape Times,1981b; Dempster, 1983] and the Northern
Transvaal [van Niekerk, 1984a; van Niekerk, 1984b]. These areas have produced a stream of asbestosis and mesothelioma cases, which has been only poorly documented to date. The asbestos-related lung cancer rate is as yet undocumented in SA.

Published scientific studies in South Africa (including Swaziland) have shown high prevalences of 26% asbestosis in the South African asbestos mines [Irwig and du Toit, 1984], 30% in the Swaziland chrysotile mines [McDermott et al, 1982], and 30% among crocidolite-handling dockworkers [Myers et al, 1985]. Rough estimates of prevalences among asbestos-cement workers range from 5 to 10% (8% based on the experience of the author).

A scientific study of environmental asbestos hazards to the population living in the North Western Cape mining area demonstrated excess mortality from lung cancer, mesothelioma and respiratory causes [Irwig and Botha, 1986]. When the authors attempted to present this paper at an international conference in 1979, they were allegedly prevented from doing so by the authorities in what has been interpreted as an attempt to suppress findings unfavourable to the asbestos industry [Flynn, 1982]. According to the mesothelioma register the rate of this cancer in the general population is also high despite almost certainly being an underestimate [Solomons, 1983].

Official figures for asbestosis cases compensated by the mining authorities are very high again almost certainly being underestimates.

2.9.3 Regulation of exposure

2.9.3.1 Environmental pollution
As most internally consumed asbestos goes into asbestos-cement which is extensively used in black township housing, environmental exposure to the tenants of low-cost state housing must be fairly substantial considering that dwelling units have asbestos-cement roofs and in some cases walls, and that they lack ceilings and internal wall insulation. Everite takes regular air samples in these townships and figures supplied by the company indicate a level of fibres in these townships (which have low traffic levels) but where the houses are constructed of asbestos cement) comparable with major cities of the developed world [Everite, 1986b]. Construction sites where asbestos-containing materials are being manipulated, and open air facilities with asbestos-cement fixtures had levels several times
The recent report of Doll and Peto has been criticised for their dismissal of the environmental hazard to tenants [Jenkins, 1986]. Despite the fact that domestic asbestos use is different in South Africa to that of the United Kingdom, working class living conditions in both cases must result in the release of substantial amounts of fibre into the domestic environment.

Disposal of waste is unregulated. This is a particularly severe problem for the mining areas mentioned, where children have been recorded playing on dumps of the fibre [van Niekerk, 1984c] and mining waste is used as building materials for homes.

2.9.3.2 Exposure on the Mines
There are still no statutory regulations governing exposure to miners and millers. Informal levels laid down by the government mining engineer were reduced to 2 f/ml in January 1985, but recently published literature shows exposure levels often to be in excess of 10 f/ml [du Toit and Isserow, 1983].

2.9.3.3 Exposure in the Factories
At the end of 1985 a set of draft asbestos regulations were published under the new Machinery and Occupational Safety Act (MOSA). These were very mild and had many weaknesses, such as releasing factories where asbestos is not a main product component from regulation, yet it is rumoured that they have been withdrawn as a result of management objections and referred back for redrafting. This is a recurring pattern with regulations under MOSA. In 1983 the general administrative, thermal and sanitary regulations under MOSA were also withdrawn after complaints from management. After substantial weakening they have now been re-drafted. Apart from the General Administrative Regulations, none of the others have yet been passed despite the fact that MOSA has been on the statute book since late 1983. In the case of the sanitary regulations they are in many instances weaker and less favourable than the old regulations under the Factories Act of 1941.

The current unofficial limit laid down by the Factory Inspectorate is 2 fibres/ml. The new regulations envisaged 1 fibre/ml for all types of asbestos including crocidolite.
The asbestos-cement industry claims to adhere to a self-standard of 2f/ml but it is self-regulated both in terms of biological monitoring of workers and of industrial hygiene monitoring for dust. Unfortunately the historical role of the asbestos industry in promoting its own interest and delaying and obstructing the process of regulation at all stages leaves little confidence in its ability to monitor itself with any integrity [Brodeur, 1985; Castleman B, 1985]. There is in any case no currently existing state monitoring or enforcement program which would be adequate to independently monitor exposure within these limits. It is also clear that the intention behind MOSA is to encourage industry rather than the state to do monitoring.

Warning labels on products containing asbestos are not mandatory, neither are there requirements to make available instructions on the 'safe' use of products on the market.

2.9.3.4 Deregulation - a new development
More recently a new bill has been introduced which does away with all regulation in certain areas and industries by proclamation of the state president [Temporary Removal of Restrictions on Economic Activities Bill, 1986]. This deregulation will affect health and safety regulations, sanitary and health regulations for the workplace, the use of machinery, the regulation of basic conditions at work such as times of work and rates of remuneration of workers, and will release employers from the obligation to make contributions to the workmen's compensation and unemployment insurance funds. The measure appears to be intended to promote small business, particularly Black business, and will almost certainly become law during the 1986 parliamentary session.

2.9.4 Organisation for safer working and general environments

2.9.4.1 Worker organisation
In 1980 there were no unions operative in the asbestos mining or manufacturing sectors representing Black workers. Since then there has been a dramatic increase in unionisation of asbestos-exposed workers. Independent non-racial unions now organising in this area are:

The General Workers' Union
The National General Workers' Union
The Black Allied Mining and Construction Workers Union
The South African Chemical Workers' Union
Unionisation of asbestos workers has had to be fought for every inch of the way as workers have had to contend with some of the most conservative and anti-union employers in the country. Genco's style in dealing with worker grievances, as has been mentioned, is to employ force (police), dismiss workers and employ new migrant workers, thereby dismissing the problems along with the workers. The company has responded in like manner on several occasions [SALE, 1985; SALE 1986].

The South African state through the South African Transport Services has adamantly refused to recognize the representative and independent GWU, threatening the full force of the law should there be strikes in what is an essential service. This same state that was busy at the time introducing labour reforms and had freshly adopted the recommendations of the Wiehahn commission [Wiehahn, 1979] refused to recognise the GWU as the workers' choice and insisted on dealing only with an in-house union to which its workers were obliged to belong.

Everite resisted unionisation for a long time. Recognition was only won after a turbulent period involving pamphlet smear campaigns in the company housing against the union leadership, the intervention of the police and violence to union members, and various delaying tactics.

On the other hand, other firms with long-term union experience in other countries like Turnall negotiated in good faith from the beginning. This is also the case for the private stevedoring company, South African Stevedores Ltd.

The main union organising asbestos workers is the GWU which is now recognised in several of the plants of the two largest asbestos-cement manufacturers in the country, Turnall and Everite. The GWU also organises stevedores employed by South African Stevedores in all the country's ports. These workers handle crocidolite and chrysotile for export. The union also organises warehouse workers employed by Renfreight Forwarding where the asbestos is stored prior to export. At one stage they counted as members all the port railway workers at Port Elizabeth where all crocidolite, and a lot of chrysotile export takes place. Unfortunately the railway workers are state employees and the union was never recognised. The GWU is rapidly making organisational strides and will soon represent most of the country's asbestos transport and manufacturing workers. It has recently amalgamated with the Transport and General Workers' Union.
The other unions organise only small numbers of asbestos workers. The NGWU is recognised at a Superoclava asbestos-cement plant in the Transvaal. BAMWU had all its members fired over a pay-related strike at the Gencor amosite mine at Penge in the Transvaal [van Niekerk, 1984d]. After this the union initiated a national anti-asbestos campaign to draw attention to the plight of workers. This has not had much success. Latterly SAWU has begun to take up the issue of asbestos additives in paints. There is as yet no national union in the building and construction industry, where many workers are exposed to asbestos. There is a union in the Transvaal, however, although the asbestos issue has not featured in their activities.

Workers, particularly those in the asbestos-cement industry organised by GWU, have made considerable health and safety gains against opposition from management and company medical personnel over the last few years. The asbestos-cement companies have tended to see health and safety as their prerogative and have tried to get workers to tie themselves to company health and safety policy and practices.

Workers have made the following gains at Everite:
* Crocidolite is no longer used with asbestos-cement products by Everite
* A notable increase in the rate of claims for compensation submitted by the company on behalf of workers with suspected asbestosis, and a similar increase in successful claims since the advent of unionisation of the workers
* Asbestosis sufferers receive a supplementary company pension which makes their state compensation pension up to the last basic wage before they were retired on health grounds. This lasts until pensionable age and the old-age pension is based upon continuous service with the company to retirement age.
* After persistent refusals by management and company medical personnel, there is now free access by doctors nominated by the union to company medical records. After review of the records, the company will submit claims to the Workmen's Compensation Commissioner if requested.
* Free post-employment follow-up examinations of all past workers with transport costs paid to medical centres around the country on the same basis as periodic examinations for employed workers has been provided.
* Warning labels are placed on all asbestos-containing products, and information is supplied on 'safe' product use.
* Most important of all, a serious attempt has recently been made to substitute natural cellulose fibres from cheap locally available materials.
for asbestos in virtually all flat asbestos cement products made by the company. These could account for up to 50% of production in a few years time.

The first health and safety agreement between an independent union and management was signed in early 1986 between the General Workers' Union and another asbestos-cement manufacturer Turnall (Cape)[SALB, 1986b]. This agreement achieved the right of worker participation in health and safety activities far in advance of the current health and safety legislation and practices in South African industry. Workers may elect their own safety representatives instead of having them imposed upon them by management which is the current practice in industry.

Superocla recently gave access to NWU nominated researchers for an industrial hygiene survey to measure asbestos levels in an asbestos-cement plant.

Achievements in the transport industry were safer handling methods and the introduction for the first time-of periodic health examinations conducted in some cases by doctors nominated by the GWU, and union access for health surveys to determine the extent of asbestos-related disease.

2.9.4.2 Consumer organisation

In conjunction with the National Anti-asbestos campaign mentioned above a group was set-up in the Transvaal to bring the asbestos issue to the attention of the public. These activities have not met with much success. As the really big asbestos consumers are the state housing authorities and the state departments responsible for water affairs at the various levels, the potential for consumers to exert their muscle is rather limited in South Africa.
2.9.5 Compensation

Tables 5 and 6 compare the situation with regard to compensation for asbestos related diseases on the mines for the years 1977/8 and 1984/5 [MBOD, 1978; MBOD, 1985].

**TABLE 5 CERTIFICATIONS FOR LIVING CASES: 1984/5 AND 1977/8**

<table>
<thead>
<tr>
<th>Type of Pneumoconiosis</th>
<th>White/&quot;coloured&quot;</th>
<th>Blacks all grades of compensable disease</th>
<th>Blacks compensable disease only</th>
</tr>
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<tbody>
<tr>
<td>Silicosis</td>
<td>192 261</td>
<td>987 1701</td>
<td>353 668</td>
</tr>
<tr>
<td>Coal Miners</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumoconiosis</td>
<td>11 11</td>
<td>47 95</td>
<td>38 64</td>
</tr>
<tr>
<td>Asbestosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Pleural</td>
<td>24 140</td>
<td>80 139</td>
<td>71 103</td>
</tr>
<tr>
<td>- Parenchymal</td>
<td>38 36</td>
<td>73 117</td>
<td>63 82</td>
</tr>
<tr>
<td>- Both</td>
<td>32 57</td>
<td>25 57</td>
<td>23 43</td>
</tr>
<tr>
<td>- Mesothelioma</td>
<td>13 8</td>
<td>3 10</td>
<td>1 10</td>
</tr>
<tr>
<td>- Lung Cancer</td>
<td>2 -</td>
<td>1 -</td>
<td>1 -</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td><strong>109 241</strong></td>
<td><strong>182 323</strong></td>
<td><strong>159 238</strong></td>
</tr>
<tr>
<td>Other Pneumoconiosis</td>
<td></td>
<td>1 12</td>
<td>1 6</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td><strong>312 453</strong></td>
<td><strong>1217 2131</strong></td>
<td><strong>551 996</strong></td>
</tr>
</tbody>
</table>

Asbestos related

Pneumoconiosis as a % of total

It is apparent from these tables that the numbers compensated have fallen by about half for Blacks in all categories for "all grades of compensable disease". For whites and "coloureds" however, the numbers compensated have remained constant with the exception of those compensated for pleural asbestosis. There is a 83% decrease in the numbers compensated for pleural asbestosis in this group. While the overall decline is probably due to the decline in numbers of miners over this period, the decrease in pleural asbestosis diagnosed cannot be explained in this way. Despite the fact that pleural asbestosis has been found to be associated with increased morbidity and mortality [Baker et al, 1985; Beritic, 1985; Finkelstein and Vingilis, 1984; McGavin, 1984; McCloud and Woods, 1985], and there has been pressure to exclude these cases from compensation benefits on the grounds that they do not suffer functional loss. It was already clear in 1980 [Myers, 1980] that the compensation authorities were about to deal with what was then the largest category (58%) of compensable ARD's. By 1984 this had been reduced to 22% for whites and "coloureds".

Asbestos-related pneumoconiosis as a percentage of total pneumoconiosis remained the same for Blacks, and decreased slightly for whites and "coloureds".

In the past very few Black workers applied for compensation outside of the mines. The mines have their own medical services and are obliged to perform frequent periodic examination on workers to check for the existence of pneumoconiosis. As a result of this system, relatively many Black
Mineworkers have been compensated for asbestosis when compared with workers in industry. Yet, as Table 6 shows, there is racial inequality in the rate at which workers are compensated given the representation of race groups in the industry. Table 7 shows further that this inequality is particularly pronounced for monetary awards. Blacks, therefore continue to be less likely than whites to be compensated in the first place, and when they are, they receive very much less money.

<table>
<thead>
<tr>
<th></th>
<th>Whites</th>
<th>Coloured</th>
<th>African</th>
<th>African post-mortem</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumoconiosis without</td>
<td>20 126</td>
<td>10 734</td>
<td>2 051</td>
<td>1 368</td>
</tr>
<tr>
<td>functional disability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pneumoconiosis with TB</td>
<td>33 207</td>
<td>17 711</td>
<td>2 461</td>
<td>1 641</td>
</tr>
<tr>
<td>functional disability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuberculosis only</td>
<td>8 386</td>
<td>4 474</td>
<td>1 119</td>
<td>559</td>
</tr>
</tbody>
</table>

Source: The Occupational diseases in mines and works act no 78 of 1973, as amended by:
- Act no 45 of 1975
- Act no 83 of 1979
- Act no 83 of 1980
- Act no 66 of 1981
- Act no 105 of 1985

Table 7 shows that things have not improved much in this regard since 1977.

Figures for those compensated in industry are unknown as the Workmen's Compensation Commissioner does not publish them or make them available.

Most existing compensation benefits have resulted historically from the activities in the early part of the century of organised white workers. As there were relatively few white workers, and Blacks were generally excluded
from these benefits, a relatively good but underutilised system of compensation developed. Benefits were extended on a racially discriminatory basis to Blacks over time.

Since the radical alteration in the labour scene during the 1970's and the recommendations of the Wiehahn Commission that Black trade unionism be legalised, there has been real and potential pressure on the compensation system for an increased volume of claims and an equalisation in the monetary awards to successful claims.

With the increased activity of independent unions in industry since the late 1970's and early 1980's, the number of workers submitting claims to the Workmen's Compensation Commissioner has increased substantially [SALB, 1985a; IHRG, 1985; IHRG, 1986; Myers et al, 1986; Leger et al 1986].

Such concerns are reflected in the report of the Niewenhuizen Commission of enquiry into compensation for occupational diseases which reported in 1979. In anticipation of a future rationalisation and deracialisation of the compensation legislation, and the resulting demands on the compensation funds, the commission recommended tightening up compensation practices [Niewenhuizen, 1981].

Even before the emergence of any draft legislation arising out of this commission, behind-the-scenes administrative measures have been taken to tighten up on compensation practices. A series of unilateral actions by the Workmen's Compensation Commissioner, making compensation less accessible and less remunerative to workers than it has been in the past, has taken place [SALB, 1984; IHRG, 1985; Workmen's Compensation Commissioner, 1986; : SALB, 1986a; IHRG, 1986, Myers et al, 1986].

Concomitantly, several claims for transport workers suffering from asbestosis have been pending for more than two years with the Workmen's Compensation Commissioner. Despite the fact that they have been medically certified by the state body used by the Commissioner - the MEBOD, their cases have not progressed. There have been innumerable delays at the Commissioner's office in processing their claims and no opportunity has been lost to hold up the procedure or to disqualify claimants.

These and other claims arising from the health and safety activities of Black trade unions concerned for the welfare of their members, have
appeared to trigger such retrogressive moves.

Since 1980 there have been no improvements of the compensation legislation other than slight upward adjustments of payments at less than the rate of inflation. The same gaps in the legislation exist as before, viz. lung cancer is still not officially compensable in the asbestos industry (or any other industry apart from the mining industry) despite the strong association between asbestosis and lung cancer [Berry, 1981].

The compensation system remains unrepresentative of the needs and requirements of those it is supposed to benefit, viz. labour. Until such time as the compensation structure is fundamentally altered, workers are unlikely to benefit significantly from an important source of social welfare in an industrialised economy.


Bell J (1984) Indecision is the biggest risk. New Scientist 13/9/84 103:16-18


Berry G (1961) Mortality of workers certified by pneumoconiosis medical panels as having asbestosis. BJIM 36:130-137


The Cape Times (1981a) Lethal asbestos polluting Prieska 27/11/81

The Cape Times (1981b) Cancer inquiry at Cape asbestos town 17/12/12


Everite (1986a) Presentation on asbestos and health and alternative fibre programme: Everite Safety and Health Programme: What you should know about Asbestos and Health February 1986.


Financial mail (1985) Less heat on asbestos. Financial Mail 15/2/85


van Niekerk P (1984b) 100 deaths each year linked to asbestos Rand Daily Mail August 21 1984.


Occupational Health & Safety (1984a) Occupational Health & Safety 53(9):60


Occupational health and safety (1984c) Court abolishes asbestos emergency temporary standard, finds no 'grave risk to workers'. Occupational health and safety 53(4):21


Rand Daily Mail (1985) Asbestos rethink a boost for SA. 5/2/85


SALB Briefing (1986b) Health and Safety negotiations between GWU and Turnall. In press.


3 SECTION B: AN ECONOMIC PROFILE OF THE ASBESTOS INDUSTRY IN SOUTH AFRICA

3.1 OWNERSHIP OF THE SOUTH AFRICAN MINES

The asbestos mining industry has been characterised by increasing concentration of ownership in the last seven years and a withdrawal of foreign interest. In 1978, four major companies, two of which were foreign, controlled the asbestos mining industry in S.A.: General Mining and Finance Corporation or Gencor (SA), Barlow Rand (SA), Lonrho (UK), and Eternit (Swiss-Belgian) company.

In 1979, the Barlow-Rand group, through their subsidiary, the Transvaal Consolidated Land and Exploration Co Ltd (TCLE), bought out the mining interests of the Cape Industries Group, a subsidiary of Charter Consolidated. Cape Industries had owned 100% of Cape Blue Mines (Pty) Ltd, controlling three crocidolite mines in the N.W. Cape and Egnep (Pty) Ltd, mining amosite at the Penge mine in the E Transvaal. The interests of Asbestos Investments (Pty) Ltd (Asbesco), controlled by Everite, a subsidiary of the Swiss-Belgian Eternit group, were purchased by TCLE in 1980. Asbesco had owned the entire shareholdings of Kuruman Cape Blue Asbestos (Pty) Ltd and Danielskuil Cape Blue Asbestos (Pty) Ltd, with a combined total of eight mines in the Kuruman and Postmasburg areas. Competition between Gencor’s subsidiary, the Griqualand Exploration and Finance Company Ltd (Gefco) and TCLE intensified in this period, resulting ultimately in 1981 in Gencor’s R43 million acquisition, through Gefco, of the entire mining holdings of TCLE.

At present one company, Gencor, through two partly owned subsidiaries, Msauli Asbestos Bpk and Gefco, and via its monopoly of the marketing of S.A.-produced asbestos, controls the entire crocidolite, amosite and chrysotile asbestos mining industry in S.A. The amalgamation of 1981 has been seen as a means of rationalising respective operations and permitting substantial cost savings through production, exploration and sales integration\(^1\). Thus Gefco has been able to close single uneconomic mines as market conditions have required and could bring them back into production without incurring any additional capital costs, hence concentrating production in those which generate profits during the present period of slack demand.

FIGURE 1: MAP OF THE ASBESTOS MINING AREA
Fig. 1 - Asbestos Mines in South Africa, 1983

Legend:
- Crocidolite (amosite)
- Chrysotile

1. Pomfret
2. Whitelode
3. Vondrag
4. Breby
5. Kipfontein
6. Emamasho
3.2 DETAILED MINE OWNERSHIP IN SOUTH AFRICA

3.2.1 Gencor

Formed by the merger of General Mining and Finance Corp Ltd and Union Corporation Ltd in 1980, its controlling shareholder is SANLAM(2) via Federale Mynbou, which owned 51.6% of the issued share capital of Gencor in 1984.(3) Gencor has a wide variety of mining interests of which its 1984 income from asbestos holdings comprised only 3.5%. Gencor reported a net income after taxation in 1984 of R316.6 million(3).

Gencor owns 44.2% of Gefco (49.9% in 1983) which produces the amphiboles, crocidolite in the N.W. Cape and amosite in the E Transvaal, and 39.3% of Msauli (no change from 1983) which produces chrysotile in the KaNgwane homeland near the Swaziland border. The market value of Gefco holdings in 1984 was R22.2 million and of Msauli, R2.7 million. The combined 1984 income after taxation was R11.2 million (R25.0 million in 1983), the combined capital expenditure R3.7 million (R5.6 million in 1983) and the labour employed 7300 (9000 in 1983).

3.2.1.1 Msauli Asbestos Bpk

The company owns the entire issued share capital of African Chrysotile Asbestos Ltd which sells chrysotile asbestos produced from its mine, Diepgezet, near Barberton. The income after taxation of this company is shown for the last 7 years(4).

<table>
<thead>
<tr>
<th>Year</th>
<th>78</th>
<th>79</th>
<th>80</th>
<th>81</th>
<th>82</th>
<th>83</th>
<th>84</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income (R m)</td>
<td>4.1</td>
<td>3.5</td>
<td>3.2</td>
<td>2.3</td>
<td>1.0</td>
<td>3.3</td>
<td>0.6</td>
</tr>
</tbody>
</table>

3.2.1.2 Gefco

Gefco is the world's only significant producer of the amphiboles, crocidolite and amosite(5). A list of subsidiaries, including the selling organisations is shown in Table 1(6).
<table>
<thead>
<tr>
<th>Country</th>
<th>Nature of business</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td></td>
</tr>
<tr>
<td>Elcor Investments (Pty)Ltd</td>
<td>Investments</td>
</tr>
<tr>
<td>Coretsi Asbestos (Pty)Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Merencor Asbestos Mines (Pty)Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Griqualand Asbes (Pty) Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Griqualand Chrysotile Mines (Pty) Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Lake Asbestos Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Saamwerk Asbestos Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Sweeney Estates Asbestos Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Asreco Forwarding Agency (S.A.)(Pty)Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Central (CAC) (Pty) Ltd</td>
<td>Selling organisation</td>
</tr>
<tr>
<td>Central Asbestos (S.A.) (Pty) Ltd</td>
<td>Selling organisation</td>
</tr>
<tr>
<td>Cape Blue Mines Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Groenwater Asbestos Mining Co (Oty) Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Postmasburg Cape Blue Asbestos (Pty) Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Rooipoort Blue Asbestos (Pty) Ltd.</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Egnep Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Amosa (Pty) Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Commodata (Pty) Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Consolidated Blue Asbestos Corp.(Pty)Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Firetard (Pty) Ltd</td>
<td>Dorman</td>
</tr>
<tr>
<td>Senekal Mine Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Malotile Properties Ltd</td>
<td>Owns mineral rights</td>
</tr>
<tr>
<td>Commonwealth &amp; Overseas Asbestos Corp Ltd</td>
<td>Selling organisation</td>
</tr>
<tr>
<td>Kuruman Cape Blue Asbestos (Pty) Ltd</td>
<td>Asbestos mining</td>
</tr>
<tr>
<td>Botswana</td>
<td></td>
</tr>
<tr>
<td>Central Asbestos (Botswana) (Pty) Ltd</td>
<td>Dorman</td>
</tr>
<tr>
<td>Swaziland</td>
<td></td>
</tr>
<tr>
<td>Havelock Chrysotile Mine</td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>Asbestos Refining Co (Zimbabwe) (Pty) Ltd</td>
<td>Dorman</td>
</tr>
</tbody>
</table>
United Kingdom
Central Asbestos Co Ltd Selling organisation
Central Minerals & Trading Ltd Trade in minerals
Sprayed Insulations Ltd Sprayed insulation processes
Central Tradimpex Ltd Trade in minerals

Switzerland
Cenbes SA Selling organisation

At present, Gefco is operating its crocidolite mines, Pomfret, Klipfontein and Whiteale in the Cape and Penge Amosite mine in the Eastern Transvaal(7). Gefco also owns two mines in Bophuthatswana located at Bute and Coretsi. Ore from these mines is processed in South Africa at the Gefco Elcor plant.

Gefco income after taxation for the period 1977-1983 was:

<table>
<thead>
<tr>
<th>Year</th>
<th>Income (Rm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77</td>
<td>11.4</td>
</tr>
<tr>
<td>78</td>
<td>8.5</td>
</tr>
<tr>
<td>79</td>
<td>4.7</td>
</tr>
<tr>
<td>80</td>
<td>3.0</td>
</tr>
<tr>
<td>81</td>
<td>7.8</td>
</tr>
<tr>
<td>82</td>
<td>17.5</td>
</tr>
<tr>
<td>83</td>
<td>21.7</td>
</tr>
</tbody>
</table>

3.2.2 The Lonrho Group (UK)

This company owns a majority share in the Duiker Exploration Company (8) which owns the entire holdings of:

a) Emmarentia Asbestos (Pty) Ltd with a mine and mill near Postmasburg
b) a newly developed mine in Krantz Kloof and
c) Wandrag Asbestos (Pty) Ltd at Kuruman, with a mill and two mines, Etric and England.

Wandrag is the principal source of supply, the Duiker company producing about 9000 tons of crocidolite a year. Its entire output is delivered to Gefco for marketing and blending with Gefco's own product. Gefco thus has full control of amphibole marketing. In 1984, asbestos sales were reduced by 8% to 9261 tons and are currently at a level of approximately 8000 tons a year. Operating income was reduced by 4% to R1.72 million and capital expenditure to R0.77 million(9).

3.2.3 A few small Independent Chrysotile Mines operate in the Eastern Transvaal:

(i) Kaapsehoop Asbestos (Pty) Ltd in Nelspruit, contributing 4.5% of total chrysotile production in 1983(10) and
(ii) the Stella Mine in the Nelspruit district, contributing 2.2% of total chrysotile production in 1983(10). Msauli markets a percentage of asbestos from these two mines giving it effective control of chrysotile marketing.

(iii) Hooggenoeg Asbestos Mine in Pietersburg, owned by B J Rogers, is included in the S.A. mining and engineering yearbook 1984/1985 as a functioning mine.

3.3 PRODUCTION AND SALES OF RAW ASBESTOS IN SOUTH AFRICA

Detailed information on the production and sales figures of Msauli and Gefco are not obtainable as the companies ceased publishing these details at the end of 1981, given the increasingly competitive nature of the market. In addition, for political and commercial reasons, sales destinations are not revealed.

However from 1982, S. A. government statistics of asbestos sales of crocidolite can be assumed to be due to Gefco production minus the 8 to 9 thousand tons (1984) produced annually by Duiker Exploration Company. The amosite production is due to Gefco alone. Chrysotile production may be attributed to Msauli except for approximately 7%, the contribution from independent mines.

3.3.1 Production

The production figures for selected years between 1960 and 1983 are shown in Table 2(11). The 1984 production was 167,389 tons, 44% of production levels in the peak year 1977.
### TABLE 2 S.A. PRODUCTION OF ASBESTOS IN SELECTED YEARS

<table>
<thead>
<tr>
<th>Year</th>
<th>Mass of individual fibre groups</th>
<th>Total Mass produced</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chrysotile</td>
<td>Amosite</td>
</tr>
<tr>
<td>1960</td>
<td>26.73</td>
<td>62.25</td>
</tr>
<tr>
<td>1965</td>
<td>35.28</td>
<td>73.23</td>
</tr>
<tr>
<td>1970</td>
<td>52.80</td>
<td>97.38</td>
</tr>
<tr>
<td>1975</td>
<td>99.75</td>
<td>88.41</td>
</tr>
<tr>
<td>1977</td>
<td>111.58</td>
<td>66.98</td>
</tr>
<tr>
<td>1978</td>
<td>79.51</td>
<td>40.53</td>
</tr>
<tr>
<td>1980</td>
<td>106.94</td>
<td>51.65</td>
</tr>
<tr>
<td>1981</td>
<td>76.77</td>
<td>56.83</td>
</tr>
<tr>
<td>1982</td>
<td>81.13</td>
<td>43.45</td>
</tr>
<tr>
<td>1983</td>
<td>93.02</td>
<td>40.66</td>
</tr>
</tbody>
</table>

**Source:** S.A. Minerals Bureau: Special report on minerals, 1983

**Note:** Mass in tons x 1000

In the period 1960 to 1980, production of asbestos fibre increased by 74%. Since 1980, however, production rates have declined in keeping with the reduced world demand for fibres, especially in the building and construction industries. The number of mines in operation has decreased from 43 in 1972 to 7 in 1983 and the labour employed from 21324 to 5664 in these years, respectively

The production mix of the three types of fibre and the relative contributions in terms of value for local and export sales are shown in Table 3 for 1977 and 1983.

### TABLE 3 PRODUCTION AND VALUE OF DIFFERENT FIBRE TYPES

<table>
<thead>
<tr>
<th></th>
<th>% of total prod</th>
<th>% of export value</th>
<th>% of local value</th>
</tr>
</thead>
<tbody>
<tr>
<td>crocidolite</td>
<td>53</td>
<td>40</td>
<td>68</td>
</tr>
<tr>
<td>amosite</td>
<td>18</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>chrysotile</td>
<td>29</td>
<td>42</td>
<td>15</td>
</tr>
</tbody>
</table>

In 1983, the production figures of crocidolite, amosite and chrysotile were 44%, 61% and 83% of the 1977 figures respectively. After 1977, a peak
year, a large drop in production may be attributed to a downturn in demand in consequence of legislation limiting the use of all types of fibres because of health risks. The production quantities of amosite and chrysotile remained relatively constant or increased after 1977, while crocidolite consistently decreased. The crocidolite mines are currently operating at 65% of capacity. Thus while the bulk of production in 1977 was crocidolite, in recent years quantities mined are considerably less and on a par with chrysotile. The bulk of export revenue in recent years was provided by crocidolite (68%) and almost entirely from amphibole production (85%). The contribution to export revenue in recent years, therefore, has dropped sharply, reflecting increased public awareness of the health hazards of asbestos and, in particular, of the increased carcinogenic properties of this particular fibre. Concomitantly, the quantity of crocidolite consumed locally has increased, though it began to drop off again in recent years with decreased demand in the construction industry.

3.3.2 Local Sales

In 1984, only 7.5% of total production in S.A. was consumed locally; the bulk was exported. The figures for local sales and export sales in terms of the quantity of each type of fibre produced and its value in rands are shown in Table 4 for the years between 1960 and 1983(11).

**TABLE 4 LOCAL SOUTH AFRICAN SALES OF ASBESTOS**

<table>
<thead>
<tr>
<th>Year</th>
<th>Chrysotile Mass</th>
<th>Chrysotile Value</th>
<th>Amosite Mass</th>
<th>Amosite Value</th>
<th>Crocidolite Mass</th>
<th>Crocidolite Value</th>
<th>Totals Mass</th>
<th>Totals Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>3.71</td>
<td>243.9</td>
<td>2.83</td>
<td>194.9</td>
<td>2.71</td>
<td>401.3</td>
<td>9.45</td>
<td>840.1</td>
</tr>
<tr>
<td>1965</td>
<td>11.44</td>
<td>820.9</td>
<td>2.50</td>
<td>194.8</td>
<td>6.40</td>
<td>773.4</td>
<td>20.34</td>
<td>1789.1</td>
</tr>
<tr>
<td>1970</td>
<td>21.52</td>
<td>1825.0</td>
<td>1.67</td>
<td>176.1</td>
<td>8.60</td>
<td>1092.2</td>
<td>31.79</td>
<td>3093.3</td>
</tr>
<tr>
<td>1975</td>
<td>15.43</td>
<td>2074.0</td>
<td>5.13</td>
<td>996.1</td>
<td>6.12</td>
<td>1662.9</td>
<td>26.68</td>
<td>4733.0</td>
</tr>
<tr>
<td>1977</td>
<td>12.31</td>
<td>2360.2</td>
<td>2.73</td>
<td>804.9</td>
<td>2.27</td>
<td>1191.2</td>
<td>17.31</td>
<td>4356.3</td>
</tr>
<tr>
<td>1978</td>
<td>12.05</td>
<td>2555.9</td>
<td>1.91</td>
<td>607.7</td>
<td>4.69</td>
<td>2513.8</td>
<td>18.65</td>
<td>5677.4</td>
</tr>
<tr>
<td>1980</td>
<td>12.14</td>
<td>3074.2</td>
<td>2.34</td>
<td>811.1</td>
<td>9.09</td>
<td>5231.1</td>
<td>23.57</td>
<td>9116.4</td>
</tr>
<tr>
<td>1981</td>
<td>11.86</td>
<td>3597.5</td>
<td>2.74</td>
<td>1023.0</td>
<td>8.00</td>
<td>5378.2</td>
<td>22.56</td>
<td>9998.7</td>
</tr>
<tr>
<td>1982</td>
<td>11.23</td>
<td>3789.1</td>
<td>2.04</td>
<td>865.8</td>
<td>7.40</td>
<td>4836.8</td>
<td>20.67</td>
<td>8491.7</td>
</tr>
<tr>
<td>1983</td>
<td>9.11</td>
<td>3183.3</td>
<td>1.73</td>
<td>686.6</td>
<td>4.60</td>
<td>2714.3</td>
<td>14.84</td>
<td>6588.6</td>
</tr>
</tbody>
</table>

**Source:** S.A. Minerals Bureau: Special report on minerals, 1983

**Notes:** Mass in tons \( \times 1000 \)

Value in R \( \times 1000 \)
In 1984, local sales were 12,615 tons valued at R5,292,043. This represents a drop of 56% in sales tonnage locally since 1981. Between 1960 and 1980 the total local sales increased by 23.6%. The deterioration in domestic demand since that time reflects stagnation in the building and construction sectors of the market.

3.3.3 Export sales

The quantity exported in 1984 was 163,107 tons which was valued at R95,655,611, only 66% of total exports in 1980. The decrease since 1977 reflects both the detrimental effect of the world economic recession and the impact of environmental and health lobbies in the USA, the UK and Europe, aimed at a more stringent control of asbestos working conditions, and even a complete elimination of its use.

TABLE 5a EXPORTS OF ASBESTOS FIBRES FROM RSA FOR SELECTED YEARS

<table>
<thead>
<tr>
<th>Year</th>
<th>Chrysotile mass</th>
<th>Chrysotile value</th>
<th>Amosite mass</th>
<th>Amosite value</th>
<th>Crocidolite mass</th>
<th>Crocidolite value</th>
<th>Total mass</th>
<th>Total value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>22.93</td>
<td>2691.6</td>
<td>61.85</td>
<td>6373.2</td>
<td>73.72</td>
<td>11684.2</td>
<td>158.50</td>
<td>20749.0</td>
</tr>
<tr>
<td>1965</td>
<td>22.95</td>
<td>1836.6</td>
<td>68.92</td>
<td>7540.5</td>
<td>98.22</td>
<td>14042.3</td>
<td>190.09</td>
<td>23419.4</td>
</tr>
<tr>
<td>1970</td>
<td>32.99</td>
<td>2607.5</td>
<td>95.00</td>
<td>10614.8</td>
<td>127.81</td>
<td>18251.9</td>
<td>255.80</td>
<td>31474.2</td>
</tr>
<tr>
<td>1975</td>
<td>81.00</td>
<td>10454.6</td>
<td>90.90</td>
<td>25974.8</td>
<td>166.90</td>
<td>50168.3</td>
<td>338.80</td>
<td>86597.7</td>
</tr>
<tr>
<td>1977</td>
<td>97.93</td>
<td>19494.0</td>
<td>61.08</td>
<td>23459.5</td>
<td>170.09</td>
<td>90417.4</td>
<td>329.10</td>
<td>133370.9</td>
</tr>
<tr>
<td>1978</td>
<td>75.16</td>
<td>14959.3</td>
<td>54.69</td>
<td>22639.3</td>
<td>125.63</td>
<td>69875.7</td>
<td>255.49</td>
<td>107474.3</td>
</tr>
<tr>
<td>1980</td>
<td>91.07</td>
<td>17817.1</td>
<td>50.14</td>
<td>20033.0</td>
<td>104.65</td>
<td>55181.3</td>
<td>245.86</td>
<td>93031.4</td>
</tr>
<tr>
<td>1981</td>
<td>68.62</td>
<td>16471.6</td>
<td>42.44</td>
<td>21056.5</td>
<td>112.18</td>
<td>69538.4</td>
<td>223.24</td>
<td>107336.5</td>
</tr>
<tr>
<td>1982</td>
<td>70.20</td>
<td>18499.2</td>
<td>42.21</td>
<td>24145.8</td>
<td>74.13</td>
<td>55593.0</td>
<td>186.54</td>
<td>98238.0</td>
</tr>
<tr>
<td>1983</td>
<td>85.38</td>
<td>26216.7</td>
<td>37.47</td>
<td>24323.7</td>
<td>63.13</td>
<td>53770.4</td>
<td>185.98</td>
<td>104310.8</td>
</tr>
</tbody>
</table>

Source: S.A. Minerals Bureau: Special report on minerals, 1983

Notes: Mass in tons X 1000
Value in R X 1000

Figures from the Minerals Bureau of South Africa shown in Table 5 suggest the destinations of exported asbestos. The USA in 1983 consumed 5.3% of total SA exports. The profile consisted of 53% crocidolite, 5.3% amosite and 42% chrysotile (13).

The geographic distribution of asbestos consumption has changed considerably in recent years. As US and European use has declined, sales
to Japan and third-world countries have risen\(^{(14)}\).

### TABLE 5b DESTINATION OF RSA'S ASBESTOS EXPORTS 1982

<table>
<thead>
<tr>
<th>region</th>
<th>chrysotile</th>
<th>amosite</th>
<th>crocidolite</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>% rank</td>
<td>% rank</td>
</tr>
<tr>
<td>Europe</td>
<td>2.3 2</td>
<td>35.1 2</td>
<td>32.3 1</td>
</tr>
<tr>
<td>N America</td>
<td>0.4 5</td>
<td>2.4 4</td>
<td>14.8 3</td>
</tr>
<tr>
<td>S America</td>
<td>- 6</td>
<td>1.5 5</td>
<td>6.0 6</td>
</tr>
<tr>
<td>Africa</td>
<td>0.7 4</td>
<td>- -</td>
<td>10.3 5</td>
</tr>
<tr>
<td>Middle East</td>
<td>1.9 3</td>
<td>1.2 6</td>
<td>25.7 2</td>
</tr>
<tr>
<td>Far East</td>
<td>94.7 1</td>
<td>48.7 1</td>
<td>10.9 4</td>
</tr>
<tr>
<td>Oceania</td>
<td>- -</td>
<td>11.1 3</td>
<td>- -</td>
</tr>
</tbody>
</table>

Source: S.A. Minerals Bureau: Special report on minerals, 1983

As Swaziland's product is marketed through South Africa, their export figures for 1983 could be used as an approximate indicator of the destinations of South African exports.

### TABLE 5c DESTINATION OF SWAZI EXPORTS 1983

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>MASS IN TONS</th>
<th>COUNTRY</th>
<th>MASS IN TONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSA</td>
<td>7533</td>
<td>Eire</td>
<td>2148</td>
</tr>
<tr>
<td>Taiwan</td>
<td>2840</td>
<td>Japan</td>
<td>1278</td>
</tr>
<tr>
<td>India</td>
<td>2664</td>
<td>Thailand</td>
<td>1500</td>
</tr>
<tr>
<td>UK</td>
<td>2733</td>
<td>Zambia</td>
<td>1381</td>
</tr>
<tr>
<td>Israel</td>
<td>2343</td>
<td>Finland</td>
<td>1154</td>
</tr>
</tbody>
</table>

Of Swaziland's annual chrysotile production of 31 174 tons, valued at R19 535 055, the following countries purchased less than 1000 tons: Uganda, Turkey, Spain, Singapore, Kenya, Italy, Indonesia, Greece, Germany, Chile, Belgium, Czechoslovakia and Burundi.\(^{(15)}\)

In 1984, asbestos was the 7th largest earner of export revenue of metals and minerals in the RSA, behind (in order) gold, coal, diamonds, iron ore, copper and manganese, representing 0.9% of total export sales.\(^{(15)}\) In 1977 asbestos was the fifth most important mineral (including metals) contributing 2.4% of total mineral sales.
3.4 SOUTH AFRICA AND THE WORLD MARKET: OUTLOOK FOR THE FUTURE

3.4.1 World Production

According to the US Bureau of Mines, some 200 million tons of identified resources of asbestos and 45 million tons of hypothetical resources (undiscovered but potentially existing in producing regions) of asbestos are present in the world today. South Africa has 7.8 million tons of reserves at present (16).

World production is dominated by the Soviet Union and Canada. South Africa is the world's third largest producer, contributing 5% of total annual supply. In 1983 4.16 million tons of asbestos were produced worldwide: the supply share of different countries is shown in Table 6 (17).

<table>
<thead>
<tr>
<th>TABLE 6a</th>
<th>WORLD PRODUCTION OF ASBESTOS BY COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSRe</td>
<td>2020</td>
</tr>
<tr>
<td>Canada</td>
<td>1493</td>
</tr>
<tr>
<td>S Africa</td>
<td>249</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>260</td>
</tr>
<tr>
<td>Brazil</td>
<td>138</td>
</tr>
<tr>
<td>Chinae</td>
<td>140</td>
</tr>
<tr>
<td>Italy</td>
<td>144</td>
</tr>
<tr>
<td>Greece</td>
<td>100</td>
</tr>
<tr>
<td>USA</td>
<td>93</td>
</tr>
<tr>
<td>Swaziland</td>
<td>34</td>
</tr>
</tbody>
</table>

In addition, asbestos (less than 40 000 tons) is produced in Afghanistan, Argentina, Australia, Bulgaria, Cyprus, Egypt, India, Republic of Korea, Japan, Mocambique, Taiwan, Turkey, Yugoslavia, North Korea, Czechoslovakia and Romania.

Source: USA Bureau of minerals report 1983

* Mass in tons X 1000
* e estimated
TABLE 6b  WORLD PRODUCTION SHARE (1983)

<table>
<thead>
<tr>
<th>Country</th>
<th>% share</th>
</tr>
</thead>
<tbody>
<tr>
<td>USSR/China</td>
<td>57</td>
</tr>
<tr>
<td>Canada</td>
<td>20</td>
</tr>
<tr>
<td>S Africa</td>
<td>5</td>
</tr>
<tr>
<td>Other</td>
<td>18</td>
</tr>
</tbody>
</table>

Of total world production, some 90 to 95% is comprised of chrysotile, with Canada and the USSR producing only this fibre. In South Africa, 60% of annual production is due to the amphiboles, amosite and crocidolite, and together they account for 75% of export sales\(^{(18)}\). Crocidolite alone was responsible for 52% of export sales in 1983, some 16% lower than the 1973 figure. South Africa is the world's only significant amphibole supplier.

South African asbestos is sold through private negotiation and prices are not published. Each of the many different grades and types commands its own price. Canada, as the largest producer in the Western world has tended to be a price setter in chrysotile. Amphiboles due to their superior physical properties, in normal economic periods command a higher price than chrysotile.

3.4.2 World Consumption

A wide number of applications for asbestos fibres exist. More than 3000 products contain asbestos in some form. The breakdown of US consumption by end use for 1983 is shown in Table 7\(^{(19)}\). By far the largest use of asbestos is for asbestos-cement manufacture, accounting for 43% of total US consumption in 1982. The various products used in the construction industry consumed about 72% of asbestos fibre in this year. Table 8\(^{(20)}\) shows the consumption of asbestos in the USA, UK and Japan from 1978 to 1984. These countries account for only 15-20% of total world demand however. The USSR consumes 40%, Europe 10% and the balance is used by the developing countries\(^{(21)}\). Construction comprises almost all of total consumption in these developing countries.
<table>
<thead>
<tr>
<th>TABLE 7 UNITED STATES CONSUMPTION BY END USE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>1982(%)</td>
</tr>
<tr>
<td>Asbestos cement pipes</td>
</tr>
<tr>
<td>sheets</td>
</tr>
<tr>
<td>Flooring products</td>
</tr>
<tr>
<td>Roofing products</td>
</tr>
<tr>
<td>Friction products</td>
</tr>
<tr>
<td>Packing and gaskets</td>
</tr>
<tr>
<td>Other* (coatings, compounds, textiles)</td>
</tr>
<tr>
<td>insulation, paper, plastics</td>
</tr>
<tr>
<td>% used in construction</td>
</tr>
</tbody>
</table>

Source: USA Bureau of Minerals Reports 1982 and 1983

*"other" is a suspiciously large category in 1983 resulting probably in an underestimation of the % used in construction.

<table>
<thead>
<tr>
<th>TABLE 8a CONSUMPTION OF ASBESTOS FIBRES - DEVELOPED COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASS IN TONS X 1000</td>
</tr>
<tr>
<td>USA</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Japan</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>UK</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
</tbody>
</table>

Source: USA Bureau of minerals reports 1982 and 1983

<table>
<thead>
<tr>
<th>TABLE 8b CONSUMPTION OF ASBESTOS FIBRES - THIRD WORLD COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>India</td>
</tr>
<tr>
<td>Indonesia</td>
</tr>
<tr>
<td>Korea</td>
</tr>
<tr>
<td>Malaysia</td>
</tr>
<tr>
<td>Taiwan</td>
</tr>
<tr>
<td>Thailand</td>
</tr>
<tr>
<td>Subtotal</td>
</tr>
</tbody>
</table>

3.4.3 World Trends

Until 1977, the world asbestos market showed sustained growth. Increasingly restrictive legislative measures, limiting the use of all types of fibres for health reasons, were implemented around this time in the USA, UK and Europe. A sharp drop in demand for asbestos resulted, and this trend was exacerbated by the recession of the 1980's. Growth in the construction industry has been hampered by high interest rates and the consumption of asbestos containing building materials has necessarily fallen. Another large consumer of asbestos, the automobile industry, has been severely depressed for some years. In third world countries where health legislation concerning asbestos is often absent, an expansion in demand, compensating for the falloff in the industrialised countries, has not been possible. Imports of fibres have grown only slowly due to financial constraints. Demand from the Middle East has fallen with the oil price.

As can be seen from Table 8, consumption in the USA between the years 1979 and 1983 fell by 39%. The US economy now only accounts for some 8% of the total sales of raw asbestos. In Britain, consumption between 1975 and 1981 dropped by 52%. The trend is mirrored in South Africa: local consumption of asbestos has fallen by 56% since 1981. The geographical distribution of asbestos consumption has therefore changed in recent years. As US and European use has declined, sales to Japan and the Third World countries have risen, but as Table 8 shows, not sufficiently to offset decreased consumption in the Western World.

The supply of asbestos has had to be curtailed in response to the lower level of demand. Canadian production in 1983 was only 56% of the 1979 output. In South Africa, those mines that are currently open are working at 65% of capacity. An excess supply of asbestos has resulted in intense competition between suppliers and stock build-up in the face of reduced demand has been inevitable. In 1981 extremely high stock levels promoted price cutting for the first time in many years. The demand for South Africa's crocidolite has been weak; it is thought that prices have not been raised since 1975 - a significant decline in real terms\(^{21}\). Chrysotile prices overseas have not been changed since 1981 and this probably applies to South African chrysotile too. Closure of mines and decreased employment in mines have been a feature of these pressures.
The large stocks of asbestos held by the mines and the diminished capacity at which these mines have been forced to operate means that the potential to expand supply rapidly is considerable. But it would seem that a worldwide recovery in demand is not likely in the foreseeable future.

Recovery is of necessity related to a recovery in the construction industry, which consumes the bulk of raw asbestos output. In industrialised countries, the growth of this sector is expected to be slow due to high interest rates and slow overall economic growth. If the proposal of the Environmental Protection Agency in the USA to ban four asbestos-containing construction products (comprising at least 50% of total US consumption) and to phase out asbestos products entirely over the next decade is accepted, this could have dire consequences for producers of raw asbestos and manufacturers of asbestos-containing products.

The greatest growth potential is expected to lie in the housing programmes of third world countries, where asbestos is relied upon as a cheap building material. In these countries there is theoretically little resistance to the increasing use of asbestos as health legislation restricting the industrial use of asbestos is virtually non-existent, and there are frequently no trade unions or consumer protection bodies that could create an awareness of the hazards of asbestos.

However as has been suggested, while growth in asbestos imports in the third world is likely to be greater than in developed countries, it cannot compensate for the fall in demand. The debt crisis of Third World countries has escalated to the extent that the World Bank expects to reschedule the debts several times. This imposes a considerable financial constraint on the import potential of these countries. In addition, cheap local asbestos substitutes exist almost everywhere. Such substitutes, like cellulose fibres derived from natural wood, which is abundantly available, are cheaper than either locally produced or imported asbestos, and completely safe from a health point of view.

3.4.4 The implications for South Africa

The deteriorating trends of the world asbestos market are reflected in South Africa. Figures 2a and 2b summarise the production and employment situation over the last few years.
FIGURE 2a DECLINING PRODUCTION AND EXPORTS POST-1977

EMPLOYMENT AND OPERATING MINES

Post 1977

Source: Mining Statistics, 1983
FIGURE 2b DECREASING EMPLOYMENT AND OPERATING MINES POST-1977

PRODUCTION AND EXPORTS
Post 1977

Source: Mining statistics, 1983
South African producers have possibly been even more adversely affected than overseas producers. The amalgamation of the industry over the last few years has served to eliminate local competition and allowed the marketing of chrysotile and amphibole asbestos through one channel. But in consequence of slack demand, the industry has been subject to damaging pressures from overseas competition. Local chrysotile production, amounting to 3% of total world chrysotile production, has to compete with Canada, Zimbabwe and the USSR in a climate of oversupply and price cutting. In addition, two new competitors, Brazil and Greece, entered the export market in 1983. South Africa's amphibole producer Gefco, responsible for nearly 93% of global crocidolite production, has also found itself competing with Canadian and USSR chrysotile. For while crocidolite with its superior physical properties does earn a higher profit margin than chrysotile, it has been conclusively shown in the scientific literature that it the most carcinogenic of all the asbestos variants and that it is the main cause of mesothelioma. Increasingly stringent legislation in the UK and the Scandinavian countries has virtually eliminated the use of crocidolite.

For health reasons therefore, consumption of this fibre even in South Africa has tended to be reduced or replaced with chrysotile fibres. This has been the case, for instance in the asbestos-cement manufacturing industry, which now uses predominantly chrysotile in its products. Gefco's subsidiary, Superocla uses crocidolite in its asbestos-cement products while Turnal and Everite use only chrysotile.

Gefco relies on the asbestos-cement market for 75-80% of its sales, and on the building and construction industry as a whole (where asbestos is used both as a reinforcing and insulating agent) for 80 - 90% of sales. The slow recovery of industrialised countries and persistently high interest rates have cut back on demand in this sector. Gefco's main markets are not in the USA, where only 8-12% of South African sales occur, but in countries where the buoyancy of the construction industry is less than in the USA. Lack of foreign exchange to pay for imports is a further factor inhibiting demand in third world markets for South African asbestos.

The implementation of the EPA ban could have dire consequences for South Africa's amphibole industry. Amosite is used in insulation and crocidolite almost exclusively in the building and construction industry, so both would be affected by the ban. Table 9 shows the likely effects of the ban on
exports to the USA from South Africa alone.

TABLE 9a A BREAKDOWN OF USA IMPORTS OF SOUTH AFRICAN ASBESTOS

<table>
<thead>
<tr>
<th></th>
<th>Mass</th>
<th>% of total</th>
<th>Value</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chrysotile</td>
<td>4968</td>
<td>42</td>
<td>3341</td>
<td>43</td>
</tr>
<tr>
<td>Crocidolite</td>
<td>6177</td>
<td>53</td>
<td>3887</td>
<td>50</td>
</tr>
<tr>
<td>Amosite</td>
<td>609</td>
<td>5</td>
<td>512</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>11754</td>
<td>100</td>
<td>7740</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: USA Bureau of Minerals Report 1983
Mass in tons
Value in $ x 1000

TABLE 9b THE EFFECT ON SOUTH AFRICAN FOREIGN REVENUE FROM THE USA FOLLOWING AN ACCEPTANCE OF THE EPA PROPOSAL

1. Crocidolite is used exclusively in construction
   Loss of revenue for South Africa: $3,887,000
2. At least 40% of chrysotile imports are used in construction
   Loss of revenue for South Africa: $1,336,000

Loss of revenue for South Africa would be at least 67% of the value of exports to the USA.

Huge population growth and urbanisation rates indicate the need for the provision of low cost housing in Third World countries. But a move such as the EPA ban, a dramatic indictment of asbestos, would be unlikely to be totally ignored by these countries. The anti-asbestos health campaign, even where conducted by small groups of lobbyists, has already had far-reaching effects. A further point is that while it is true that asbestos products are cheap, a ban on asbestos would catalyse the development of alternative cheap building materials to satisfy the obvious demand in developing countries. As already indicated, there are plentiful, cheap substitutes. Residual difficulties in substitution are only encountered for a minority of products with certain specialised applications requiring the superior technical properties of crocidolite.

Chrysotile has inferior properties to crocidolite in this respect, so the
tendency to switch from the former to the latter is irrational, as other substitutes are either superior to chrysotile, or equally efficient. The current defensive move by the asbestos industry is to promote chrysotile as having similar properties to crocidolite without the health hazards. Crocidolite, being only a small proportion of world production, but a major proportion of South African production is now being sacrificed in order to retain chrysotile production. This new offensive of the asbestos industry has obvious disadvantageous implications for South Africa - the sole amphibole producer.

The recent production figures of Gefco reflect poor demand. The dollar price of output has fallen by 20% in the last two years. Production has been cut back, mines closed, and the labour force retrenched. In 1983 sales dropped by approximately ten per cent and were further lowered in 1984, attributable profit falling from R7.3m in 1983 to R 6.1m in 1984 (end June interim). Capital expenditure dropped from R8.4 to R3.5 million in 1983 and to about R2 million in 1984. Certain shaft sinking and development projects were deferred.

A labour dispute concerning wages and inadequate safety measures at Penge mine in July 1984 brought the company adverse publicity. All the workers were retrenched by the company and the trade union involved subsequently launched a national anti-asbestos campaign. The fact that both Msauli and Gefco have felt the strain of a local press campaign directed against asbestos in the last year or two is apparent by their intention to launch an expensive 'comprehensive communications programme' to enhance the image of asbestos.

Msauli has suffered from fierce competition and decreased prices in the chrysotile market but various factors indigenous to the mine have exacerbated the unprofitability of the last two years' production. Fibre production dropped by 20% in 1984 and costs increased by 32% resulting in an operating loss before taxation of R551 000. The company is committed to a high capital expenditure programme, potentially R2.7 million in the next two years, initiated in 1983, to secure future reserves by tertiary shaft sinking. It has been suggested that the high cost of working the mine at the greater depth necessitated by the steep dip of the ore deposit beneath a mountain, could force the mine's closure, should low prices for output persist. A further factor cutting recent production was the flooding of the mine due to cyclone Domoina in February 1984. A recent article saw a
possible long term improvement in the fortunes of Msauli should the
Canadian mines, responsible for 50% of world production, yield to strong
anti-asbestos pressures and the high cost of maintaining output in open
cast mines by going underground (25).

At a time when the EPA ban proposal was thought to have been defeated, the
asbestos industry predicted poor short term growth, but steady growth after
the 1980's (26). Today, estimation of the growth potential of the industry
is beset by several imponderables including the possible implementation of
the EPA ban, an intensification of the health campaign in other directions,
an acceleration of the search for substitutes, a continued recessionary
climate and low foreign exchange in developing countries. Indeed, the
recent turn taken by the South African economy augurs badly for the
industry. While exports are bound to benefit from the low rand/dollar
exchange rate, gains may be offset by high rates of inflation and
prohibitive costs of imports necessary for capital expenditure and
maintenance (the cost of imports rose by 75% in the year preceding August
1985). Interest rates while falling at present are expected to rise as
capital pressure increases.

In conclusion, there seem to be too many unfavourable factors currently and
potentially influencing the South African asbestos industry to anticipate a
return to the productive apex of 1977, even in the long term.
3.5 REFERENCES

2. McGregor's "Who owns whom"
5. S.A. Minerals Bureau: Special report on minerals 1983
8. Lonrho Corporate Report 1984
10. Interview conducted with the S. A. Minerals Bureau by H Rice (1984)
11. S.A. Minerals Bureau: Special report on minerals 1983
12. S. A. Mining statistics 1983
15. S. A. Government Mining Engineering Yearbook 1984/1985
16. Ibid.
18. S. A. Mineral Affairs 1983
21. Financial Mail April 26, 1985
22. Gefco Corporate Report 1984
23. Msauli Corporate report 1984
24. Ibid.
25. Financial Mail Survey, September 28, 1984
4 CONCLUSION

This paper has sought to review the current state of knowledge about asbestos health hazards and the state of the industry in South Africa.

The past six years have been characterised by significant developments. Asbestos appears to be on the way out as an industrial material in many countries.

Asbestos has been definitively proved to be a cancer-causing substance which presents a serious health hazard under normal workaday conditions for most workers handling the substance.

Substitutes for asbestos exist for virtually all applications, even though a few of these may be initially expensive. Asbestos is easily substituted in its principal use worldwide - as a construction material.

Given time, especially in the developed countries, it will no longer be used or handled. This will be due to increasingly restrictive legislation, ever cheaper and more effective substitutes; the refusal of workers to use or handle it, and consumer boycotts of asbestos-containing products.

The South African industry has taken a particularly hard knock in recent years. Although the economic recession must have been in large measure responsible, an important adverse factor has been the type of asbestos produced here. Amphibole asbestos has been repeatedly implicated as a more aggressive carcinogen in a large number of studies, and is for practical purposes the sole cause of the fatal cancer mesothelioma.

In the USA and other developed countries, the industry has been exposed as trying to hide the ill-effects of asbestos for most of the twentieth century. In the USA there have been massive and damaging costs awarded against asbestos companies in favour of the victims of asbestos-related disease. Given sustained adverse publicity for company and product alike, it seems unlikely that there will be either a short or longer term improvement in the fortunes of the industry.

Residual damage will continue to plague society for many years to come with problems of environmental pollution, a need for expensive removal and sealing programmes in public buildings, and the legacy of disease in those
occupationally exposed. There is a 30 to 40 year time lag for asbestos fibres to cause their damage.

Apart from the recent litigation in the USA where legal system peculiarities enabled successful claims to be brought against asbestos companies, most employers in other countries have been able to escape their obligations to the victims of asbestos disease by hiding behind seriously inadequate compensation and poorly enforced factory safety legislation.

Compensation structures in South Africa and elsewhere seem designed more to frustrate victims than to recompense them for damage done to them by exposure to this deadly fibre. Poor social support systems militate all the more for effective prevention of asbestos-related disease. The best prevention is, as always, removal of the noxious substance. This means substitution and/or banning of asbestos.

The next few years will see an even greater move away from the use of asbestos in the developed countries. Potential victims, like workers will become increasingly aware and will take measures to avoid exposure rather than run the risk of suffering unsupported from disease when it is too late. Others like consumers will become increasingly concerned and aware of the hazards involved to themselves and those who must continue to produce asbestos products. They are less and less likely to use a dangerous substance under special circumstances when abundant and harmless substitute materials exist.

On the other hand Third World countries are unlikely to be able to fill the gap and take up the slack resulting from substitution and banning in the developed countries. Foreign exchange shortages are much more likely to lead to the development of local non-hazardous substitutes.