16 ECONOMETRIC MODELLING AND COST-BENEFIT ANALYSIS

16.1 INTRODUCTION

One of the main objectives of the study is to determine the knock-on effect of the phasing out of asbestos and in particular the economic costs of substitution. For this purpose, use is made of the internationally tried and tested Cost-Benefit Analysis (CBA) methodology

This analysis is mainly based on the information that was gathered through the Field Research questionnaires. Each of the identified asbestos containing products has been individually analysed in terms of various phasing out scenarios. The number of products investigated includes the following:

- Friction materials:
    - Brake disk pads
    - Brake linings
    - Clutch plates
    - Rail blocks
    - Earth and heavy duty equipment
    - Industrial and Mining applications

- Special Applications:
    - Heat and Arc Resistant Electrical Insulation Board
    - Acetylene Gas Cylinder Stabilization
    - Gaskets, Seals and Insulation Materials

- Asbestos Building Materials:
    - Roofing
    - Flat Sheets
    - Water and Sewage Pipes

16.2 ECONOMIC COST BENEFIT ANALYSIS

Economic Cost Benefit Analysis (CBA) is widely used in both the public and private sectors as an instrument to determine priorities between competing projects that require scarce capital resources to implement.

In order to do this the future streams of costs and benefits that would be generated over the economic lifetime of the project are estimated. Once this is done, the cost and benefit values are discounted by an appropriate discount rate to show the future values in present day values (i.e. the time element has been eliminated to show what the present day value (buying power) would be of future income and cost streams.

Obviously if the discounted benefit stream exceeds the cost stream, the project would be classified as one that would add value to the economy and require further investigation[1)] These same principles have been applied to this asbestos phasing out study, although in a more limited form. In this particular case, the point of departure has been that, in the

1) In economic theory this is also referred to as the opportunity cost principle. In other words, a net benefit result will indicate that it would be more beneficial for the economy as a whole to allocate scarce capital to such a project.

majority of cases, the phasing out of asbestos containing products would lead to the substitution by more expensive materials. This will have a cost-raising effect for the affected industries and, in some cases, private consumers. In a few cases, the use of alternative materials might result in producing benefits that can be used to offset to some extent the cost-raising effects of phasing out asbestos.

In conclusion, by using the CBA methodology as applied to the asbestos phasing out scenario, the aim has been to show the total net cost raising effect on the economy in present day money terms. This figure will also signify the additional amount of capital resources that will of necessity be channelled towards products that must serve as alternatives to asbestos-contained ones.

16.3 PHASING OUT STRATEGIES

An important element of CBA analysis is to assume phasing out scenarios for each of the 12 identified products.

16.3.1 Formulating the Null Scenario

CBA requires that a "null scenario" be formulated. This null scenario is then used as the baseline for comparing the impacts that various "intervention scenarios" (e.g. regulations that phase out the use of asbestos) would have on the economy.

Generally, the status quo (i.e. a continuing situation of "business as usual") is used as the null scenario. However, in the case of the South African asbestos industry, declining international and local demand for ACM's is driving a "natural" phasing out of asbestos in certain industry sectors, i.e.:

- The manufacturing of asbestos cement building and construction products, where the sole local manufacturer took the decision fifteen years ago to convert from asbestos cement formulations to alternative fibre cement formulations. This conversion programme will be complete by the end of 2002, after which the only asbestos cement products available in south Africa will be those imported from Zimbabwe
- The manufacturing and importation of friction materials for on-highway vehicle brake products, where the local manufacturers and importers are working with the SABS to introduce a set of specifications that prohibit the use of asbestos in on-highway vehicle brake products, after which the only asbestos-containing friction material will imported clutch plates
- The manufacturing and importation of gaskets, seals and insulation materials, where many large industrial customers are insisting that only non-asbestos materials be supplied and used in their production environments

In light of these developments, a "Natural Market Forces" scenario has been formulated and is used as the null scenario against which the impact of various "intervention scenarios" are compared.

16.3.2 Formulating the Intervention Scenarios

In the case of the phasing out of the use of asbestos in South Africa, it is possible to formulate a number of different scenarios based on a variety of assumptions regarding "complete" versus "partial" phasing out. However, in light of the comments made regarding the poor implementation of the Asbestos Regulation 2001 (see section 6.4.4 for details), it was decided to formulate scenarios based on an assumption of a complete phasing out of all new uses of asbestos.

An allowance has been made for the fact that it may be necessary to permit the use of a small number of specific ACM's that cannot yet be phased out for technical performance reasons. This small number of products does not have any significant impact on the overall CBA.

Three intervention scenarios have been used as part of the CBA:

- **A Short Term Phasing Out Scenario**, that uses the minimum, practicable phasing out periods for each of the major categories of products analysed within each industry sector. These practicable phase out periods vary between 24 months and 60 months, and average out at 36 months
- **A Medium Term Phasing Out Scenario**, that uses a 72 month phasing out period, and
- **A longer Term Phasing Out Scenario**, that uses a 120 month phasing out period

These three intervention scenarios assume that a complete phasing out of asbestos occurs within 3, 6 and 10 years. In contrast, the Natural Market Forces strategy results in most of the asbestos currently in use in the various industry sectors declining gradually over the next 20 years, with some small residual amount of usage remaining beyond that - 20 years is the standard time period in most long term economic analyses of this kind in South Africa.

16.4 RESULTS OF THE CBA ANALYSIS

16.4.1 Friction Materials

Eight of the 12 asbestos containing products investigated fall into this group. Table 59 shows what the cost-raising effect would be for every asbestos-containing product if immediately substituted for by an alternative. Obviously this will not happen as such, so for calculation purposes, assumptions are made of the time foreseen for the phasing out processes. In the majority of cases, such information has been obtained from the survey results (See Annexure for phasing out assumptions).

TABLE 59: FRICTION MATERIALS: ASBESTOS CONTENT

	ON HIGHWAY FRICTION MATERIAL					OFF-HIGHWAY FRICTION MATERIAL		
	BRAKE DISK PADS	BRAKE LININGS		CLUTCH KIT/PLATES		RAIL BLOCKS	EARTH MOVING EQUIPMENT	INDUSTRIAL MINING
		PASSENGER	HEAVY	LIGHT	HEAVY			
Volume Sold (units)	2,800,000	2,240,000	2,000,000	1,200,000	90,000	350,000		
Value (price x volume)	R73.5 m	R15.4 m	R46.4 m	R49.2 m	R38.3 m	R21.0 m	R9.0 m	R3.0 m
Price Differential	R18.3 m	0	R18.6 m	R17.3 m	R11.2 m	0	R3.4 m	R1.1

Explanatory notes to Table 59

- Brake Disk Pads
  - Total disc pads = 14 m pads
  - Asbestos containing = 14 m X 20% = 2,800,000
  - Price per pad = R26.25
  - Price differential[1] = + 25%

[1] The price differential indicates the percentage difference between an asbestos containing product and an alternative non-asbestos product.

- Brake Linings – Passenger Vehicles
    - Total brake linings = 2.8 million units
    - Asbestos based = 2.8 million X 80% = 2,240,000
    - Price per shoe = R6.88
    - Price differential = 0%

- Brake Linings – Heavy Duty Vehicles
    - Total brake linings = 2.5 million units
    - Asbestos containing = 2.5 million X 80% = 2,000,000
    - Price per lining = R23.26
    - Price differential = + 40%

- Clutch Plates (Light Commercial & Passenger Vehicles)
    - Total clutch plates = 1.5 million
    - Asbestos containing = 1.5 million X 80% = 1,200,00
    - Price per clutch plate = R41.00
    - Price differential = + 29.3%

- Heavy Duty Vehicles Clutch plates
    - Total clutch plates = 150,000
    - Asbestos containing = 150,000 X 60% = 90,000
    - Price per clutch plate = R425.00
    - Price differential = + 29.3%

- Rail Blocks
    - Total brake blocks = 350,000
    - Asbestos containing = 0

- Earthmoving Equipment
    - Total market value = R90 million
    - Asbestos containing = R90 million X 10% = R9 million
    - Price differential = + 37.5%

- Industrial/Mining equipment
    - Total Market value = R30 million
    - Asbestos containing = R30 million X 10% = R3 million
    - Price differential = + 37.5%

16.4.2 Special Applications

The basic information used to conduct the CBA for this group of products is summarized in Table 60.

TABLE 60: SPECIAL APPLICATIONS

	HEAT AND ARC RESISTANT ELECT. INSULATION BOARD	ACETYLENE GAS CYLINDER STABILIZATION	GASKETS, SEALS AND INSULATION MATERIALS
Volume (units)	2,500	250,000	2.9 million kg
Value of Cost Differential	R 200 000		R137.5 m

Explanatory notes to table 60:

- Heat and Arc Resistant Electrical Insulation Boards:
  - Currently there are 2,500 3kw DC circuit breakers in operation, of which 80% contain asbestos.
  - The replacement cost of a new circuit breaker with a ceramic arc chute is R200,000

- Acetylene Gas Cylinders:
  - There are 250,000 cylinders circulating around the market place

- Gaskets, Seals and Insulation Materials:
  - Currently 60% are asbestos based
  - 20% of local production is exported (mainly asbestos based)
  - Average price differential = 50 %

16.4.2.1 Acetylene Gas Cylinder Stabilization

This industry is faced with a rather daunting problem. Two calculations are made, one portraying the status quo, i.e. replacing redundant and re-massed cylinders with an asbestos based compound (the null scenario). The second calculation assumes that the redundant and re-massed cylinders will be filled with a glass fibre compound, which will be a more expensive alternative. A discounted net cost total of R174 million is arrived at for this assumed scenario of intervention. The whole process will take ± 15 years. Obviously, if a more aggressive approach is taken to replace the asbestos compound, the cost-premium will rise accordingly.

16.4.2.2 Gaskets, Seals and Insulation Materials

The survey results show that the South African market for asbestos based gaskets, seals and other insulation materials, could run in the order of R275 million (producers' prices). About half is imported and 20% of local production is exported.

As can be seen from the CBA calculations, if the phasing out period is shortened from 20 to 5 years, it could cause a relatively large cost premium in terms of the discounted Net Present Value of R700 million.

16.4.3 Building Materials

16.4.3.1 Roofing Materials

The survey has shown that asbestos cement sheeting presently has ± 2.6% of South Africa's roofing market of ± 30 million sq. metres, of which the only local producer, has ± 60% market share and the rest is supplied by a Zimbabwean firm.

The local manufacturer has indicated that it will totally converted to non-asbestos products by the end of 2002.

To arrive at an appropriate Net Present Value for the two competing substituting materials – corrugated iron sheeting vs. asbestos fibre cement sheeting – a number of assumptions have had to be made The calculations are based on a 57m² size house. The current merchant's price of iron sheeting and asbestos cement sheeting of R16.0 and R28.81 per square metre respectively were used as a departure point. Another critical assumption was that for the purpose of calculating the NPV, iron cladding would have to be replaced every 20 years.

The size of the "new" market in 2002 amounts to ± R13 million – i.e. 13,684 housing units with an average size of 57 m.

It is further assumed that the asbestos portion of the roofing market will decline to 1.3% in 12 years' time and remain at that level from thereon. (In the non-intervention scenario this means that the supply would come form Zimbabwe) In conclusion the NPV calculations shows a cost of R13.58 million.

16.4.3.2 Flat sheets

This market is made up of two parts, i.e. internal walling and ceiling board. This amounts to ± 20 million square metres per year. According to the survey results, asbestos based flat sheets still have a market share ranging between 5% and 85% (schools and hospitals). For purposes of calculation an average figure of 6.5% is used.

The phasing out through intervention would lead to additional cost at a net present value of R6.2 million.

16.4.3.3 Water and Sewage Pipes

According to the Survey results, the local producer will cease production at the end of 2002. There is a possibility that some imports might still come in from Zimbabwe

16.5 SUMMARY AND CONCLUSIONS

A complete phasing out of the use of asbestos in South Africa will require that asbestos be replaced (as a raw material in the manufacture of a number of products) with, in nearly all instances, more expensive alternative fibres.

The actual quantified value of these additional economic costs is summarized in Table 61. All of the figures are reflected in their present value format, discounted at a rate of 8% per year.

A sensitivity analysis has been undertaken to estimate the impact with regard to the three phasing out scenarios:

- The short-term refers to the standard null scenario that reflects a phasing out over approximately three years. It is important to note that, for practical reasons, it is not possible to phase out certain products containing asbestos within a period less than five years.
- The medium-term scenario reflects a six-year phasing out period with a target date of 2007.
- The long-term scenario refers to a phasing out period of ten years with a target date of 2011.

TABLE 61: ADDITIONAL COST IMPACT OF VARIOUS ASBESTOS PHASING OUT SCENARIOS

(RMILLIONS, 2002 PRICES)	PRESENT VALUES		
	SHORT TERM SCENARIO +/- 3 YEARS	MEDIUM TERM SCENARIO +/- 6 YEARS	LONG TERM SCENARIO +/- 10 YEARS
ECONOMIC COSTS			
A. Friction Materials			
On Highway Friction Material			
• Brake Disk Pads	108.59	82.55	40.13
• Brake linings – Passenger	0	0	0
• Brake linings – Heavy duty	109.95	75.29	40.64
• Clutch Plates – Light	112.73	80.88	48.39
• Clutch Plates – Heavy	87.64	62.88	37.62
Off Highway Friction Material			
• Earth moving equipment	4.27	4.27	4.27
• Industrial and Mining	1.38	1.38	1.38
B. Special Applications			
Heat & Arc Resistant Electric Insulation Board	301.17	279.78	208.96
Gaskets, Seals & Insulation Materials	700.30	648.21	331.68
Acetylene Gas Cylinder Stabilization	174.23	174.23	174.23
C. Building Materials			
• Roofing Materials	13.58	7.71	4.20
• Flat Sheets	6.23	4.47	2.68
Present value of costs	**1,620.09**	**1,421.67**	**894.19**
ECONOMIC BENEFITS			
A. Friction Materials			
On Highway Friction Material			
• Brake linings – Heavy duty	35.13	6.35	6.35
B. Special Applications	0	0	0
C. Building Materials	0	0	0
Present value of benefits	**35.13**	**6.35**	**6.35**
NET PRESENT CBA VALUE @ 8%	**1584.96**	**1415.32**	**887.84**

An important deduction that can be made from this table is that no major differences exist between the medium-term and short-term phasing out scenarios. The reason for this is that, for practical reasons, it is not possible to phase out certain products in less than five years.

Table 61 indicates that the present value of the additional economic costs associated with a complete phasing out of asbestos vary between R900 million and R1.6 billion, depending upon the length of time allowed for the phasing out. As would be expected, the additional cost impact is greater if shorter-term phasing-out periods are allowed.

There is very little difference between the short and medium term scenarios: approximately 12%. This is due to the fact that a number of products cannot be practicably phased out in three years, e.g. replacing all 2,000 of the circuit breakers that use asbestos cement arc chutes will take at least five years. As such, they're phasing out periods naturally "extend" into the medium term scenario. This suggest that it makes practical sense to pursue a medium term phasing out period as there is very little difference between the costs associated with these two scenarios.

However, there is a significant difference between the medium term and longer-term scenarios. This suggests that allowing a ten-year phasing out period "reduces" the additional economic cost impact by almost 37%. This saving will have to be evaluated in terms of the impact that four more years of exposure to asbestos fibres and the risks of contracting a debilitating ARD would have on the economy. This issue is addressed in the next section of this report.