**REPORT**

# SOCIO - ECONOMIC IMPACT OF THE PROPOSED PLASTIC BAG REGULATIONS

**Bentley West Management Consultants**

## Acronyms and abbreviations

| | |
|---|---|
| **BOD** | Biological Oxygen Demand |
| **CEPPWAWU** | Chemical, Energy, Paper, Print and Wood Allied Workers Union |
| **CINPF** | Chemical Industries National Provident Fund |
| **COD** | Chemical Oxygen Demand |
| **CSIR** | Council for Scientific and Industrial Research |
| **DEAT** | Department of Environmental Affairs and Tourism |
| **DTI** | Department of Trade and Industry |
| **FOB** | Free On Board |
| **FRIDGE** | Fund for Research into Industrial Development Growth and Equity |
| **GDP** | Gross Domestic Product |
| **HDPE** | High Density Polyethylene |
| **ISO** | International Standards Organisation |
| **JSE** | Johannesburg Stock Exchange |
| **LCA** | Life Cycle Analysis |
| **LCI** | Life Cycle Inventory |
| **LDPE** | Low Density Polyethylene |
| **LLDPE** | Linear Low Density Polyethylene |
| **MEIBC** | Metal Industries Bargaining Council |
| **NEDLAC** | National Economic Development and Labour Council |
| **NUMSA** | National Union of Metal Workers South Africa |
| **PE** | Polyethylene |
| **PFSA** | Plastics Federation of South Africa |
| **SACWU** | South African Chemical Workers Union |
| **S.O. Bag** | Self Opening Bag |
| **SIC code** | Standard Industrial Classification Code |
| **SME** | Small Medium Enterprise |
| **VCB** | Vest type carrier bag |

## EXECUTIVE SUMMARY

The Department of Environmental Affairs and Tourism (DEAT) has identified littering in general as a problem facing the South African environment, and has focused on the effect of indiscriminate dumping of thin plastic bags in, believing that this has contributed greatly to the problem. It is in this light that the DEAT has proposed new plastic bag regulations under Section 24 of the Environmental Conservation Act (73/1998), which were published in the Government Gazette of 19 May 2000 The aim of the regulations is to restrict the production of non-reusable plastic shopping bags and to promote re-use and recycling.

In order to quantify the socio-economic impact of the proposed regulations all constituencies of Nedlac's Trade and Industry Chamber agreed that joint research should be conducted in order to develop a shared understanding of the potential socio-economic impact of the proposed regulations

The research study was restricted to vest type carrier bags (VCB's), which in layman's terms can be defined to be " thin plastic bags with handles, which are typically distributed in retail outlets". The reason for this restricted scope of research was two-fold. It firstly reflected the urgent need for an accurate and quantified impact assessment that can contribute to the process of finalising the regulation, and secondly focussed on the product that, relative to other forms of disposable consumer plastic, is significant both in terms of the volume of production and usage. The scope of research included an assessment of the impact of the regulations on potential substitute products such as paper and cloth bags.

Data was collected by means of structured interviews and completion of questionnaires within the following sectors:

- Polymer producers (2 companies, data obtained from both)
- Manufacturers of vest type carrier bags (42 companies, data obtained from 12 companies that represent 75% of VCB manufacturing)
- Worker representatives of manufacturers of VCB's
- Plastic recyclers (85 companies identified, of which two are currently recycling VCB's.)
- Pulp producers (2 companies identified, data obtained from both)
- Paper bag manufacturers (6 companies identified, data obtained from 3)
- Paper recyclers (4 companies identified, data obtained from 2)
- Cloth bag makers (3 companies identified, data obtained from 2)
- Retail industry (data obtained from representative sample of 390 small, medium and large retailers)
- Government (combined DEAT and DTI submission received)

Excluded from the direct data collection exercise were the distributors of VCB's as well as the consumers of VCB's. Information about these two groups was indirectly obtained from VCB manufacturers in the case of the distributors, and retailers in the case of consumers.

## THE KEY CHARACTERISTICS OF THE RELEVANT PRODUCTS

The following products were relevant to the study:

### Plastic VCB's

Although there is a wide range of bags made in different dimensions, the research indicated that the following types, in terms of dimensions, are predominant in use.

| Type | Length (mm) | Width (mm) | Thickness µ | Weighted avg. thickness | Weighted avg. weight per bag (g) | Research sample of 34365 tonnes | |
|---|---|---|---|---|---|---|---|
| | | | | | | Production (t) | % of total |
| Mini | 440-460 | 320-330 | 9-15 | 11.8 | 3.11 | 2408 | 7% |
| Handi | 460-480 | 360-380 | 14-17 | 14.02 | 4.35 | 5641 | 17% |
| Midi/Maxi | 560-600 | 420-480 | 14-20 | 15.96 | 7.01 | 18491 | 55% |
| No data provided [1] | | | | | 14.24 | 21% | |

In terms of material characteristics these bags can be either printed, in which case they are manufactured from predominantly virgin High Density Polyethylene (HD-PE), unprinted but still manufactured from virgin material (for example clear bags), or "plain" in which case the bags have a high (40% upwards) recycle content. The recycled polymer used in plain bags is however not post consumer waste, but first generation in-house scrap. The "plain" bags are not printed on and of a lower quality than bags manufactured from virgin polymer.

The cost per 1000 bags varies greatly between high quality printed bags (weighted average of R 79 per 1000 bags) and "plain" bags (below R60 per 1000 bags).

### Paper bags

The characteristics of the current paper carry bag used for retail purposes, called the "shopper" bag in the paper industry, is as follows:

| Dimensions | Paper "Shopper" bag |
|---|---|
| Length (mm) | 420 |
| Width (mm) | 305 x 165 |
| Thickness (g/sq m) | 80 |
| Weight (kg/1000) | 32.6 |
| Carry capacity (kg) | 4 |
| Cost (R/1000 bags) | 340 |

[1] The distribution of converters that did not supply detailed product data was very similar to those who did, namely a combination of large manufacturers that supply printed bags to the mass-retail industry and smaller manufacturers who supply plain or printed bags to smaller retailers. The weighted average of the available data is therefore used.

A key characteristic of this bag is that it does not have carry handles. The addition of handles will increase the price significantly

**Life cycle of plastic bags compared to paper bags**

The objective of the life cycle analysis was to provide life cycle inventory data from publicly available international data sources so as to compare the environmental impacts of the paper, plastic and cloth check out carrier bags lifecycles. No data was found for cloth check out carrier bags. Paper and cloth carrier bag data was found in the form of 'cradle-to-gate' and 'gate-to-gate' studies. Continuity through the value chain was not achieved therefore studies, which undertook complete product lifecycle comparisons, were sought out.

Two studies were considered, one comparing the environmental impact of the life cycles of checkout grocery bags in the United States and the other comparing the life cycles of 25kg distribution sacks in Europe. The first study argued strongly that the plastic checkout grocery bag had less environmental impact than the paper grocery bag across four environmental impact criteria, namely energy consumption, solid waste generation, atmospheric emissions and waterborne wastes. The second study argued in favour of the paper sack across nine impact critera, namely primary energy consumption, abiotic resource depletion, global warming, acidification, nutrient enrichment, photochemical ozone formation, aquatic ecotoxicity, air emissions and water emissions.

It was noted that the comparison of these studies between each other and to the South African environment is not possible due to the internal variables of each project's scope, methodology and objectives and possible environmental and geographic differences between Europe, United States and South Africa. It is concluded that it would be erroneous to report on the life cycle impact of paper and plastic products in the South African context using international studies as a basis for comparison. In order to ascertain which product life cycle has the greatest .environmental impact in South Africa would require a independent study to be commissioned locally.

**Cloth bags**

The use of cloth bags within the retail industry is non-existent, except for a minimal amount (150 000) that was manufactured as a niche product for one large retail group. Industry sources are of the opinion that very few of the bags have actually been sold.

It is estimated that the cost of a cloth bag substitute to the current plastic VCB will cost about R 6.99 per bag. This makes it prohibitively expensive to be even considered as a substitute product, even considering its durability, and excluded from the research.

**Biodegradable plastic bags**

Degradable polymer technology is in a state of relative infancy internationally. It is only within the last four years that the term biodegradable has been defined, by international standards authorities, to denote the complete degradation of inorganic constituents to $H_20$, $CO_2$, methane and biomass. Photo-degradation is a separate process and implies the minute fragmentation of plastics due to exposure to ultra violet light (usually sunlight).

Degradable plastics are created through the use of either additives to conventional polymers or the use of degradable polymers. It has been noted by the CSIR that production of degradable film is not yet feasible to due technical limitations of extrusion on conventional machinery. In addition the cost premium for degradable polymers is approximately 20% for additives and 150 – 300% for degradable polymers, as compared to conventional polymers. No evidence of the large-scale production of degradable vest type carrier bags has been found, however biodegradable checkout carrier bag trials were found.

As far as recycling is concerned no research-based evidence has been found to support polymer manufacturers claims that the degradation process is deactivated in normal recycling processes. In addition it has been noted that conventional landfills will benefit from the inherent stability and longevity of conventional plastic packaging. Photo-degradation as a result of exposure to sunlight, however, can be helpful for products used in rural and marine environments where litter is less likely to be cleared, but it will not make urban litter disappear within an acceptable time span or remove the social problems of litter.

Locally polymer manufacturers have confirmed that production of degradable polymers is unlikely in the short to medium term due to their commitment to the recycling industry and historic focus on conventional polymers (including HDPE, LDPE and LLDPE).

International industry experts argue that degradable plastics offer no real life cycle benefit primarily due to the smaller scale of production and the necessary transportation of additives and polymers to South Africa.

It is therefore argued that degradable polymers are not, yet, a feasible option in the South African context.

## SUPPLY AND DEMAND BALANCE OF THE CURRENT VCB INDUSTRY

The current supply and demand balance for the VCB industry was calculated to be as follows:

| **Retailer category** | **Spending on bags**<br>**R million** | **Bags consumed**<br>**(billion)** | **Conversion, exports and imports (units and tonnage)** | **Average weight per bag (g)** | **Polymer usage tonnes** |
|---|---|---|---|---|---|
| Large retailer groups | 202 | 2.552 | Domestic<br>44000t (7.736 m bags)<br>Exports<br>6000t (560 m bags)<br>Imports<br>400t (1.32 m bags) | 5,87 | 14728 |
| Smaller retailers<br>Printed bags | 181.09 | 2.314 | | 5.87 | 13740 |
| Smaller retailers Unprinted | 188.45 | 3.158 | | 4.35 | 13587 |
| Total | 571.54 | 8.024 | | | 42055 |

It is worthwhile pointing out that the supply and demand balance was calculated and verified from two angles, namely based on retailer demand data as well as based on raw material supply.

There is great uncertainty on the number of bags currently being imported, and the estimate of 4500 tonnes can be considered to be a “upper limit” estimate. It is noteworthy that it is not only thin (estimated to be as thin as 10µ), low quality plain bags that are being imported. It has come to the attention to the Study Team that one of the largest retailer groups are importing large quantities of higher quality printed bags. More details could however not be obtained.

## THE KEY CHARACTERISTICS OF THE CURRENT VCB MANUFACTURING INDUSTRY

### Polymer production

There are only two manufacturers of polymer in South Africa. In the case of ethylene based polymers there is only a single manufacturer of each product and in the case on polypropylene, both parties are involved in its manufacture. Only the polyethylenes are of interest in this assessment.

The table below depicts the current supply and demand balances for ethylene based polymers.

| Polymer | Domestic Capacity/ tpa | Domestic Demand | Imports | Exports | Surplus/ (Shortage) |
|---|---|---|---|---|---|
| HDPE | 165,000 | 155,000 | - | 10,000 | +10,000 |
| LDPE | 95,000 | 115,000 | 20,000 | - | -20,000 |
| LLDPE | 90,000 | 110,000 | 20,000 | - | -20,000 |

Due to the ethylene shortage, South Africa is unable to provide more domestically produced polymer into the local market – at least in the short tem while the monomer shortage continues to exist. Any additional demand for polymer will have to be met through imports and any upstream expansion will initially have to address the ethylene shortage. Further capital investment will take the form of expanding capacity of all ethylene based polymers i.e. HDPE, LDPE and LLDPE (some is debottlenecking only, other is new plant).

### VCB manufacturing (conversion)

The research identified 42 companies with a combined production of 44 000 tons per annum. The companies range from very small operations with turnover of less than R 5 million per annum, and employing less than 15 people, to large companies with annual turnovers in excess of R 200 million, and employing up to 500 people. The total value of the industry is in the region of R 550 million per annum.

The VCB manufacturing industry displays the typical characteristics of a mature commodity industry, operating primarily in a limited domestic market, as follows:

- There are a small number (6) of large companies that have significant (70 - 75%) market share. Being in a commodity market these companies cannot compete with each other on a product differentiation basis, and have to compete on efficiencies
- There are a large number (36) of small companies that seek out the niches in the market that is not served by the large manufacturers. The niche markets are created by the need of smaller retailers who require small quantities of printed bags (large manufacturers have “minimum runs”)

or “plain” carrier bags. The demand for “plain carrier bags is driven by retailers who have no need for printed bags, wants to spend the absolute minimum on bags, and are not as quality conscious.

It is important to notice that barriers to entry to the industry is low (A capital outlay of less than R 500 000 is sufficient), henceforth the large number of SME’s in the industry.

Other key characteristics of the industry are as follows:

- The VCB manufacturing industry is a specialised industry in that company’s that manufacture VCB’s do not produce large volumes of other products as well. 88% of total production is for VCB’s only, and further analysis of the data reveals that the other 12% is plastic film.
- Technology and age of equipment varies considerably within the industry. Small and medium sized companies in general use technology that is two generations older that that used by the large manufacturers. Equipment in general has a long (20 to 30 years) life span, and even the oldest technology is use have at least 10 years remaining life.
- There is limited (less than 5%) excess capacity within the industry.
- Limited data was supplied by converters on historic capital investment, but it is known that at least R 120 million have been invested over the last 10 years, and the current book value of equipment is in excess of R 50 million
- Only one company indicated that any capital investments have been made in anticipation of the proposed regulations. This is due to the uncertainty about what minimum thickness will be specified. It is worthwhile noting from the outset that a 80µ bag is a very different product to a 30µ bag, and requires completely different manufacturing equipment. It is not possible to change existing equipment to manufacture firstly at 30µ and then at 80µ.
- All but one of the companies surveyed indicated that they have placed capital investments on hold until the uncertainty about the regulations have been resolved. One companies provided evidence to the Study Team of a planned capital investment not materialising due to banks refusing finance until such time as the regulations promulgated.
- Manufacturing costs vary significantly between manufacturing companies, but being a commodity industry is driven by raw material cost, which constitutes approximately 60% of the total product cost, Labour costs add another 20% and the remaining 20% is made up of various items such as consumables, rent, energy, etc. The weighted average revenue per tonne was determined to be R 13 581.

**Employment in the VCB Manufacturing Industry**

Information on employment in the VCB industry and the possible implications that the proposed regulations might have was collected through two primary channels. First, detailed questions on labour were included in the questionnaire sent to all known VCB manufactures. This source of information while important was limited because most companies were unable or unwilling to provide the requested data. A second source of information was that provided by detailed interviews with 16 shop stewards. The analysis of labour draws on both these sources plus a small number of interviews with trade union officials and an official of the Metal and Engineering Industries Bargaining Council (MEIBC).

**The VCB Manufacturing Industry**

The VCB Manufacturing industry can be divided into two segments.

- The High Productivity Segment of the industry pursues efficient production. It is characterised by high capital intensity, high productivity (as measured in tonnes converted per employee), relatively high wages, and generally better working conditions (for example health and safety). This segment accounts for 72.2% of VCB production (by tonnes).
- The Low Productivity Segment of the industry pursues niche markets. It is characterised by low capital intensity, low productivity (as measured in tonnes converted per employee), low wages, and poor working conditions. Its survival depends on the security of its niche markets from the High Productivity Segment and its ability to source cheap labour. This segment accounts for 27.8% of VCB production (by tonnes).

The following table summarises the data on productivity, minimum wage levels, and the average size of sites on which data was obtained in the two segments.

| **Variable** | **High Productivity Segment (5 sites)** | **Low Productivity Segment (10 sites)** |
|---|---|---|
| Total VCB tonnage | 31,780 | 5,958 |
| VCB employment | 766 | 469 |
| Productivity (tonnes per employee) | 41.5 | 12.7 |
| Average number of VCB related employees per site | 153 | 47 |
| Average (un-weighted) minimum wage (Rands per hour) | 10.1 | 4.8 (information from fives sites only) |
| Range of minimum wage (Rands per hour) | 9.01 – 11.82 | 2.65 – 7.73 |

**Employment in the VCB Industry**

Employment in the VCB industry is estimated at between 1,700 and 2,000. Of this employment, it is calculate that approximately 750 are employed in the High Productivity Segment and between 950 and 1,250 in the Low Productivity Segment. The majority of employees in the industry (65%) are employed in three occupational categories – film blowing, printing, and bag making and packing. These, and a number of other occupational categories in the industry, are low or semi-skilled. They are remunerated at or slightly above minimum wage levels in the industry.

The majority of employees in the industry were estimated to be male (73%), African (64%), and between the ages of 26 and 45 (71%).

**Remuneration in the VCB Industry**

In the High Productivity Segment of the industry minimum wages range between nine and 12 Rand per hour. In the Low Productivity Segment of the industry minimum wages range between 2.65 and eight Rand per hour. Take home pay is based on workers' grade (the industry falls under the MEIBC), the actual level of wages paid by their company, and the number of hours worked. Because of the nature of the industry machines are generally kept running 24 hours a day. In the High Productivity Segment of the industry the operation of up to four shifts limits overtime. In the Low Productivity Segment of the industry there are generally less shifts. As a consequence workers in this segment often work considerable overtime. This is, in terms of income, offset by lower wage levels.

When workers' dependants are taken into consideration, the average monthly disposable income per member of their family unit (including all other sources of income) is R428 in the High Productivity Segment of the industry and R332 in the Low Productivity Segment of the industry.

*Retrenchment and Re-employment*

Many workers in the industry are migrant workers. Most workers indicated that they would be willing to relocate with the RSA to find employment. Despite this it is concluded that the prospects of re-employment for these workers is limited. It is estimated that approximately 85% of employees in the Low Productivity Segment and approximately 77% of employees in the High Productivity Segment would *not* find employment if they were retrenched.

For the majority of these workers, retrenchment and the loss of their wage would push them and their dependants below internationally defined poverty levels.

**The retail industry**

The demand for VCB's within different segments of the retail industry can be summarised as follows:

| Retailer category | Key characteristics | Spending on bags R million | Bags consumed (billion) |
|---|---|---|---|
| Large retailer groups | Use printed bags primarily manufactured from virgin material | 202 | 2.552 |
| Smaller retailers – Printed | Use printed bags primarily manufactured from virgin material | 181.09 | 2.314 |
| Smaller retailers Unprinted | Use unprinted "plain" bags manufactured with a high recycle content | 188.45 | 3.158 |
| Total | | 571.54 | 8.024 |

**The waste industry, including recycling**

At present less than 1% of VCB's are recycled after consumption. The very low recycling rate is due to a combination of constraining factors on both the supply and demand side.

The demand for recycled HD-LD is restricted to refuse bags (primarily), certain types of pipes, and to a very limited extent to the manufacture of "plain" VCB's. On the supply side the key constraints relate to collection of VCB's not being economically viable due to a host of factors, including:

- The high levels of contamination, including printing, reduces the value of the bags.
- The low mass to volume ratio of bags contribute greatly to the VCB's being low in the pecking order of collection, where the relative value items (weight per item) determine the feasibility of collection
- The absence, other to dumpsites, of extensive central collection points of post consumer waste.

It was fount that in order for large scale recycling of VCB's to take place it is essential to remove not only the constraints on the supply side , but also to create additional demand.

## THE IMPACT OF THE PROPOSED REGULATIONS

### The approach to the impact assessment

The socio economic impact assessment reflects the impact of the proposed regulations on the current industries relevant to vest type carrier bags, as well as industries that could possibly be affected in future. There are two main factors that drive all the impacts with regard to the proposed plastic bag regulations.

The first factor is that **products** will change based on the 30 micron or 80 micron criteria and that these product changes create a number of impacts. This product change will then create significant shifts in the market that will fundamentally affect **demand** for VCB type bags and subsequently create a number of upstream and downstream impacts. The demand change is however not only a function of product change since there are demand boundary constraints such as maximum affordable cost. Therefore, product change will also depend on demand changes. How these two factors combine determines what the nature of the impacts will be.

A number of scenario's, based on different products and varying levels of demand, is therefore created to illustrate the potential impact of the regulations. For each scenario the impact variables such as impact on investment, the changes in labour requirements, the price of the product, etc. were calculated, based on the product and demand assumptions.

The four scenario's created were as follows:

- Scenario A, the **current demand scenario** is the upper-boundary limit, and although an unlikely scenario, provided insight a maximum impact situation based on current consumption levels. It assumes there are no limits to retailer spend, that products stay the same, and substitute products are ignored This scenario is unrealistic because it assumes no change in current bag demand, and no role for substitute products.
- Scenario B, the **adjusted demand scenario,** is more realistic in that it considers that the regulations will achieve a reduction in demand for bags and that market forces will introduce a substitute product in the form of paper bags, which is estimated to capture 5% market share under a 30μ regulation and 35% under a 80μ regulation. The change in demand is realistically estimated considering factors such as reduction in demand due to bag optimisation (larger bags with increased carrying capacity), efficiency gains through improved packaging practices, as well as increased re-use. The reduction of demand is assumed to be 30% under a 30μ regulation, and 15% under a 80μ regulation. The reduction under a 80μ regulation is lower due a number of factors, the most important being the fact that the proposed 80μ plastic bag and paper bag alternative are much smaller bags than the "optimised" plastic bag.
- Scenario C reflects what the situation will be if no additional cost to the retailer (and therefore consumer) is to be incurred. This is the **current retailer spend scenario**. Retailers spend as a

percentage of revenue stay the same, with adjustments for increased usage of paper bags as a substitute product. This can be seen as the other demand boundary. The need for adjustment for substitute products is driven by the change in the difference between the cost of plastic and paper bags due to the regulations. It assumes the bag characteristics remain unchanged.

- The scenario's conclude with a brief description of what could be a **worst-case scenario,** Scenario D. The worst-case scenario, which is where the total VCB manufacturing industry ceases to exist, could happen for two reasons. The first would be if converters were unable or unwilling to recapitalise their equipment to manufacture at the proposed minimum thickness, and exit the industry. The domestic supply would become zero. The second would be if the cost of bags increases to a point where retailers and consumers are unable to, or unwilling to buy bags. The demand for bags therefore ceases to exist. The impact is the same, and assessed in this scenario.

The calculation of the optimum scenario is beyond the scope of this research, as this would include thorough research into the consumer market to determine price elasticity of demand, potential changes in consumer behaviour, consumer spending patterns, and a host of other factors.

**Key findings**

The key finding per scenario is extensively described in the report. The following are the primary findings regarding the impact of the regulations in general, and specifically on the industry value chain.

- A first and most important finding is that the proposed "two step" introduction of the regulations, i.e. firstly a minimum thickness of 30μ and then after six months, a minimum thickness of 80μ, is not feasiblel. An 80μ bag is a very deferent bag to a 30μ bag. It requires totally different manufacturing technology (equipment) to that currently used, is primarily made from LD-PE compared to the current HD-PE bag, and will require extensive capital investments. No manufacturer will be prepared to make a capital investment to manufacture a 30μ bag, and then scrap the equipment 6 months later in order to invest in the manufacture of 80μ bags. A significant capital investment will be required in order to convert current manufacturing capacity to be able to produce 30μ bags .

- A second important finding is that there is a real chance that, under an 80μ regulation, the local VCB manufacturing industry could shut down altogether, and be replaced by imported product. It was found that there are a number of forces that come into effect under a 80μ situation, which will result in manufacturers exiting the industry. The first factor is the extent of capital investment required, as extensively dealt with later on. The second is the current structure of the industry, namely it being a relatively mature commodity industry with low margins and therefore relatively unattractive to new investment. The third factor relates to the prevalence of imports and the difficulties (especially for SME's) in accessing alternative, and specifically, export markets.

  The research found that the small and medium enterprises will not have access to the capital required, and be forced to either shut down or find alternative markets under the 80μ scenario.

Export markets are not accessible to such SME's, and the potential to enter alternative domestic markets is limited due to the specific application of current equipment.

Large companies who have access to finance indicated that their shareholders would be reluctant to approve large capital investments in a low margin industry. The large company that is currently exporting indicated that the margins on exports are so low that business can probably not be sustained solely on exports.

The implications of the domestic VCB industry ceasing to exist are severe and include massive job losses, negative impact on international investor confidence especially in the upstream sector, unrealised capital investments, negative impact on South Africa's balance of payments, negative impact on socio-economic development in rural areas such as KwaZulu-Natal and the Eastern Cape, etc.

- A third key finding is that although an increase the thickness of bags will stimulate recycling, the increase in recycling will be limited (maximum 10-15% of production, due to fundamental economics of recovery) unless other factors that constrain recycling are addressed. The most important factor is the need to create additional demand for recycled polymer. A frequently mentioned example of how additional demand can be created relates to the merits of specifying a minimum recycle content of refuse (and possibly other) bags. Alternatively, a levy could be placed on the industry to subsidise sub-economic recovery of VCBs. Further investigation of the merits of such interventions was beyond the scope of the study.
- The findings of this study relate only to the impact on the VCB manufacturing sector of the plastic industry. Other sectors, such as the manufacturing on non-VCB's will also be affected by the regulations. The impact on other sectors of the plastic industry could not be established since Government were not is a position to clarify the scope of the regulations in the detail required for successful extrapolation, when this research was conducted.

**Impact on the upstream sector**

The table below depicts the impact on the upstream sector as identified by the scenarios developed. It is important to understand that the scenarios are for illustrative purposes only and that the maximum numbers are highly unlikely in the extreme. In fact the most likely scenarios from a realistic point of view is the minimum scenario.

| | **Current Situation**<br>**Actual demand** | **30 micron scenario**<br>**Changes in demand** | | **80 micron scenario**<br>**Changes in demand** | |
|---|---|---|---|---|---|
| | | **Max** | **Min** | **Max** | **Min** |
| **HDPE Demand** | 37,000 | +37,382 | -7,036 | -37,000 | -37,000 |
| **LLDPE Demand** | 4,760 | +15,075 | +3,230 | +50,445 | +544 |
| **LDPE Demand** | 0 | 0 | 0 | +207,019 | +19,890 |
| **Masterbatch** | 1,740 | 3,218 | +258 | +12,061 | -414 |

The polymer manufacturing sector is currently ethylene constrained and polymer capacity constrained, with available ethylene being the major constraint. Polymer capacity cannot be expanded without ethylene capacity first being increased.

The 30 micron scenario shows HDPE demand changing from an increase in demand for 37,382 tons per annum to a decline in demand of 7,036 tons per annum. In the case of an increase, the first 10,000 tons will be able to be supplied from the current HDPE capacity surplus of 10,000 tons. This will have a positive impact on the profitability of DOW Chemicals since the production will be sold into the domestic market as opposed to exported.

The remaining 27,382 tons will have to be imported will all the associated negative impacts of importing polymer such as:

- Negative impact on trade balances
- Negative impact on exchange rate due to increased dollar demand
- Negative impact on trade balance
- Negative impact on balance of payments
- Increase in converter costs since they will have to hold greater stocks of polymer to guarantee supply with increasing uncertainty of on –time delivery and increased lead-times due to having to import the required polymer
- Increasing port delays due to increased volumes on a port infrastructure that is already under strain

In the case of the 80 micron scenario, all the HDPE which is currently sold into the domestic VCB market will be lost and will have to be exported. This will have a significant impact on the profitability of DOW Chemicals as well as on the investor confidence of an international firm which has made significant investments in South Africa.The worst case impact for the 80 micron scenario is a reduction in profit to DOW Plastics of R70m per annum and a loss of taxes to the government of R21m per annum (assuming an average tax rate of 30%)

In the 30 micron scenario depending on the market size, the likely impact on DOW Plastics ranges from increased profits of R18.95m to a profit reduction of R13.3m.

In all the scenarios there is an increase in demand for LLDPE. The increase in demand ranges from +50,445 tons to +544 tons per annum, depending on the scenario. There is currently a shortage of locally produced LLDPE in South Africa and all of the increased demand will have to be imported. The impacts fall into the same categories as above for imported product. Clearly if the converters do not make the required investments then demand for LLDPE will decline. The impact will not be high since there is currently a shortage of LLDPE and polymer is being imported to meet domestic demand.

In the case of LDPE demand, this changes only under the 80 micro scenario where demand increases between +19,890 tons per annum to +207,019 tons per annum. Clearly the upper scenario is totally unrealistic for the 80 micron product (increased cost alone shows it to be unrealistic) and besides a world scale plant would have to be established to supply this demand – highly unlikely for an uncertain market and for a single product line. In the short-medium all polymer requirements will have to be imported due to the negative supply/demand balance for LDPE and to bring volumes of the order of 200,000 tons per annum through the current port infrastructure is probably unrealistic.

**Impact on the plastic VCB manufacturing industry**

The implications for production and production technology at 30µ are similar for all scenario's, namely that the production process remains essentially the same, the raw material mix will change as specified, and that that conversion of existing technologies is possible, but there will be a cost implication.

The implications for production at 80µ is also the same for all scenarios, namely that a vest type carrier bag cannot be manufactured at 80µ and that the type of bag will change. The raw material mix will change as identified, and conversion of current equipment is technically impossible.

There are capital investment required to manufacture at 30 and 80µ's, regardless of the demand and product assumptions. The capital investments relates to three factors, as indicated in the table below and as shown in the table range from R34m to R526m.

| **Capital investment requirement 30µ regulation** | **Scenario A Maximum impact (R million)** | **Scenario B Adjusted demand (R million)** | **Scenario C Minimum impact (R million)** | **Comments** |
|---|---|---|---|---|
| To compensate for a reduction in throughput due to increased thickness | 35 | 35 | 19 | The maximum scenario makes no provision for paper bags as substitute<br><br>Scenario B and C makes provision for paper capturing 5% of the market. No capital investment is required in paper industry |
| Modifications to existing equipment to be able to produce at increased thickness | 15 | 15 | 15 | |
| New equipment to meet increased demand in tonnages due to changes in bag demand and thickness | 100 | 34 | 0 | |
| Total | 150 | 84 | 34 | |
| **Capital investment requirement 80µ regulation** | **Scenario A Maximum impact (R million)** | **Scenario B Adjusted demand (R million)** | **Scenario C Minimum impact (R million)** | **Comments** |
| To compensate for a reduction in throughput due to increased thickness | 61 | 61 | N/A | The maximum scenario makes no provision for paper bags as substitute<br><br>Scenario makes provision for paper capturing 35% of the market. Capital investment is required in paper industry is R 120 million for scenario B and R 10 million for scenario C |
| Modifications to existing equipment to be able to produce at increased thickness | Not possible | Not possible | Not possible | |
| New equipment to meet increased demand in tonnages due to changes in bag demand and thickness | 465 | 180 | 54 | |
| Total | 526 | 241 | 54 | |

It is worthwhile pointing out that no capital investments would be required if a minimum thickness of 22 - 24µ is specified. There is agreement within industry that 24 microns is the maximum thickness at which manufacturing can take place, without any throughput capacity being lost, or any modifications to equipment is required.

### Impact on the retail industry

The impact on the retailer (and therefore the consumer) is concluded from two perspectives:

The first is to assume that retailers (and consumers) can, but will not pay more for bags. Under the proposed regulations this will translate to a maximum number of bags that will be available as follows:

| Retailer spending (R million) | | Current consumption (bag units, billions) | Maximum bag consumption 30 µ - billions | | | Maximum bag consumption - 80 µ | | |
|---|---|---|---|---|---|---|---|---|
| | | | Plastic bags | Paper bags | % reduction | Plastic bags | Paper bags | % reduction |
| Large retail | 203.44 | 2.552 | 1.14 | 0.06 | 53 | 0.27 | 0.14 | 84 |
| Small printed | 184.86 | 2.314 | 1.06 | 0.056 | 51 | 0.25 | 0.13 | 83 |
| Small unprinted | 188.45 | 3.158 | 1.02 | 0.053 | 64 | 0.24 | 0.13 | 88 |
| Total | 571.54 | 8.024 | 3.23 | 0.17 | 58 | 0.77 | 0.41 | 85 |

Under the 30µ regulation it will require substantial increases (58%) in packing efficiencies for retailers to still provide bags free of charge (scenario B reflects the impact of realistic efficiency gains)

Under the 80 µ regulation it will become impossible for retailers to provide customers with bags, free of charge. The increased cost of the bags will mean that retailers simply will not be able to buy enough bags to satisfy demand. The implication is that retailers will either have to make consumers pay for bags (a scenario which the large retailer groups view as unacceptable since it reduces customer service as well as customers' disposable income), or consumers will have to bring their own bags. The cost of consumers providing their own bag will always be higher than the current cost to the consumer, which is zero. Regardless of the strategy the retailers follow, it will have a negative effect on consumer spending power.

The other perspective is to consider that retailers will pay more for the bags (in reality any increases in cost will be passed to the consumer), but tries to minimise demand through optimisation, thereby minimising cost.

For this scenario where demand is reduced due to efficiency gains, the bag size is optimised, and paper bags as an substitute product becomes economically viable, the analysis indicates that under the 30µ the efficiency improvements of a larger bag and improved packaging practices are largely offset by the increase in the cost of the bag due to its increase in dimensions. The implications are that much higher efficiency gains will have to be achieved if the cost to the retailer, who will inevitably pass it on to the consumer, is to be minimised. Whether efficiency increases additional to those assumed in this scenario can be achieved is debatable.

The impact of cheaper paper bags as a substitute product to a 80µ plastic bag still produces increased costs to the retailer in the region of 400% and more. The conclusion is therefore regardless of efficiency gains, or the utilisation of paper bags as an alternative, there are substantial cost implications to the retailer, who will pas it on to the consumer. (R 500 million for the 30µ scenario and in excess of R 2 billion for the 80µ scenario).

**Impact on the waste management, including recycling industry**

The key factors that need to be considered regarding recycling have been mentioned. The other factor that needs to be considered would be that for all scenario's the amount of material that will enter the waste stream will either be the same as current levels, or increase. A worst case scenario, from a waste management perspective, would be the 80 µ scenario where demand for bags remain at current levels (who carries the additional cost associated with thicker bags is not ignored), since it will mean an additional 236 000 tonnes of material enters the waste stream. The cost of additional landfill disposal would be in excess of R 40 million per annum

**Impact on labour and their dependants**

For the purposes of this report, research was focused on the VCB manufacturing industry. Other industries, notably upstream polymer production, paper bag manufacturing, plastic recycling, and retail are relevant to any complete analysis of changes in the industry. Detailed research was not carried out on these industries. However, an attempt was made to estimate any implication on labour as a result of the proposed legislation.

The employment implications for the upstream industry and, to a lesser extent, the paper bag industry is relatively small to that of the VCB industry. By contrast, the potential employment implications to the plastic recycling industry and the retail industry dwarf possible employment losses or gains in the VCB industry. The data for these other industries is less reliable than for the VCB industry given the focus of the research. However, employment implications in these sectors deserve serious consideration.

The major impact, in terms of labour, of the proposed regulations is:

- the impact on jobs and, cascading from this,
- the impact on wage earners' dependants.

The impact of these two factors is modified by the quality and remuneration of the jobs lost or gained. In brief, the loss of jobs is likely to push workers and their dependants into poverty. The creation of jobs will have the reverse effect. The impact on individuals can, to an extent, be quantified other implications, such as the affect on crime, cannot.

The impact of the regulations on employment and dependants, as modelled in the scenarios, range between:

- Substantial (though unlikely) job creation as a result of huge increases in polymer conversion and the potential for recycling (Scenarios A and B)
- Minor, negative, changes in employment (Scenario C,30 microns),

- Significant job losses as a result of decreased polymer conversion (Scenario C, 80 microns, D.1, and D.2),
- potentially massive job losses should the VCB industry close down and consumers use their own bags (Scenario D.3).

The following table summarises the estimated employment change and the affect on dependants under the different scenarios. It should be noted that the extremes of employment change are heavily influenced by the possible (but very uncertain) creation of informal jobs in the collection of plastic post-consumer waste for recycling, and by the assumed loss of jobs of retail packers should consumers use their own bags. In addition to these caveats, caution should be used in assessing all these estimates and readers are urged to read the full list of assumptions made in their calculating.

| Summary of Changes in Employment and Number of Dependants Affected Scenarios A – D | | | | | |
|---|---|---|---|---|---|
| **Scenario** | **Quality of Jobs Affected**[2] | **Employment Change** | | **Dependants Affected** | |
| | | **Lower Limit** | **Upper Limit** | **Lower Limit** | **Upper Limit** |
| **Scenario A, 30 microns No change in the number of VCBs demanded** | Higher Quality Formal | +1,181 | +960 | 8,739 | 7,104 |
| | Lower Quality Formal | 0 | +1,446 | 0 | 7,664 |
| | Informal | 0 | +2,857 | 0 | 8,571 |
| | **Total** | **+1,181** | **+5,263** | **8,739** | **23,339** |
| **Scenario A, 80 microns No change in number of VCBs demanded** | Higher Quality Formal | +5,053 | +5,133 | 37,392 | 37,984 |
| | Lower Quality Formal | -2,000 | -1,105 | (10,600) | (5,857) |
| | Informal | 0 | +7,143 | 0 | 21,429 |
| | **Total** | **+3,053** | **+11,171** | **26,792** | **53,556** |
| **Scenario B, 30 Microns: 35% reduction in volume demand, paper takes 5% of market** | Higher Quality Formal | +466 | +384 | 3,448 | 2,842 |
| | Lower Quality Formal | 0 | +805 | 0 | 4,267 |
| | Informal | 0 | +4,286 | 0 | 12,858 |
| | **Total** | **+466** | **+5,475** | **3,448** | **19,967** |
| **Scenario B, 80 Microns: 50% reduction in volume demand, paper takes 35% of market** | Higher Quality Formal | +2,388 | +2,388 | 17,671 | 17,671 |
| | Lower Quality Formal | -2,000 | -1,105 | (10,600) | (5,857) |
| | Informal | 0 | +7,143 | 0 | 21,429 |
| | **Total** | **+388** | **+8,426** | **7,071** | **33,243** |
| **Scenario C, 30 Microns: VCB spend remains constant, paper takes 5% of market** | Higher Quality Formal | -26 | -26 | (192) | (192) |
| | Lower Quality Formal | -75 | -75 | (398) | (398) |
| | Informal | 0 | 0 | 0 | 0 |
| | **Total** | **-101** | **-101** | **(590)** | **(590)** |
| **Scenario C, 80 Microns: VCB spend remains the same, paper takes 35% of market** | Higher Quality Formal | +92 | +92 | 681 | 681 |
| | Lower Quality Formal | -6,042 | -6,201 | (32,023) | (32,865) |
| | Informal | 0 | 0 | 0 | 0 |
| | **Total** | **-5,950** | **-6,109** | **(31,342)** | **(32,184)** |
| **Scenario D.1: Closure of domestic industry – VCBs are imported** | Higher Quality Formal | -587 | -587 | (4,344) | (4,344) |
| | Lower Quality Formal | -814 | -973 | (4,314) | (5,157) |
| | Informal | 0 | 0 | 0 | 0 |
| | **Total** | **-1,401** | **-1,560** | **(8,658)** | **(9,501)** |
| **Scenario D.2: Closure of domestic industry – VCBs replaced by paper bags** | Higher Quality Formal | -18 | -18 | (133) | (133) |
| | Lower Quality Formal | -814 | -973 | (4,314) | (5,157) |
| | Informal | 0 | 0 | 0 | 0 |
| | **Total** | **-832** | **-991** | **(4,447)** | **(5,290)** |
| **Scenario D.3: Closure of domestic industry – consumers shift to own bags** | Higher Quality Formal | -587 | -587 | (4,344) | (4,344) |
| | Lower Quality Formal | -70,814 | -70,973 | (375,314) | (376,157) |
| | Informal | 0 | 0 | 0 | 0 |
| | **Total** | **-71,401** | **-71,560** | **(379,658)** | **(380,501)** |

[2] See Note 13 in Chapter 8 for a full explanation of the quality of jobs involved.

### The role of Government

There are a number of factors relevant to the role of Government in the context of the regulations:

- The first relates to the cost and requirements to the enforcement of the proposed regulations. Although the Government had not established the costs associated with the enforcement of the regulations at the time of this research, it is recognised that the cost of enforcement is an additional cost to the economy. In this respect Government has informed the Study Team that enforcement will not be done at point of manufacture. It must be recognised that the cost of enforcement will probably be higher if done at point of distribution. Enforcement of the regulations on imported bags will also contribute to the cost.
- A second issue of relevance is that Government support to the plastic industry in lieu of the regulations would be limited. Government has indicated that the only relevant support programme is the SME – Development Programme. This programme will assist SME's with recapitalisation of equipment due to the regulations. Whether is will be substantial enough (limited to a R 1.7 million grant for an investment of R 30million) to ensure that recapitalisation does take place, is debatable.
- A third issue that came to the attention of the Study Team is that the manufacturing process of VCB's is such that the thickness of the material varies by up to 10%. This factor is important in the enforcement of the regulations

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# 1 Background

The principle of sustainable development, which implies that the promotion of economic and social development must occur in conjunction with the protection of the environment for present and future generations, has been embraced by the South African Government and embodied in the Constitution of the Republic of South Africa, as well as the National Environment Act. There is therefore increasing attention being given to issues that have an impact on the environment.

The Department of Environmental Affairs and Tourism (DEAT) has identified littering in general as a problem facing the South African environment, and has focused on the effect of indiscriminate dumping of thin plastic bags , believing that this has contributed greatly to the problem It is in this light that the DEAT has proposed new plastic bag regulations under Section 24 of the Environmental Conservation Act (73/1998), which were published in the Government Gazette of 19 May 2000 No 21203, GN 1994 of 2000. The text of the regulations and the accompanying explanatory memorandum is contained in Annexure A of this report.

The South African Government indicated that the need for the regulations is a logical extension of South Africa's integrated pollution control and waste management policy and strategy, which provides a systematic framework to guide the implementation of a range of actions, one of which is the combating of littering. Initiatives are already in place for other major categories of litter and that plastic bags are logically the next category to address.

From the public comments received in response to the DEAT's invitation for comment on the proposed regulations, the exploration of various possibilities has been suggested. There were numerous proposals for educational programmes, and increased anti-littering campaigns, as well as for the introduction of heavy anti-littering fines. Increased recycling of plastics has been identified as an opportunity, provided that the material has a value and that a market is established for the recycled products. The issue however, is that none of these have been quantified. It is to this extent that all constituencies of Nedlac's Trade and Industry Chamber agreed that joint research should be urgently conducted in order to develop a shared understanding of the potential socio-economic impact of these proposed regulations.

For the purposes of this research, data collection was restricted to vest-type carrier bags. The reason for the focus on these thin, plastic bags with handles, such as those distributed in retail outlets, is the volume of production and usage relative to other forms of disposable consumer plastic. This was decided in order to define the scope of the study more accurately and facilitate sampling for the study.

This report presents the findings and conclusions of the research into the socio-economic impact of the proposed regulations. The research was conducted in accordance with the Study Terms of Reference, which is contained in Annexure B. No recommendations are made. The purpose of this report is to guide the thinking of the Plastic Bag Task Team in formulating recommendations to NEDLAC.

# 2 Objectives, scope and approach of this study

## 2.1 Objectives

The objective of this study is to develop a shared understanding among constituencies of the potential positive and negative impacts of the proposed regulations on the following:

- **Investment and dis-investment**, including the nature of the investment i.e. whether it is capital intensive, labour intensive, as well as the geographic location of the investment.
- **Employment**, including job losses, job creation, shifts in the nature of work/employment patterns, the profile of the workforce, skills profile and conditions of employment.
- **Distortions in the market** including supply and demand balances and different product types this is achieved by isolating one aspect of the packaging industry, namely the vest type carrier bag.
- **Industry,** which relates to industries directly affected, such as petrochemicals and plastics, as well as other related industries, considering the knock-on effect of closing or transforming these industries.
- **Consumers**

## 2.2 Research scope and approach

The research study was restricted to vest type carrier bags, which are technically defined as follows:

- *These bags are manufactured from extruded tubular polyethylene film in varying thickness.*
- *The tube is folded lengthwise on both sides (side gussets).*
- *A bag is then formed by heat-sealing at both ends with a profiled cut at one end resulting in the formation of two handles.*
- *The resultant bag has the shape of a "vest" or "T-shirt".*

The value chain relevant to the manufacture, use and disposal of VCB’s is summarised as follows:

  - Polymer production
  - Conversion
  - Consumption, including re-use
  - Disposal and recycling

Data was collected by means of structured interviews and completion of questionnaires within the following sectors:

- Polymer producers

- Manufacturers of vest type carrier bags
- Plastic recyclers
- Pulp producers
- Paper bag manufacturers
- Paper recyclers
- Cloth bag makers
- Retail industry
- Government

Excluded from the direct data collection exercise were the distributors of VCB's as well as the end consumers of VCB's. Information about these two groups were indirectly obtained from VCB manufacturers in the case of the distributors; and retailers in the case of consumers.

Questionnaires and interview guides were designed so as to extract information as required by the terms of reference and were approved by the counterpart group prior to use.

The following sections outline the specific data gathering approach used and the progress made within the relevant sectors.

### 2.2.1 Polymer producers

Data was successfully collected by means of in-depth interviews, using a structured interview guide, with the two polymer manufacturers in South Africa.

### 2.2.2 Manufacturers of vest-type carrier bags

Data was gathered through two mechanisms, namely the use of a structured questionnaire and follow up interviews. Interviews were also held with labour representatives at those companies that were unionised.

**Data collection by means of structured questionnaire**

- Questionnaires were distributed to 52 VCB manufacturers as per the list of manufacturers provided by the Plastics Federation
- The relevant VCB population turned out to be 42 companies
- The total number of completed questionnaires represented 10 companies, and 12 manufacturing plants representing 75% of total VCB production.
- An additional source of high level, aggregate company data was identified to be the submissions made by companies to the Government (Report on Comments Received, Proposed Regulations under section 24 of the Environment Conservation Act, DEAT, 2000).

Any data used from this source was first verified (telephonic interview) before used for analysis purposes

**Follow up interviews with VCB manufacturers**

- 13 interviews were successfully completed, as follows:

| Region | Small**** | Medium**** | Large**** |
|---|---|---|---|
| KZN | 1 | 2 | 0* |
| Cape Province | 1** | 3 | 1 |
| Gauteng | 1*** | 1 | 3 |

* Identified manufacturer did not make VCBs
** Problematic due to language problems
*** Only produces bags above 30 microns
**** Organisations were categorised based on employment data supplied by the PFSA. Categories defined as follows: Small <25 employees, Medium <25 & <100 and Large >100 employees.

**Interviews with labour representatives of VCB manufacturers**

The interviews were conducted in conjunction with the follow-up interviews of VCB manufacturers. Companies that were not unionised were not targeted for interviews with labour representatives. In addition one company did not agree to interviews. The following table summarises the results of the process

| Region | Small* | Medium* | Large* |
|---|---|---|---|
| KZN | 1 | 1 | 0 |
| Cape Province | 0 | 1 | 1 |
| Gauteng | 0 | 1 | 3 |

* Organisations were categorised based on employment data supplied by PFSA. Categories defined as follows: Small <25 employees, Medium >25 & <100 and Large >100 employees

### 2.2.3 The plastic recycling industry

Data was collected by means of both questionnaires and follow up interviews, as detailed below.

**Data collection by means of structured questionnaire**

- A total of four completed questionnaires were returned
- Follow up communications with plastic recyclers revealed that most do not see the relevance of the proposed regulations to their organizations, and also indicated that they do not see the relevance of questions asking for historical data.

**Follow up interviews conducted with plastic recyclers**

- Four companies, including the two that recycle VCBs (only two currently recycle VCBs) were recommended to the consultants by the Plastics Recyclers Employer Organization
- Two interviews were successfully conducted

### 2.2.4 Pulp producers

The Paper Manufacturers Association of South Africa recommended two pulp producers. One structured interview was successfully completed.

### 2.2.5 Paper bag manufacturers

Data was collected by means of questionnaire and follow up interviews, as detailed below.

**Data collection by means of structured questionnaire**

- The total population was identified to comprise of 6 South African paper bag manufacturers
- Three completed questionnaires were received, and considered to be representative

**Follow up interviews conducted with paper bag manufacturers**

- Analysis of the completed questionnaires indicated that it would be best to limit follow up interviews with 3 manufacturers that completed the questionnaire
- One interview was conducted successfully

### 2.2.6 Paper recyclers

Data was collected by means of structured interviews, as detailed below.

- 4 paper recycler were identified by the Paper Manufacturers Association of South Africa
- Two paper recyclers were successfully interviewed

### 2.2.7 The retail industry

The large listed retail sector was firstly identified, using the results of the Financial Mail's annual top 200-company survey. Within the study is an indication of the top companies in the retail sector from which the top 20 companies were singled out by turnover and those that are involved in either the retail of foodstuffs or clothing were approached by means of a faxed questionnaire. 17 questionnaires were distributed to representatives for 38 individually branded outlets and representing R 117bn in turnover. In total responses were received from 7 retail groups representing R 41.13bn in turnover and 2475 outlets. As data extracted by means of the questionnaire was not representative it was necessary to extract additional data using the follow-up interviews, for this reason follow-up interviews were held with 4 large retailers.

Secondly, smaller retailers were identified through the utilization of a contact database acquired from Matrix Marketing. The small retail sector was then segmented according to Geographic location, Standard Industrial Code (SIC) classification and company size. A direct marketing company was utilized to undertake the requisite number of interviews in order to include an appropriate number of respondents (i.e. 384). The sampling approach forced the inclusion of respondents in terms of segmentation variables. The desired weightings were determined from retail revenue data from StatsSA. In addition the number of retailers has been estimated at 90 000 outlets.

The total number of successful interviews was 377, the shortfall of 7 being due irregularities with contact data, (e.g. incorrect telephone numbers, business closed, etc.). The actual sample was found not to differ significantly from the desired sample and was therefore accepted for analysis.

#### 2.2.8 Cloth manufacturers

Data was gathered from cloth manufacturers by means of structured interviews. Cloth bags were restricted to being those that were made of woven polypropylene and calico. The interviews were as follows:

- Two manufacturers of poly-propylene bags were interviewed
- One manufacturer of calico bags was interviewed
- One cloth manufacturer was interviewed

#### 2.2.9 Informal sector

Data was to be gathered from the informal retail sector by means of a structured questionnaire. This proved unsuccessful as representative bodies proved difficult to establish and retain contact with. Representatives indicated that bodies only dealt with issues affecting the right to trade within certain areas. Attempts to ascertain market size through interviews with small VCB manufacturers proved fruitless due to a lack of understanding of the profile of their cash/small clients.

#### 2.2.10 Government

Data was gathered from Government by their submission of a written response to a set of questions. Follow up interviews were held to obtain more clarity.

#### 2.2.11 Additional interviews conducted

Additional information gathering interviews were held with the following:

- Packaging Council of South Africa
- Symphony Plastics
- CSIR – Process Technology Centre

# 3 Life cycle assessment of paper and plastic checkout carrier bags

## 3.1 Overview of the life cycle analysis approach and findings

This section has been approached by means of an introduction to life cycle analysis (LCA) followed by a description of a generic life cycle analysis methodology, a discussion of the limitations of LCA's, descriptions of the lifecycles of paper and plastic checkout carrier bags, a description of the research approach, a description of the limitations of the research, the presentation of the research found and a statement of conclusions.

The objective of this section was to present a summary of the findings of a literature review into studies previously undertaken of the life cycles of plastic (polyethylene), paper and cloth checkout carrier bags. The review found no data relating to cloth carrier bags. Two studies dealing with the comparison of, firstly, paper and plastic checkout grocery bags in the United States and, secondly, paper and plastic animal feed distribution sacks in Europe were found.

A comparison of the two studies indicates that the results are contradictory. Literature found suggests that the discipline of life cycle analysis is highly sensitive to internal variables including the project scope, methodology, objectives and environmental and geographic context in which the studies are undertaken. This therefore suggests that the studies are limited in both comparison to one another and interpretation in the South African context. It is therefore concluded that in order to generate an understanding of which product life cycle has the greater environmental impact (in South Africa) a South African LCA comparison must be completed.

## 3.2 Introduction to life cycle analysis

A life cycle analysis (LCA) provides a framework and methods for identifying and evaluating environmental burdens associated with the complete life cycles of products and services, i.e. from the product cradle to the grave.

## 3.3 What is Life Cycle Analysis?

The life cycle assessment (LCA) method deals with the complex interaction between the provision of a product or service, through all stages of its life cycle, and the environment. The LCA attempts to predict the overall environmental burdens associated with the provision of the product and identify particularly burdensome or wasteful processes therein.

The United States Environmental Protection Agency defines a Life Cycle assessment as 'an objective process used to evaluate the environmental burdens associated with a product, process or activity by identifying and quantifying energy and materials used and wastes released to the environment, and

...to evaluate and implement opportunities to affect environmental improvements'[3] The purpose of following the product life cycle from the cradle to the grave is to limit or eliminate impact displacement.

Typically a life cycle assessment would determine the energy and raw material utilisation and solid, liquid and gaseous emissions generated at each stage of the life cycle. Generally the second-generation impacts of the system are ignored (e.g. the energy used to fire the bricks that are used to build the kiln would typically not be included).

The basis of an LCA study is an inventory of all the inputs and outputs of industrial processes that occur during the life cycle of a product. The inventory process is simple, in principle. In practice, however, it is subject to a number of practical and methodological problems, as listed below:

- System boundaries
- Processes that generate more than one product
- Avoided impacts
- Geographical variations
- Data quality
- Choice of technology

## *3.4 Generic methodology*

The life cycle of a product or service includes extraction of natural resources, production of raw materials, transport, production of the product, use, and waste management/recycling. In a life cycle assessment, the environmentally relevant input and output flows of the life cycle of the studied products, and the environmental impacts that these cause are calculated and evaluated.

Currently ISO 14040-43 defines a life cycle as comprising of four phases, namely:

**Phase 1: Goal and scope assessment**

The purpose of the study is described. This description includes the intended application and audience, and clearly states the reasons for carrying out the study. The scope of the study is described, which includes the limitations, the functions of the systems investigated, the functional unit, the systems investigated, the system boundaries, the allocation approaches, the data requirements, the key assumptions, the impact assessment method, the interpretation method and the type of reporting.

[3] Vignon B W, Tolle D A, Cornaby B W, Latham H C, Harrison C L, Boguski T L, Hunt R G and Sellers J D, 1993, 'Life-Cycle Assessment: Inventory Guidelines and Principles', United States Environmental Protection Agency, Cincinnati, USA.

**Phase 2: Inventory analysis**

Data is collected and interpreted, calculations are made and the inventory results are calculated and presented. Mass flows and environmental input and output flows are calculated and presented.

**Phase 3: Impact assessment**

The production system is examined from an environmental perspective using category indicators, such as global warming, acidification and eutrophication.

**Phase 4: Interpretation**

Herein the results are analysed in relation to the goal of the study. Conclusions are drawn, limitations of the results are presented and recommendations are provided based on the findings of the preceding phases. The conclusions should be compatible with the goals and quality of the study.

**Practical constraints of life cycle assessments**

A continuing concern of LCA methodology development bodies is the time and cost required to complete LCAs. Some have questioned whether the LCA community has established a methodology that is beyond the reach the majority of potential users. Others have questioned the relevance of the LCA to the actual decisions that potential users must make.

Collection of Life Cycle Inventory (LCI) data can be extremely costly and time consuming and often results in LCA studies being abandoned or proving inadequate because of poor and inconsistent LCI data. Good LCA's demand sound LCI's that subsequently contribute to making good judgments about environmental matters. The build up of a LCI puts together a whole series of smaller process data sets, either for individual processes or collections of individual processes.

In an attempt to facilitate the completion of LCIs numerous industry segments have undertaken and made available 'cradle-to-gate' or 'gate-to-gate' LCI studies. These are prepared by many of the specific industry groupings for the connected processes that are under their control. Such 'block' collections of industry data are known as 'eco-profiles'. A collection of Eco-profiles can then be added together to form a complete LCI. This procedure serves to reduce costs, save time, provide reliable and accurate data and makes LCA studies easier to complete, be more widely applicable, and as a consequence, assists with sound decisions on environmental management by interested parties. The profiles are, however, highly dependent on the context in which they where developed and use in different contexts introduces risk of incompatibility.

There are a number of organizations marketing eco-profiles in the form of LCA databases however these have been found to vary considerably in[4]:

- Level of detail
- Flexibility of data manipulation
- Data quality
- Purchase costs

## *3.5 Limitations of LCAs*

As with any scientific method the LCA methodology suffers from limitations that must be understood. Several basic principles and practicalities remain to be defined:

- Data details differ for each supplier, specific processes used, location, dominant methods of primary production
- Analysis of multi-product manufacturing systems provide complex allocation problems
- The impact assessment stages are not fully developed and cannot provide a full decision support system
- The impact assessment depends on environmental priorities of the industry segment and data provided
- Interpretation is subjective in its ranking of impacts

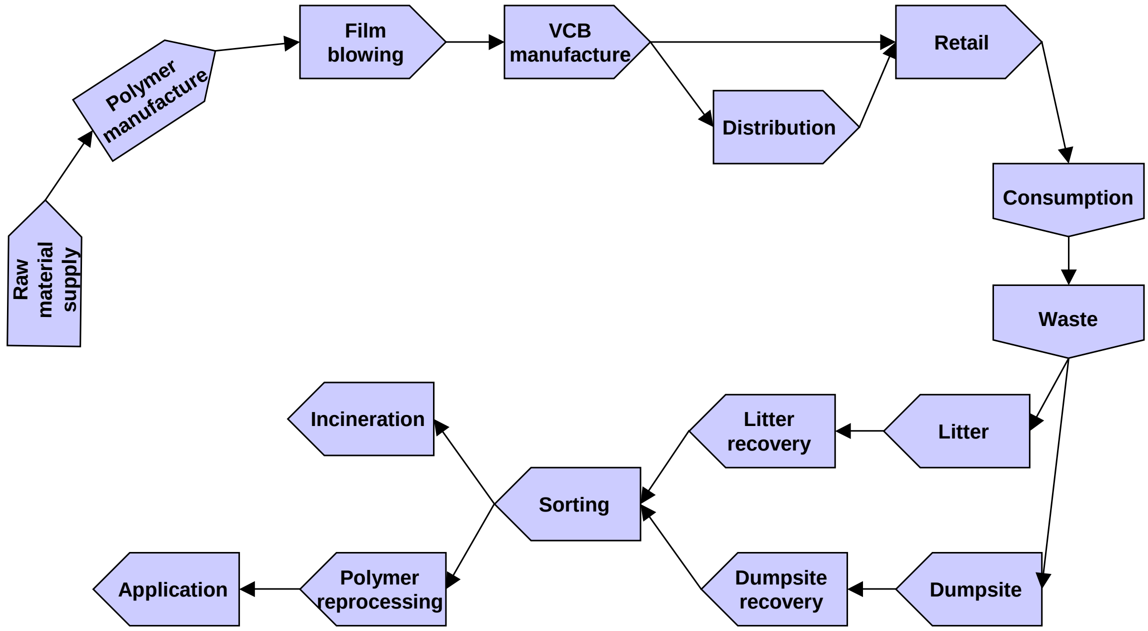
In this light LCAs have been shown to rarely produce clear winners and losers but rather serve to detail environmental implications and illustrate tradeoffs[5].

[4] LCA – Help or Headache?, Estelle Hook, http://www.co-design.co.uk/ehook.htm

[5] Use of Life Cycle Assessment (LCA) as a Policy Tool in the Field of Sustainable Packaging Waste Management, A EUROPEN Discussion Paper – September 1999, http://www.europen.be/issues/lca/lca_revised.html

## 3.6 Generic Life Cycle of Plastic Carrier Bags

The life cycle of plastic vest type carrier bags is illustrated in the diagram below.




**Raw material supply and polymer production**

Polymers used in the plastic resin and manmade fiber industries either occur naturally, such as cellulose, or are formed during polymerization when bond-forming reactions cause small repeating molecules to join together. Polymers are typically made from one type of simple chemical unit, or monomer.

Polymers are central to plastic resin manufacture. Many grades of different polymers are produced, each with different physical characteristics such as strength and ease of flow when melted. These different physical characteristics are achieved by changing operating parameters or by using different polymerization processes to change properties, such as polymer density or molecular weight. Polymers, which have been dried and formed into pellets, are called plastic resins. These resins are further processed at plastics processing facilities that create plastic products of different shapes, sizes and physical properties.

There are several steps that are important to polymerization. First, reactants are purified prior to polymerization. During polymerization, catalysts, heat, pressure and reaction time are all optimized to maximize polymer conversion and speed the reaction. Finally, the polymer is extruded and palletized for packaging and shipment. Various supporting steps are important to note because of their potential effect on the environment. These supporting steps include unloading and storage of chemicals and equipment cleaning.

### Conversion of plastic film

Polymer resins are delivered to converters either in bulk tankers or in plastic sacks. Molten polymer is extruded as a continuous tube. As it leaves the extrusion die, the tube is inflated with air to form a bubble and when the bubble reaches the appropriate size it is cooled by air that changes it into a solid film. The region where the solidification occurs is known as the ‘frost line’, is the region where the required film thickness is reached. The tube is then guided by collapsing boards and gradually flattened and gusseted as it approaches the pinch rolls. When the film passes between them, the top of the bubble is effectively sealed.

The flat film is fed to the winding equipment via a pre-treatment and slitting unit. Slitting and trimming is a continuous operation. The flat film is then wound onto rolls.

Machinery for the extrusion of HDPE and LDPE differ significantly due to the different nature of the molten polymer. The differences prevail primarily in cooling, dye units and screws.

#### VCB manufacture

The gusseted wound film is unwound and passed through a series of rollers. Depending on the printing requirements the film may be passed under ultra violet lights to serve as preparation for printing and print curing. The film may then be printed.

Printed film is passed through rollers, sealed and cut at predetermined lengths. Lengths of film are then stacked and punched to form the handles of the vest type carrier bag. Bags are then bundled and baled for distribution.

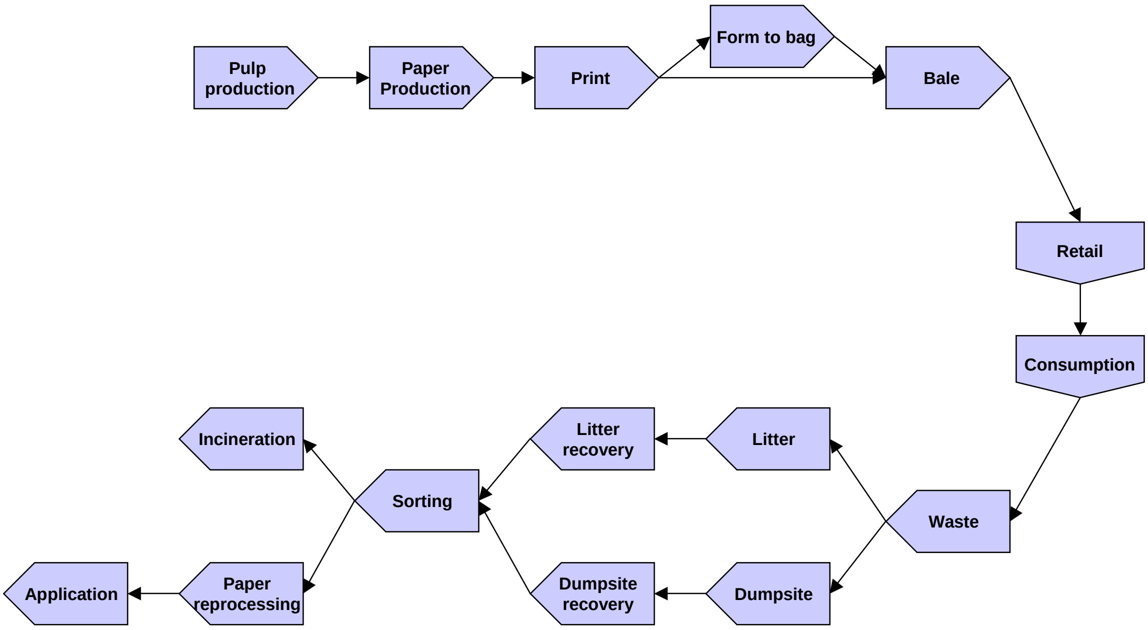
#### Distribution and consumption

Vest type carrier bags are distributed to formal and informal retailers though numerous mechanisms including hawkers, distributors and direct delivery. Carrier bags are used on checkout to hold purchased goods. On completion of use the carrier bag is thrown away or reused in numerous ways such as bin liners and carriers.

#### Waste management

The sources of materials for recyclers typically comprise in-house film that is collected and sorted by polymer grade. Collectors obtain materials from those not wishing to recycle their own materials and may also wish to obtain material from dumps by means of teams of pickers. Materials are then sorted and baled. Materials collected generally comprise post consumer waste and in process waste. Sorted and baled materials are passed through a granulator, agglomerator and then pelletised.

## 3.7 Generic Life Cycle of Paper Carrier Bags




**Raw material production**

Paper is manufactured by applying a watery suspension of cellulose fibres to a screen which allows the water to drain and leaves the fibrous particles behind in a sheet. Most modern paper products contain non-fibrous additives, but otherwise fall within this general definition. Only a few paper products for specialized uses are created without the use of water, via dry forming techniques. The watery fibrous substrate formed into paper is called pulp. The production of pulp is the major source of environmental impacts in the pulp and paper industry.

Processes in the manufacture of paper and paperboard can, in general terms, be split into three steps: pulp making, pulp processing, and paper/ paper board production. First, a stock pulp mixture is produced by digesting a material into its fibrous constituents via a chemical, mechanical, or a combination of chemical and mechanical means. In the case of wood, the most common pulping material, chemical pulping actions release cellulose fibres by selectively destroying the chemical bonds in the glue-like substance (lignin) that binds the fibres together. After the fibres are separated and impurities have been removed, the pulp may be bleached to improve brightness and processed to a from suitable for paper-making equipment. At the paper-making stage, the pulp can be combined with dyes, strength building resins, or texture adding filler materials, depending on its intended end product. Afterwards, the mixture is dewatered, leaving the fibrous constituents and pulp additives on a wire or wire-mesh conveyor. Additional additives may be applied after the sheet-making step. The fibers bond together as they are carried through a series of presses and heated rollers. The final paper product is then spooled on large rolls to be passed on to subsequent steps.

**Conversion**

Self opening bags are produced on S.O. bag machines, some of which have their own in line printing presses. These presses are used when the number of colours or type of design do not justify pre-printing. After printing, the plies pass trough slitters which pre-cut the bottom of the bag, and a cross pasting station where the plies are pasted together at regular intervals. A nozzle then applies adhesive to the longitudinal seam. The plies are then folded over one another and the pre-pasted seams allowed to adhere to the form a tube. This tube is immediately flattened, gussets being formed in the process. The tube now passes between a revolving knife and a stationary knife which cut with a scissor action, and separate the tube into individual lengths for converting into bags. The pre-slit bottom section of each length is opened up with the aid of suction cups and forming guides after which adhesive is applied. Bottom pasters ensure that adhesive is transferred to the required position on the bottom. The bottom is then closed by means of formers and rollers. The completed bags are compressed between a series of rollers before being counted, bundled and palletized.

**Distribution and consumption**

Paper checkout bags are distributed to retailers through numerous channels including distributors and direct supply. Paper checkout bags are primarily used by boutique stores and distributed free of charge to consumers at checkout. Currently paper bags make up approximately 9% of bags distributed by small retailers. However the percentage of grocery checkout carrier bags is significantly smaller than that (currently estimated at less than 1%).

**Waste management**

After use bags can enter the sorting phase by one of two mechanisms namely from litter or the dumpsite. After collection the waste is then sorted and depending on quality and condition is either disposed of by incineration or dumping or recycled.

## 3.8 Research approach for the life cycle assessment

Publicly available literature relating to LCAs of plastic, paper and cloth check out bags was sought from the following sources:

- ECOINVENT (Energy-materials-environment Group)
- BUWAL 250 (ETH Swiss Federal Institute of Technology)
- Eco-profile of the European plastics industry (APME)
- IVAM (IVAM Environmental Research)
- FEFCO
- STFI
- VITO (Flemish Institute for Technological Research)
- KCL ECODATA (The Finnish Pulp and Paper Research Institute)
- PEMS (Packaging Industry Research Association)

The review managed to identify numerous point sources of inventory data in the form of 'eco-profiles'. Lack of data continuity prevented the production of a Life Cycle Inventory, it was therefore necessary to resort to studies in which the complete life cycle for products had been analysed. Since the scope and objectives of LCAs greatly affect results, in order to provide comparisons between product types it was necessary to target comparative studies.

Review of the relevant literature revealed two studies that dealt with direct comparisons between paper and plastic sacks.

The first study, undertaken in the United States, is an LCA based comparison of LDPE and Paper "1/6 barrel grocery sacks" and was undertaken by Franklin Associates.

The second study undertaken in Europe dealt with the distribution of agricultural filling goods in different distribution systems, namely paper, plastic, semi-bulk and bulk. The distribution systems are 25 kg (capacity) sacks made of 140 micron Low Density Polyethylene and 70 g/m$^2$ two ply unbleached paper.

No data was found relating to the life cycle of biodegradable plastics. Industry experts however felt that biodegradable plastics offer no real life cycle benefit since production is on a smaller scale than polyethylene therefore production facilities are not as efficient per kilogram of polymer. In addition due to lack of local production facilities of biodegradable resins therefore require shipping thereby significantly affecting the life cycle profile. None of the alternative biodegradable polymers would have a density lower than polyethylene; therefore equivalent bags would require more resin thereby attracting a life cycle penalty[6].

No life cycle inventory data, or life cycle analyses were found for cloth bags this therefore has been left out of the report.

## *3.9 Limitations of the research approach*

There are a number of issues affecting the comparison of the above studies both to the South African environment and to one another, for example:

- Geographies
    - Temperature
    - Availability of land
    - Annual rainfall
- Product life cycle
    - Raw material source (e.g. coal vs. oil)
    - Sources of energy (nuclear, coal, hydro electric power stations)
    - Production processes (Cracking and extrusion technologies, emission controls)
    - Conversion processes (Modern and antiquated technology)
    - Consumer processes (propensity for reuse, propensity to recycle, waste management, is the product used as a source of energy?)
    - Waste management processes
- Objectives and scope
    - Definition of system parameters
    - Definition of objectives
    - Data collection methodology

The issues listed above are indicative of the factors that may, or may not, cause significant differences in LCAs for similar products in different circumstances. These factors compromise the ability to use the above studies in the South African context. The two studies are, however, presented in the following section and conclusions drawn.

[6] Email communications with Tony Kingsbury, President of the International Biodegradable Products Institute, 27th August 2001.

## *3.10 Presentation of relevant literature*

**The functional unit**

The functional unit of an LCA is the amount of product or material for which the environmental loadings are quantified. When comparisons are performed it is important that the products to be compared fulfil the same function, therefore the unit of comparison in both the following studies is 10,000 uses.

Study 1: Title: **"Resource and Environmental Profile Analysis of Polyethylene and Unbleached Paper Grocery Sacks,"** Franklin Associates, Ltd., 1990.

Franklin Associates, an independent Life Cycle Analysis and Solid Waste Management consultancy undertook the study.

**Background**

Packaging materials, in the United States, had come under the scrutiny of a wide range of interest groups as a result of decreasing landfill capacity, an inability to find new landfill sites and the large percentage by volume of packaging materials in landfills.

**Objectives**

The objective of this study is stated as the determination of energy and environmental discharges of polyethylene and paper grocery sacks.

**Scope**

Grocery bags examined in the study were the:

- 1/6 barrel polyethylene (HDPE and LLDPE) vest type grocery sacks; and
- 1/6 barrel 70 pound base weight single ply unbleached paper grocery sack.

Details of the sacks considered.

| Bag type | Micron/ $g/m^2$ | Dimensions (cm) | Similar to | Indicative pricing |
|---|---|---|---|---|
| 1/6 Barrel Polyethylene | unknown | 51 x 30.5 x 20 | Maxi VCB | $ 45/ 1000 |
| 1/6 Barrel Paper | 110 | 44 x 18 x 31 | Shopper paper checkout bag | $ 70/ 1000 |

These sacks were regarded as being standard issue plastic and paper sacks used in grocery stores in the United States.

The utilisation ratio of polyethylene to paper sacks was identified as critical to the project. It was identified that there was no representative industry ratio indicating the number of uses of polyethylene grocery sacks that fill the same role as paper grocery sacks. The results of the analysis are presented at ratios of 1.5:1 and 2:1, i.e. 1.5 plastic sacks filling the same role as 1 paper sack. It is however recognized that the plastic sack has a greater reuse capability.

**Methodology**

A cradle to the grave approach was used to determine the energy and environmental discharges of the packages, this quantified energy consumption and environmental emissions at each stage of the product's life cycle beginning at the point of raw material extraction and proceeding through processing, manufacture, use and final disposal, or reuse.

Energy use was presented in the report in British Thermal Units but has been converted to Mega Joules for the purposes of this report.

Government documents as well as federal regulations, technical literature and confidential industry sources form the basis of the data.

Three broad environmental categories were considered, namely solid wastes, atmospheric emissions and waterborne wastes.

Both paper and polyethylene sacks were considered to participate in an "open loop" recycling system, in that recycled materials would replace virgin materials in the manufacture of other goods (e.g. in the case of polyethylene recycled material would go to the manufacture of pipes, etc.).

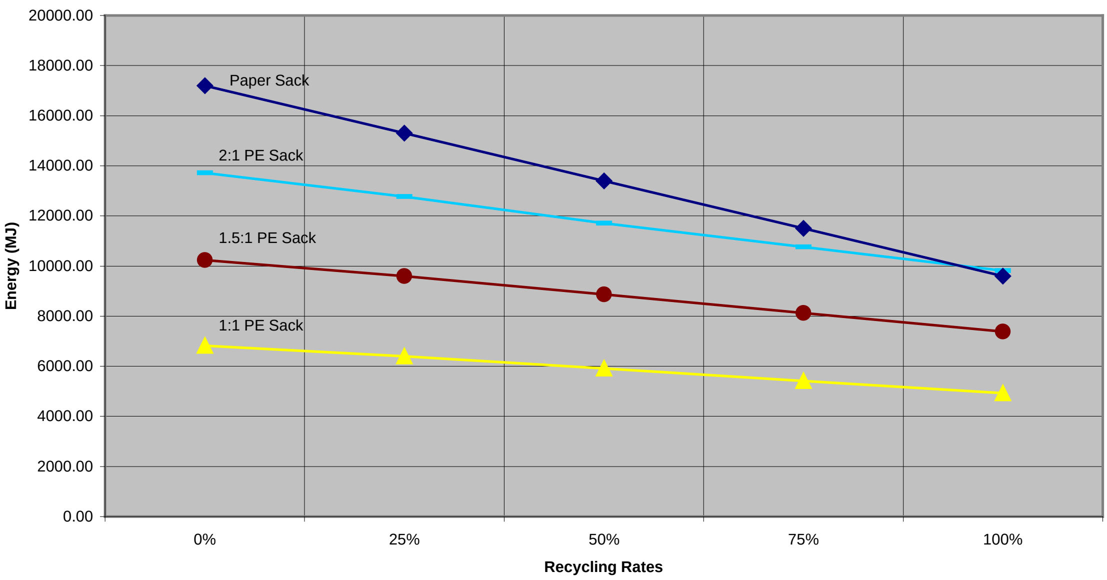
## Findings of the study

### Energy requirements

| Energy requirements for 1/6 Barrel PE and Paper Grocery Sacks at Various Recycling Rates (MJ/10 000 bags) | | | | | |
|---|---|---|---|---|---|
| **Sack type** | **Recycling rates** | | | | |
| | **0%** | **25%** | **50%** | **75%** | **100%** |
| **1.0 PE to 1 Paper Sack Ratio** | | | | | |
| Polyethylene | 6822.70 | 6400.67 | 5908.31 | 5415.95 | 4923.59 |
| Paper | 17197.41 | 15298.31 | 13399.21 | 11500.11 | 9601.01 |
| **1.5 PE to 1 Paper Sack Ratio** | | | | | |
| Polyethylene | 10234.04 | 9601.01 | 8862.47 | 8123.93 | 7385.39 |
| Paper | 17197.41 | 15298.31 | 13399.21 | 11500.11 | 9601.01 |
| **2 PE to 1 Paper Sack Ratio** | | | | | |
| Polyethylene | 13715.73 | 12766.18 | 11711.12 | 10761.57 | 9812.02 |
| Paper | 17197.41 | 15298.31 | 13399.21 | 11500.11 | 9601.01 |

The energy requirements for the plastic polyethylene sacks were found to be 20 to 40% less than for paper sacks at zero percent recycling for both sacks. As recycling increases, the energy requirements became equivalent at approximately a 90% recycling rate (for a 2:1 ratio)

**Energy requirements for Grocery Sacks**



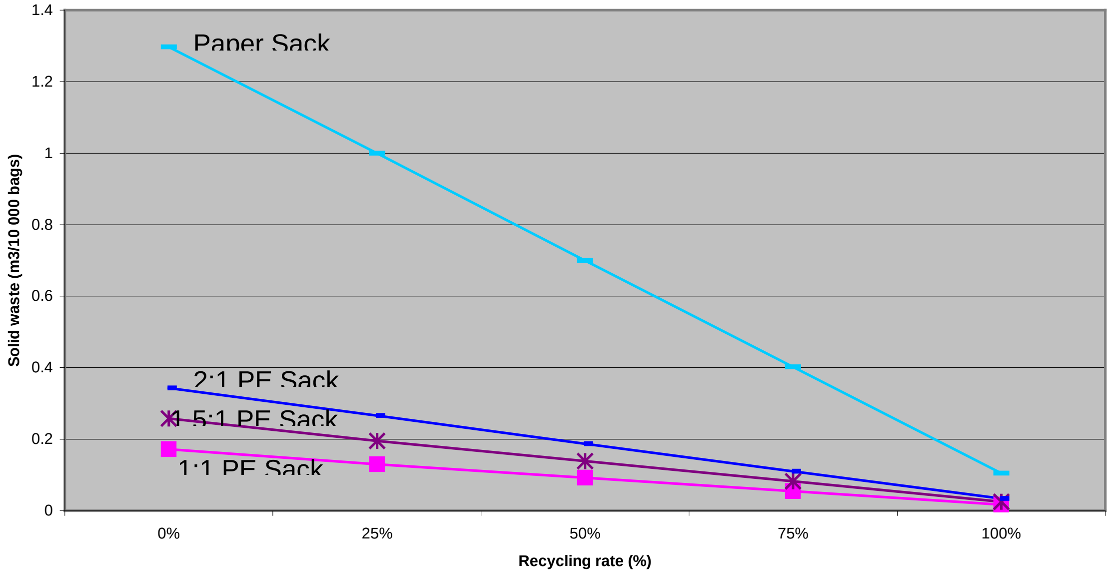
## Environmental

### Solid waste emissions

| Solid waste emissions ($m^3$/ 10 000 bags) | | | | | |
|---|---|---|---|---|---|
| **Sack Type** | **Recycling rates** | | | | |
| | **0%** | **25%** | **50%** | **75%** | **100%** |
| **1 PE to 1 Paper Sack Ratio** | | | | | |
| Polyethylene | 0.17 | 0.13 | 0.09 | 0.05 | 0.02 |
| Paper | 1.30 | 1.00 | 0.70 | 0.40 | 0.10 |
| **1.5 PE to 1 Paper** | | | | | |
| Polyethylene | 0.26 | 0.19 | 0.14 | 0.082 | 0.025 |
| Paper | 1.30 | 1.00 | 0.70 | 0.40 | 0.10 |
| **2.0 PE to 1 Paper** | | | | | |
| Polyethylene | 0.34 | 0.27 | 0.19 | 0.11 | 0.03 |
| Paper | 1.30 | 1.00 | 0.70 | 0.40 | 0.10 |

For the purposes of this study solid wastes comprised ash from energy generation and incineration and post consumer solid wastes. Polyethylene sacks were found to contribute 74 to 80 percent less solid waste than paper sacks at zero percent recycling. Polyethylene sacks continued to contribute less solid waste than paper sacks at all recycling rates.

**Total solid wastes for grocery sacks**

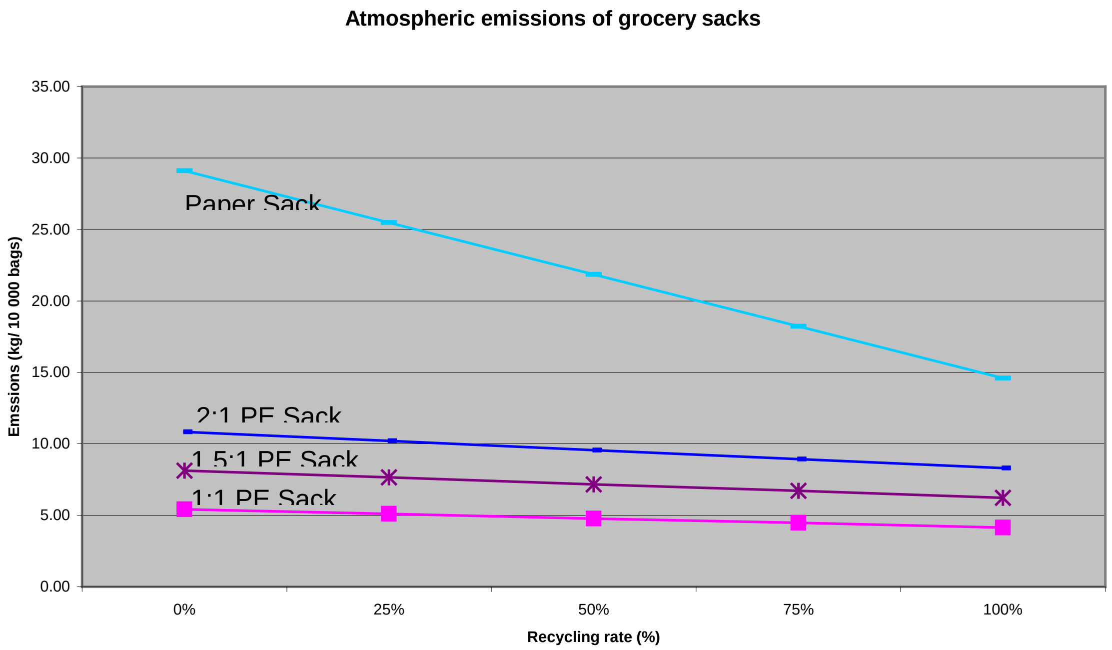


### Atmospheric emissions

| Atmospheric emissions (kg/ 10 000 bags) | | | | | |
|---|---|---|---|---|---|
| Sack Type | Recycling rates | | | | |
| | 0% | 25% | 50% | 75% | 100% |
| 1 PE to 1 Paper Sack Ratio | | | | | |
| Polyethylene | 5.41 | 5.11 | 4.78 | 4.48 | 4.14 |
| Paper | 29.12 | 25.49 | 21.86 | 18.23 | 14.61 |
| 1.5 PE to 1 Paper | | | | | |
| Polyethylene | 8.12 | 7.67 | 7.17 | 6.71 | 6.21 |
| Paper | 29.12 | 25.49 | 21.86 | 18.23 | 14.61 |
| 2.0 PE to 1 Paper | | | | | |
| Polyethylene | 10.84 | 10.21 | 9.57 | 8.94 | 8.30 |
| Paper | 29.12 | 25.49 | 21.86 | 18.23 | 14.61 |

Six components were analysed in combination in this category, namely particulates, nitrogen oxides ($NO_x$), Hydrocarbons, sulphur oxides ($SO_x$), carbon monoxide and odorous sulphur.

Atmospheric emissions for the polyethylene sack were found to range from 63 to 73 percent less than for paper sack at zero percent recycling. These lower impacts for polyethylene sack continued throughout all recycling rates.



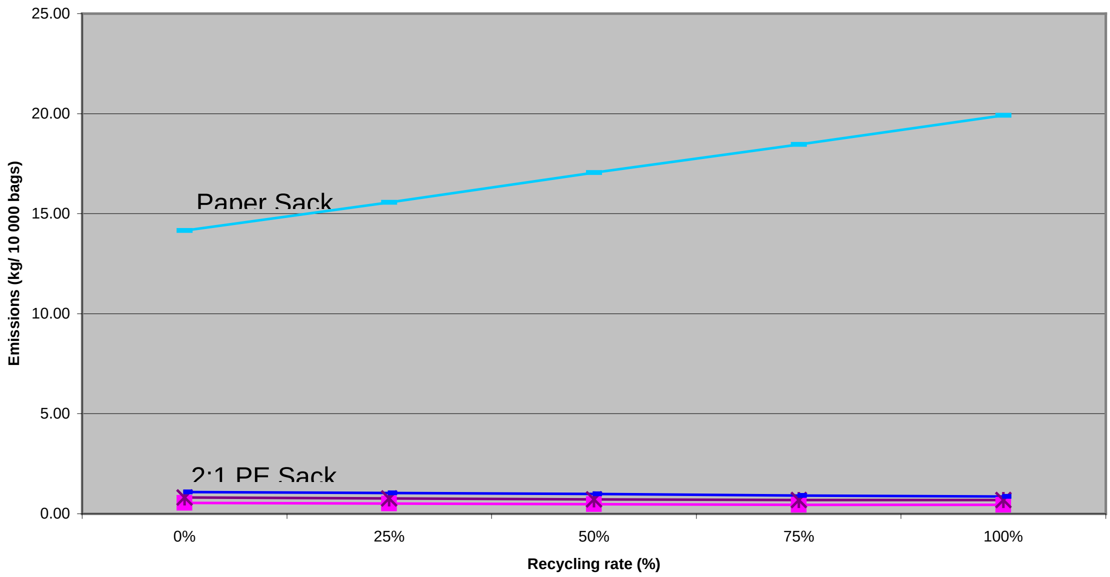
### Waterborne wastes

| Waterborne emissions (kg/ 10 000 bags) | | | | | |
|---|---|---|---|---|---|
| Sack Type | Recycling rates | | | | |
| | 0% | 25% | 50% | 75% | 100% |
| 1 PE to 1 Paper Sack Ratio | | | | | |
| Polyethylene | 0.54 | 0.51 | 0.48 | 0.45 | 0.45 |
| Paper | 14.15 | 15.56 | 17.06 | 18.46 | 19.91 |
| 1.5 PE to 1 Paper | | | | | |
| Polyethylene | 0.82 | 0.77 | 0.73 | 0.68 | 0.68 |
| Paper | 14.15 | 15.56 | 17.06 | 18.46 | 19.91 |
| 2.0 PE to 1 Paper | | | | | |
| Polyethylene | 1.09 | 1.04 | 1.00 | 0.91 | 0.86 |
| Paper | 14.15 | 15.56 | 17.06 | 18.46 | 19.91 |

Four components were analysed in combination in this category, namely dissolved solids, biological oxygen demand (BOD), suspended solids and acids.

At zero percent recycling rate the polyethylene sack contributed over 90 percent less waterborne wastes than the paper sack. As the rates of recycling increased the difference was found to increase as the recycling of paper contributes more to waterborne wastes than paper made from virgin material.

**Waterborne wastes for grocery sacks**



### Recyclability

Both polyethylene and paper sacks were found to be recyclable. Manufacturing and scrap trim from the fabrication of the sacks were typically recycled. Post consumer recycling for both sacks was not found to be significant. In the case of paper sacks, recycling efforts relied on the collection of old newspapers as a support. For Polyethylene sacks, efforts were found to focus on industrial film scrap.

### Combustion

Polyethylene releases 2.75 times more energy upon incineration than unbleached paper. However on an unequal basis, paper grocery sacks weigh 4 to 5 times more than plastic grocery sacks. Therefore the paper sack was noted as having the greater potential for energy release from incineration than the polyethylene sack.

### Landfill impacts

The landfill volume occupied by the polyethylene sack is 70 to 80 percent less than the volume occupied by paper sacks given equivalent uses. It was noted that little data exists regarding the rate of degradation for both polyethylene and paper. It was therefore argued that the rate of decomposition could not be estimated and so no estimates regarding the potential impact on landfill leachate or methane gas production were included.

### Discussion

The products under consideration are clearly are directly relevant to the South African study. In terms of comparison to a South African situation the factors discussed earlier may alter the results significantly. Unfortunately the only access to the study was in the form of the final report. It was not possible to get better access to the study results.

Study 2: Title: **"Distribution in Paper Sacks,"** CIT Ekologik, Chalmers Industriteknik, 2000.

The study was undertaken by CIT Ekologik, an independent Swedish environmental consultancy, on behalf of Eurosac and CEPI Eurokraft.

**Goal**

To compare the environmental performance of distribution in 25kg paper sacks with alternative distribution systems. The alternatives include bulk distribution, 25kg Plastic sacks and 1000kg 'big bags'. It is noted that the products analysed in this study are fundamentally different products to check out carrier bags – they are bigger bags.

**Objectives**

The primary objective of the study was to compare the environmental impacts of distribution in paper sacks with those of distribution in other systems for filling goods in Europe.

**Scope**

All of the systems studied include extraction of natural resources, production of raw materials, production of sacks/big bags/silos, after use treatment and all associated transport.

On the comparison of the distribution systems, it became clear that the distribution system transport itself gave the highest impact of the studied systems. This was due to the assumed distribution of 1000kg of filling goods over a distance of 300km. It was also noted that the environmental effects were of the same size regardless of the packaging system and were therefore removed from the presentation of the study results.

The paper and plastics sacks are described as follows:

| Bag type | Micron/ g/m$^2$ | Dimensions (cm) |
|---|---|---|
| LDPE | 140 | 37 x 72 x 13 |
| Paper | 2 x 110 | 50 x 70 x 13 |

The lifecycle phases covered in this report are explained in the table below

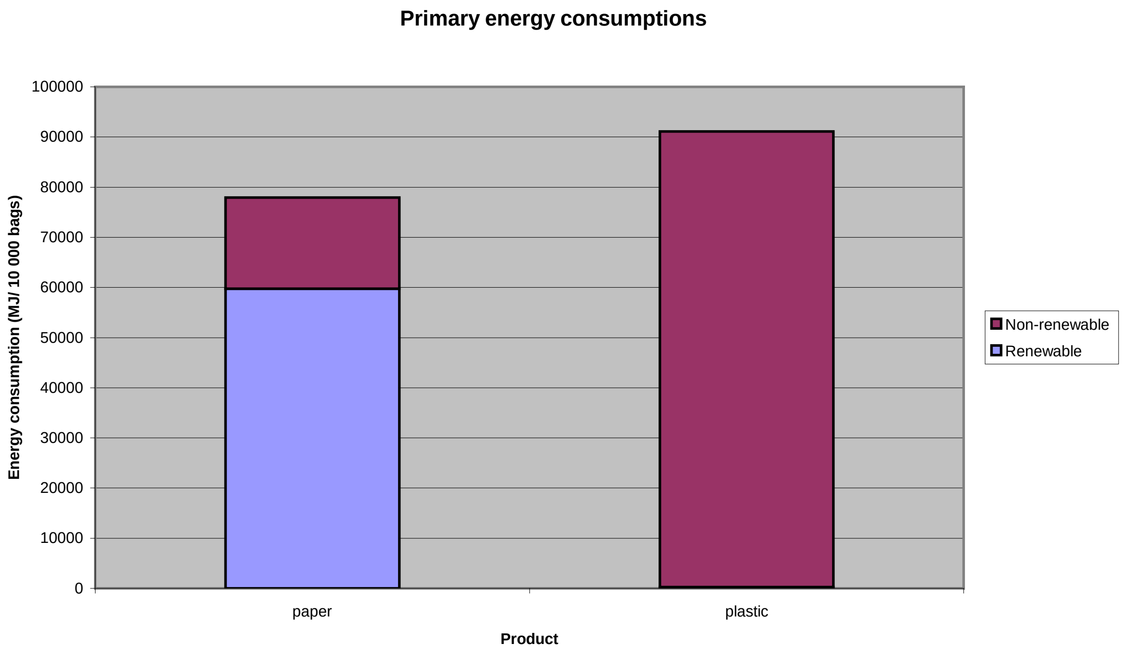
| Life cycle stage | Explanation |
|---|---|
| Raw material production | Production of paper and LDPE from original source |
| Conversion | The conversion of paper and resin into Sacks |
| Waste management | Waste management, incineration, land filling or composting were considered as separate scenarios. The recycling scenario has assumed 100% recycling for both paper and plastic. Note for ease of comparison only reflected the recycling waste management scenarios have been reflected, however where relevant reference is made to other scenarios. |
| System expansion | The systems are expanded to include parts of other life cycles that are affected by the compared systems. The purpose of this system expansion is to avoid allocation problems that arise at waste incineration or at open loop recycling of material from one life cycle to another. The systems are expanded to include parts of other systems that are affected by the recycling of major materials after use in the distribution system. |

This life cycle analysis considered environmental impacts under the following headings:

| Impact category | Unit |
|---|---|
| Primary energy consumption | MJ/ 10 000 bags |
| Abiotic resource depletion | Kg/ year/ 10 000 bags |
| Global warming | Kg $CO_2$ equivalents/ 10 000 bags |
| Acidification | Kg $SO_2$ equivalents/ 10 000 bags |
| Nutrient enrichment | Kg $NO_x$ equivalents / 10 000 bags |
| Photochemical ozone formation | Kg $C_2H_2$ equivalents/ 10 000 bags |
| Aquatic ecotoxicity (water emissions) | $M^3$ polluted water |
| Air emissions | Kg contaminated body weight |
| Water emissions | Kg contaminated bodyweight |

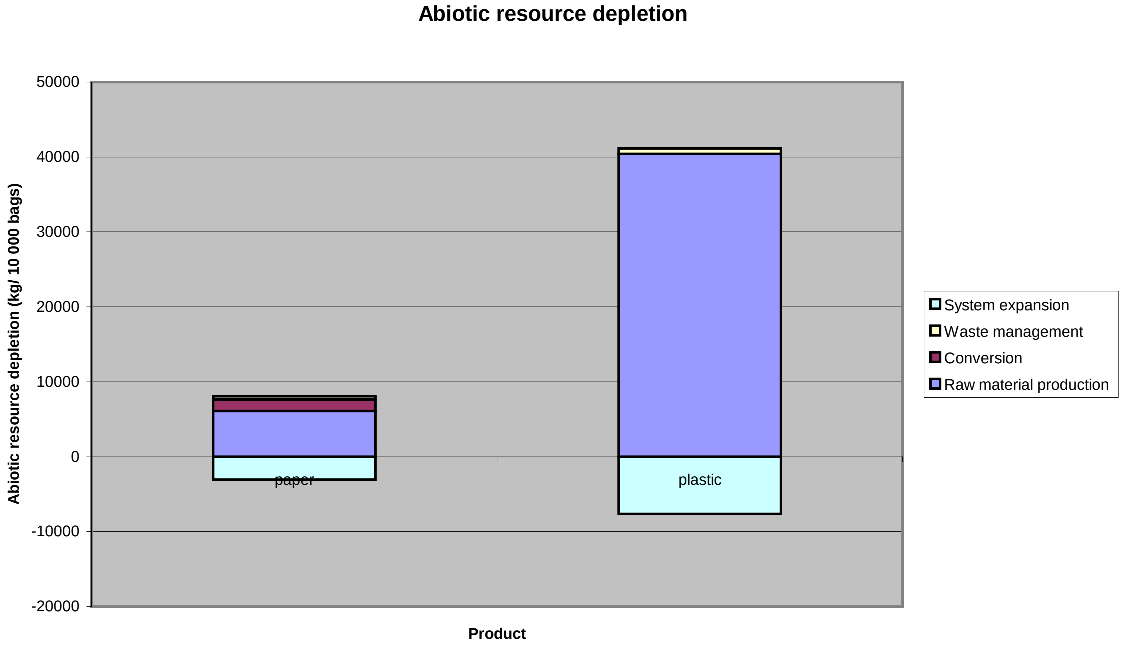
The findings of the analysis are presented in the following sections.

### Primary energy consumption




Primary energy consumption was calculated including energy utilization in the production of the raw material (i.e. crude oil and wood). The LDPE sacks were found to give a higher contribution to the depletion of non-renewable resources than paper. This is due to the use of fossil raw material and energy in the production of LDPE.

### Abiotic resource depletion

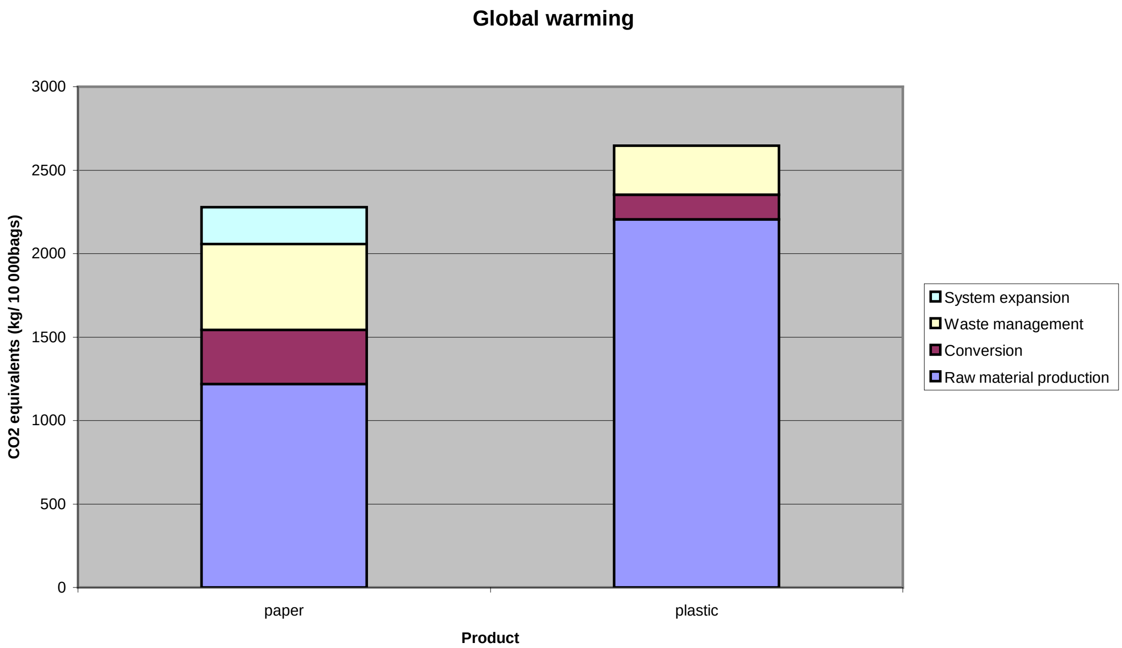



The depletion of abiotic resources such as metal ores and fossil fuels is problematic since it results in a situation where future generations will be required to resort to use other resources. It is important to note in this respect that, in Europe, forests grow faster than they are depleted and this was therefore not included as resource depletion.

The LDPE sack was found to give the highest contribution to abiotic resource depletion. This was dependant on the fact that, in the study geography, LDPE is made from crude oil and natural gas. The characterization factor associated to extraction of natural gas and oil is large due to the assumption that annual extraction is large when compared to reserves.

In addition the recycling scenarios gave higher contributions than the corresponding incineration scenarios since the energy produced on incineration was assumed to replace heat and electricity from other sources. Heat energy has been assumed to be a mix of 60% light fuel oil and 40% natural gas, and electrical energy was based on European averages.

## Global warming



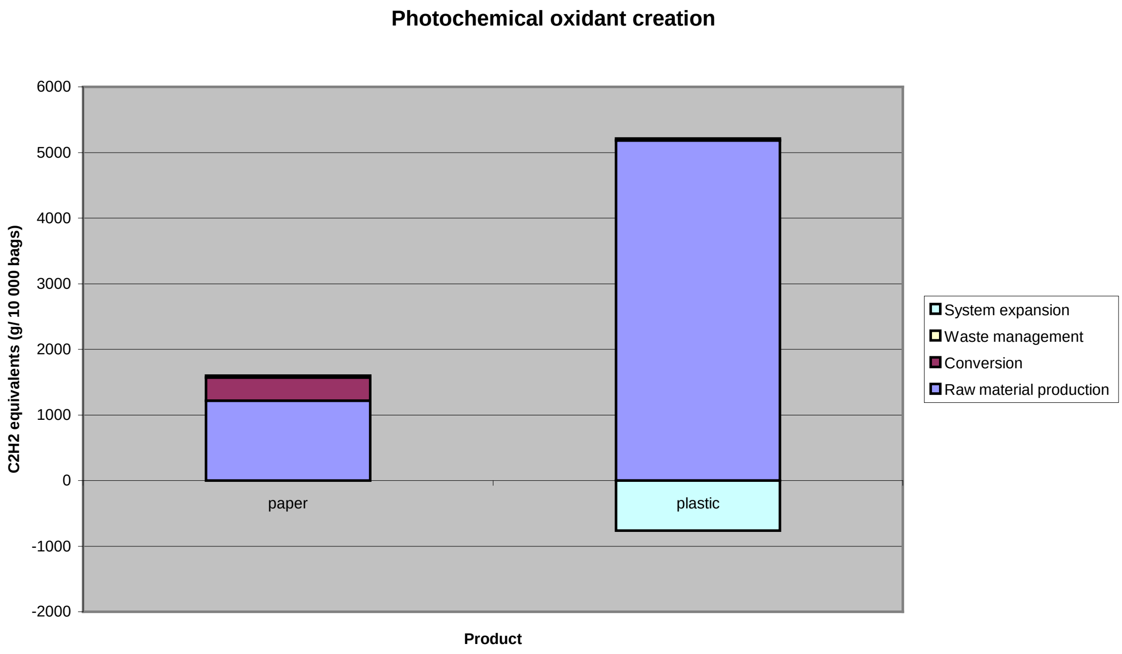

Global warming is caused by increases in the atmospheric concentration of chemical substances that absorb infrared radiation. Global warming is measured in $CO_2$ equivalents.

It was found that the LDPE sacks gave the highest potential contribution to global warming. It was also found that the contribution to global warming from paper sacks on incineration was low because the carbon dioxide at incineration of paper was deemed to be biological thereby eliminating a net contribution to global warming. In addition the heat generated during incineration has been assumed to replace heat produced from a mix of 60% light fuel oil and 40% natural gas.

The contribution from the LDPE sack, incineration scenario was found to be higher than the incineration scenarios for the paper sacks. This was due to the characterization of carbon dioxide emissions from incineration of LDPE as fossil, as opposed to biological. LDPE was found to have a higher ‘heat value’ than paper thereby allowing greater recovery of energy.

The contribution to global warming from the paper sacks, recycling scenario was found to be high. This was as a result of system expansion as the recycled sacks were assumed to replace virgin paper from other products that were assumed to end up in landfills thereby causing methane gas emissions.

## Photo chemical oxidant creation



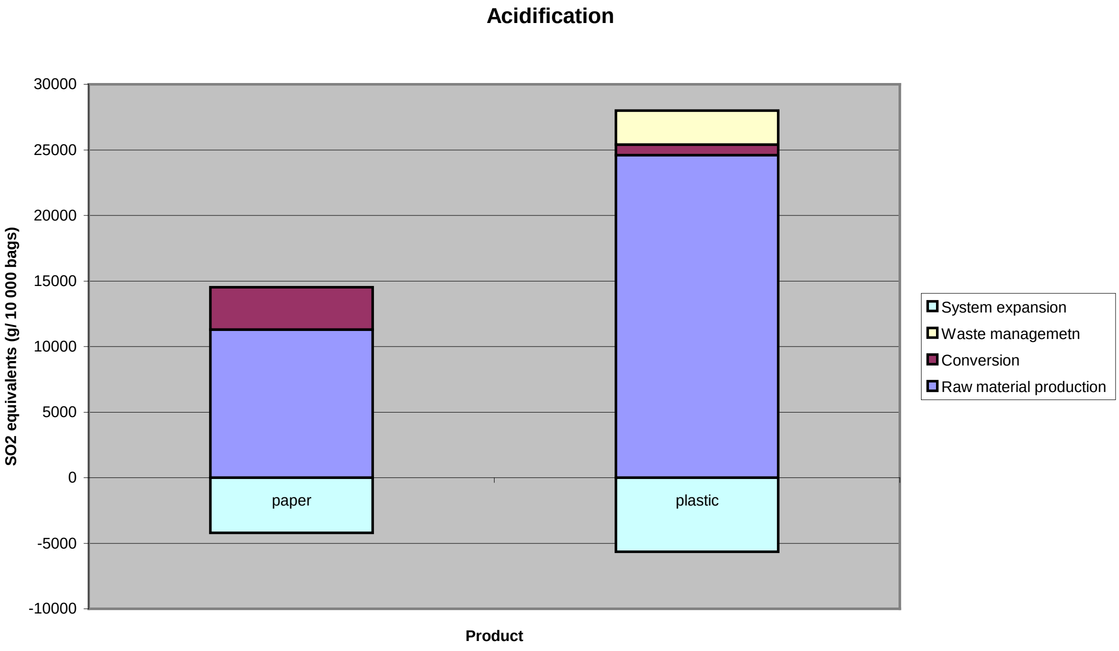

This impact category reflects the creation of oxidizing compounds through photochemical reactions in the air. The most important oxidant, in this context, is ozone.

The LDPE sack gave the highest contribution to photochemical oxidant creation. This was as a result of the emission of hydrocarbons from the production of LDPE.

The landfill scenarios for the paper sacks gave the higher contributions than the other scenarios for the paper sacks due to the formation of methane during decomposition.

An additional difference between photo oxidant creation was found to be a gap in data provided by STFI (i.e. lack of detail).

## Acidification




Acidification is the reduction of the pH value in terrestrial and water systems. This is problematic since it causes substances, including nutrients, in the soil to dissolve and be carried away by water systems.

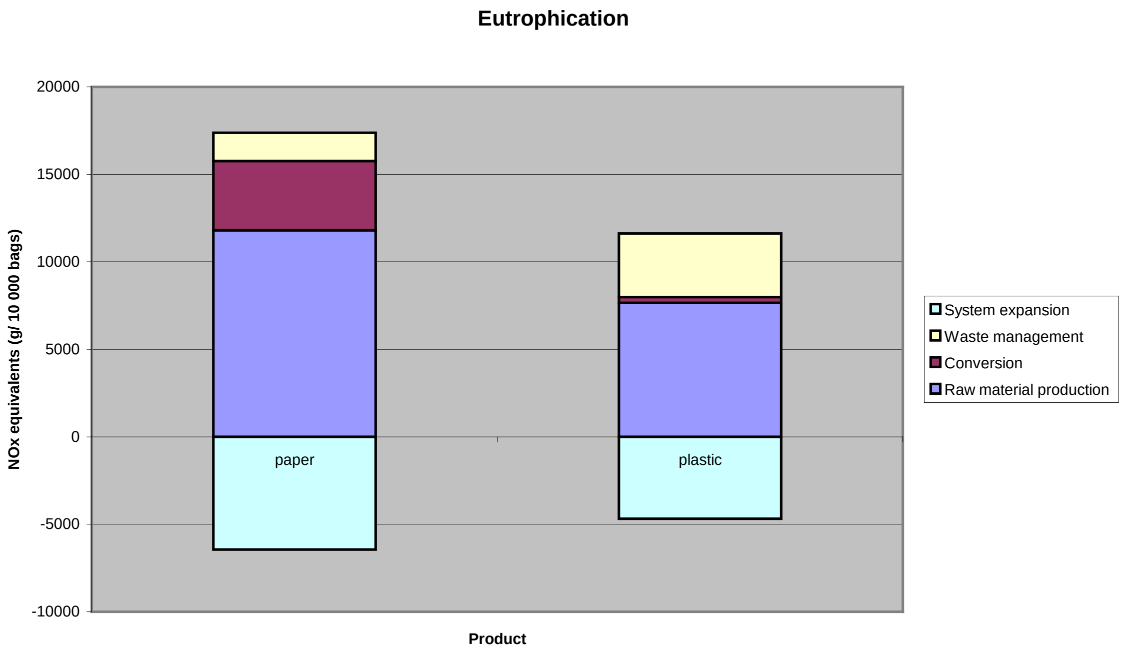
The LDPE sack gave the highest contribution to acidification due to emissions of $NO_x$ and $SO_2$ associated with the use of fossil fuels.

During the incineration of LDPE, $NO_x$, is created, contributing to acidification.

The positive contribution to acidification from the recycling of LDPE comes from creation of $NO_x$ and $SO_2$ at electricity generation. The negative contribution from the system expansion at the recycling of LDPE is mainly from the avoided LDPE production, the avoided LDPE recycling and from the alternative energy production.

The difference between the LDPE sack and the paper sack is however rather high, which primarily depends on the fact that at recycling, the LDPE has been assumed to replace only 17% virgin material while the paper replaces 44% virgin material.

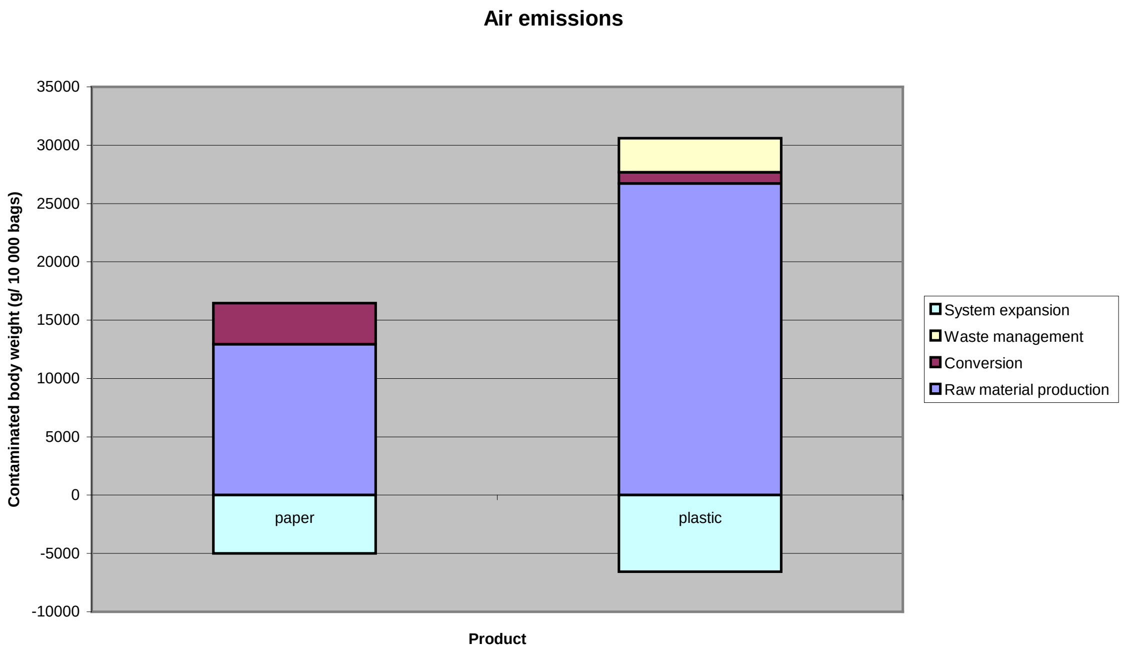
## Eutrophication




Eutrophication is the disturbance of the nutritional balance in the soil. In aquatic systems this leads to increased production of biomass, which may lead to oxygen deficiency on decomposition.

The paper sack gave the highest contribution to eutrophication due to the high levels of COD from sack paper production.

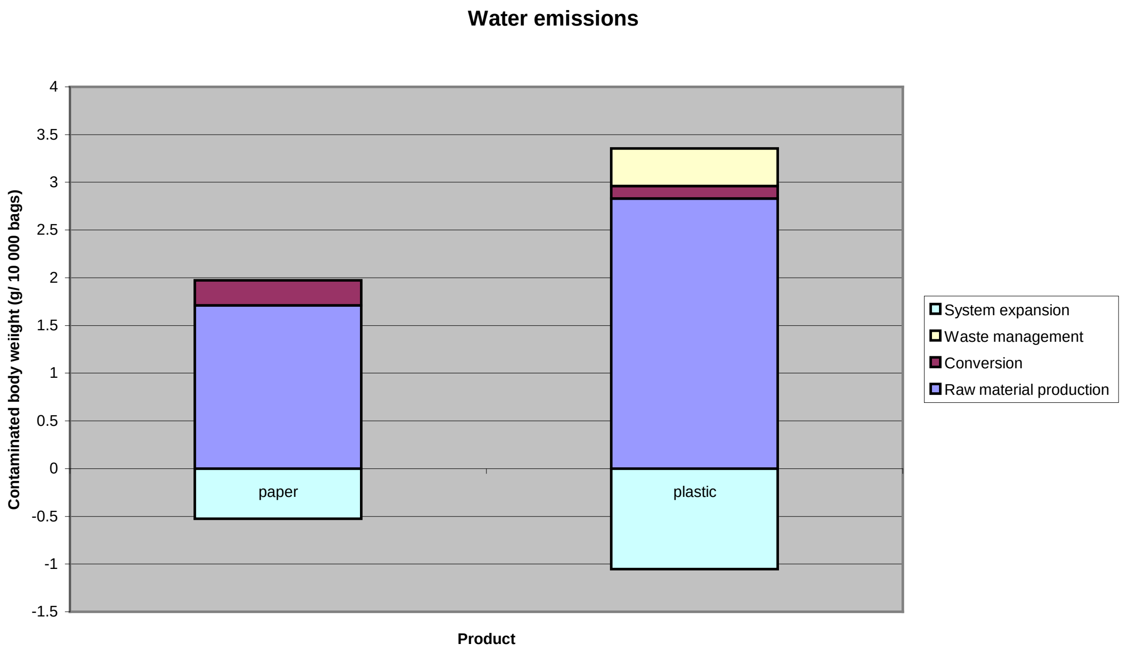
## Air emissions




For human toxicity caused by air emission, it is the LDPE sack that gives the highest contribution. The emissions of $NO_x$ and $SO_2$ associated with the use of fossil fuels at the production of LDPE were found to dominate thereby giving the LDPE sack a greater contribution to air emissions.

The positive contribution from the recycling of LDPE arises due to the creation of $NO_x$ and $SO_2$ at electricity generation. The negative contribution from the system expansion at the recycling of LDPE is mainly from the avoided LDPE production, the avoided LDPE recycling and from the alternative energy production.

## Water emissions

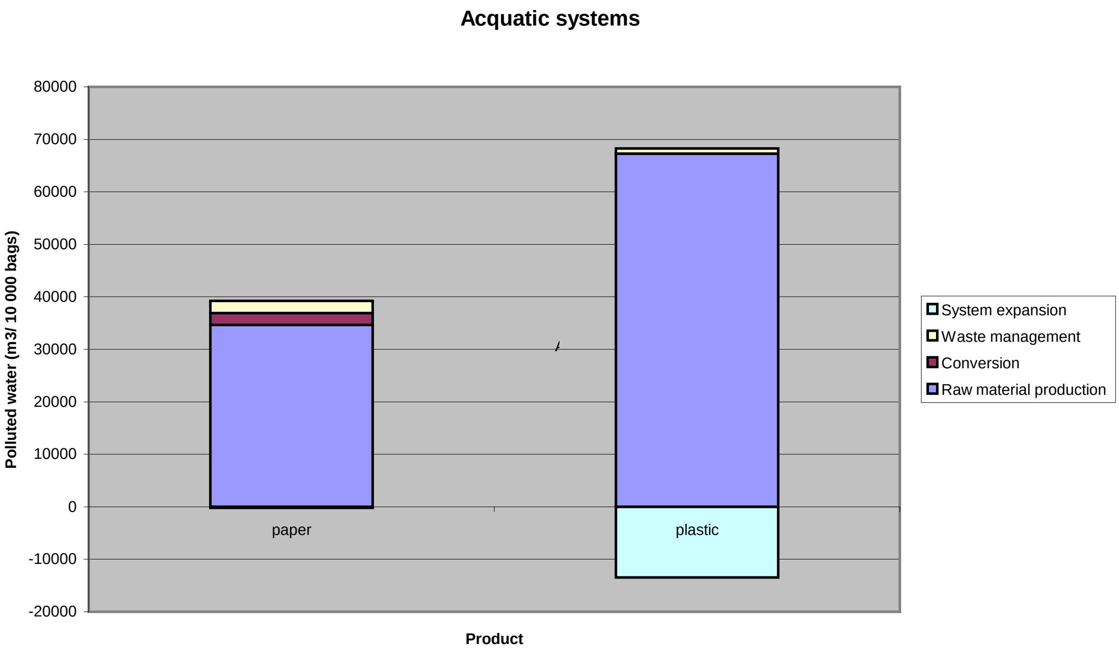



For human toxicity caused by water emissions, it is the bleached paper sack, landfill scenario that gives the highest contribution.

The negative contributions from the system expansions for recycling were found to be higher for the LDPE sacks than for the paper sacks. The recycling of LDPE was assumed to replace 83% recycled material from other products and 17% virgin material. The recycling of paper was assumed to replace 56% recycled material from other products and 44% virgin material.

The slight negative contribution from the recycling of paper is due to the production of electricity. This is a negative contribution due to the lack of emissions of iron (Fe) to water from European average electricity production.

## Pollution of aquatic systems




The contribution to the pollution of aquatic systems from the production of LDPE was found to be higher than the contribution from paper production.

The negative contributions from system expansions for recycling are higher for the LDPE sacks than for the paper sacks.

### 3.10.1 Conclusion

The objective of this section was to prepare a comparison of the environmental life cycle effects of both plastic and paper checkout carrier bags. It was found however that due to the sensitivity of the results of LCA to factors such as scope, objective, geography, climate, energy sources including others that LCA's are limited in their comparison, firstly, between studies and, secondly, between environments (e.g. Europe and South Africa).

Life cycle studies analysing relevant products were found, the findings of which are listed for each of the impact categories in the table below:

| **Impact category** | **Study 1**<br>**1/6 barrel grocery sacks** | **Study 2**<br>**25 kg (capacity) distribution sacks** |
|---|---|---|
| | **Paper versus Plastic** | **Paper versus Plastic** |
| Primary energy | Plastic life cycle uses 23.08% less | Paper life cycle uses 80.00% less |
| Solid waste | Plastic life cycle produces 75.68% less | Category not considered |
| Abiotic resource depletion | Category not considered | Paper life cycle depletes 85.00% less |
| Global warming | Category not considered | Paper life cycle contributes 95.69% less |
| Acidification | Category not considered | Paper lifecycle contributes 53.79% less |
| Nutrient enrichment | Category not considered | Plastic life cycle 55.36% less |
| Photochemical ozone formation | Category not considered | Paper life cycle contributes 64.04% less |
| Aquatic ecotoxicity | Category not considered | Paper life cycle contributes 37.04% less |
| Air emissions | Plastic life cycle contributes 57.45% less | Paper life cycle contributes 52.23% less |
| Water emissions | Plastic life cycle has 96.58% fewer | Paper life cycle contributes 28.79% less |

Clearly the results presented in the table above are contradictory. This serves as an illustration as to the possible effect of project scope, system limitations, objectives and assumptions and possible geographic factors on the LCA results. Furthermore, close examination of the exact by-products examined as emissions in each LCA may reveal differences which identify why the results are contradictory (the consultants are not privy to these details). Greater access to studies may have shed light on sources of differences unfortunately however access was limited to the final reports of the projects. This however would shed no light on the possible geographic and environmental differences between study locations and South Africa. Furthermore, any LCA can be constructed to carry a specific message by carefully selecting the appropriate impacts to examine.

It is therefore concluded that in order to formulate an accurate assessment of which life cycle is the more environmentally friendly in the South African context a streamlined LCA should be commissioned.

# 4 Overview of the South African plastics industry, and specifically the plastics packaging industry

South Africa's chemical industry is of substantial economic importance to the South African economy contributing 5.3% to GDP in 1996. Therein, South Africa has a well-developed plastics industry that is made up of polymer manufacturers, converters and recyclers. Since South Africa has no proven oil reserves the plastics industry relies on the synthetic fuel industry for feedstock. Ethylene is produced as a by-product from the synthetic fuel production process. The total South African ethylene capacity is at its limit at 450 000 tonnes per annum.

Local polymer production (including HDPE, LDPE and LLDPE) is currently constrained by the availability of ethylene.

Currently domestic capacity for HDPE, LDPE and LLDPE is 165 000t, 95 000t and 90 000t respectively. Approximately 600 local companies convert polyethylene into a range of products including vest type carrier bags. Consumption of HDPE and LLDPE for vest type carrier bags is estimated at 40 000t and 4 000t respectively. Any shift in demand from HDPE to LLDPE or LDPE cannot be supplied using domestic capacity and therefore will have to be imported.

In 1994 the plastics manufacturing industry consumed 740 000 tonnes of virgin polymer of which 48% was used by the packaging sector[7], as illustrated in the table below:

| Sector | Total consumption of virgin polymer | Percentage |
|---|---|---|
| Rigid Packaging | 214 600 | 29 |
| Flexible Packaging | 140 600 | 19 |
| Building and Construction | 66 600 | 13 |
| Engineering/ mining | 37 000 | 5 |
| Electrical / electronics | 37 000 | 5 |
| Other | 238 800 | 29 |

There are approximately 200 converters producing carrier bags of various types, approximately 42 of which producing vest type carrier bags. Technology used by converters is generally imported (there are a limited number of South African manufacturers of VCB equipment) and plant capacity is tailored to meet the needs of the local markets, very few converters compete in international markets. In 2000 it was estimated that the average age of conversion capacity in South Africa is 15 years old. Large manufacturers of vest type carrier bags, however, use current technology in production processes.

[7] Economic analysis of the draft plastic carrier bag regulations, DEAT

# 5 The products relevant to the study

Before any assessment can be made of the potential impact of the proposed regulations, it is necessary to have a clear understanding of the current products being used in the retail industry, as well as possible substitute products. An important consideration is that the current products will change (dimensions, material composition etc.) under the proposed regulations, as part of the natural tendency of industries to optimise products over time. The products that will most likely be relevant under the proposed regulations are therefore also described.

## 5.1 Current plastic VCB

Although there are a number of "standard" VCB products produced, it must be pointed out from the outset that these products vary significantly in dimensions, weight, and material composition.

VCB's can be categorised from two perspectives as follows:

**Categorisation according to the material characteristics:**

- Clear VCB: The bag is see-through and can only be made from virgin polymer
- White VCB: The bag can only be made from virgin polymer and first generation white recycle, with a maximum first generation recycle content generally not exceeding 50% for 17μ bags
- Printed VCB: The bag is printed on and generally made from virgin polymer and a maximum of 20% first generation unprinted recycle
- Plain VCB: The bag is "plain" in colour and not printed on. It is of a lower quality than printed bags, primarily because it generally has a high (40% upward) recycle content. The recycled material can be printed as well as unprinted recycled material, and first generation as well as post consumer recyclate.

**Categorisation by type of bag according to functionality:**

Although there is a wide range of bags made in different dimensions, the research indicated that the following types are predominantly in use.

| Type | Length (mm) | Width (mm) | Thickness µ | Weighted avg. thickness | Weighted avg. weight per bag (g) | Research sample of 34365 tonnes | |
|---|---|---|---|---|---|---|---|
| | | | | | | Production (t) | % of total |
| Mini | 440-460 | 320-330 | 9-15 | 11.8 | 3.11 | 2408 | 7% |
| Handi | 460-480 | 360-380 | 14-17 | 14.02 | 4.35 | 5641 | 17% |
| Midi/Maxi | 560-600 | 420-480 | 14-20 | 15.96 | 7.01 | 18491 | 55% |
| No data provided [8] | | | | 14.24 | 5.87 | 8025 | 21% |

[8] The distribution of converters that did not supply detailed product data was very similar to those who did, namely a combination of large manufacturers that supply printed bags to the mass-retail industry and smaller manufacturers who supply plain or printed bags to smaller retailers. The weighted average of the available data is therefore used.

For purposes of the study the variations between dimensions is standardised by calculating the weighted (by production volumes) average weight per bag. This is then used as the basis for further calculations.

This analysis does not include the key characteristics of the current 70µ "bag for life". This is due to the very low numbers of bags in use (less than 1%). It is also worthwhile to point out that if the definition of what constitutes a "vest-type carrier bag" is strictly applied, the current 70µ "bag for life" should be excluded from the analysis. It is technically not possible to manufacture an 80µ VCB. An 80µ bag is normally a "side seal" bag or a "bottom seal" bag without side gussets. By virtue of not having side gussets, it requires a different handle configuration, namely either a separately attached "loop" handle, or a "kidney" or "banana" cut out handle.

## *5.2 Plastic VCB product changes under the proposed regulations*

The following table presents the changes to the key product characteristics under the proposed regulations. Bag dimensions and raw material mix values are based on the values generally agreed by industry, with bag weight and cost calculated values.

| | **Current VCB** | **30 µ bag**<br>**Current dimensions** | **30 µ bag**<br>**Adjusted dimensions** | **80 µ bag**<br>**Adjusted dimensions** |
|---|---|---|---|---|
| **Bag dimensions:**<br>• **Length (mm)**<br>• **Width (mm)**<br>• **Thickness (µ)**<br>• **Carrying capacity (l)** | Various | Various | 600<br>480<br>30<br>20 | 520<br>420<br>80<br>20 |
| **Weight of bag** | 5.87g | 12.36g | 16.6g | 34.4 |
| **HDPE proportion** | 85% | 75% | 75% | 0% |
| **LLDPE proportion** | 10% | 20% | 20% | 20% |
| **LDPE proportion** | 0% | 0% | 0% | 75% |
| **Masterbatch proportion** | 5% | 5% | 5% | 5% |
| **Cost to retailer (R per 1000 bags)** | 71.45 | 167.87 | 225.46 | 467.30 |

The first data column represents the weighted average data for the variety of bags currently in use, as previously calculated.

The second column represents the data of the current VCB's in use, but with a thickness of 30µ. The assumption is therefore that the same type of bags is manufactured, and the product mix remains the same, but that the thickness increases to 30µ. By using weighted average mass calculation, based on weighted average thickness etc., a baseline is established from which the impact on the industry can be calculated.

The "30 µ adjusted dimensions" bag reflects the properties of the bag which is most likely to come into use should the regulations be enforced at 30µ. The dimensions and properties of the bag reflects the view of the manufacturers and retailers on what such a bag should be in order to maximise variables such as volume, carrying capacity, strength, cost, etc.

The data for the 80µ-adjusted bag, with the adjustment reflecting adjustment from the current 70 µ low volume, high specification and high cost ”bag for life” to a high volume, lower specification and lowest cost 80µ bag.

It is important to consider that the current 70µ “bag for life”, for which the consumer pays R 1 per bag, is a niche product, and can not be considered as an approximation for a potential mass-market 80µ carry bag. Unique features that contribute to the cost of the bag include the high quality of printing, layers of lamination to protect the printing from rubbing off, and a separately attached “loop” handle. The cost of the 80 µ bag which would probably come into use is therefore much lower that that of the current “bag for life”. This cost was calculated and verified with converters as being the minimum possible cost potentially possible.

The “retailer cost per 1000 bags” figures also reflect the differences in cost of HDPE, LLDPE and LDPE The values are therefore throughout reflective of the minimum cost to the retailer, which together with the cost of disposal, constitutes the minimum cost to the economy

**Please note**

**Potential changes in bag cost due to the potential increase in post consumer reprocessed material, as a source of polymer is not considered. This is because the increase of the extent of post consumer waste entering the raw material supply chain is dependent on many factors such as; availability of virgin raw material, economics of waste collection, technological factors in the manufacturing process, etc. Any adjustment to the current cost of bags would therefore pre-empt the impact assessment. The impact on availability and use of post consumer reprocessed polymer will be determined as part of the scenario building, and corresponding changes in product cost as well as changes in the value chain will be commented on, as part of the impact assessment.**

## *5.3 Current paper carry bag products*

There must be a distinction drawn between paper bags and paper sacks, which are seen as different products by the paper industry, as they require different technologies to manufacture.

- Self opening paper bags are used for commodities such as flour, sugar, maize meal and also as carrier bags
- Multi-walled paper sacks are used for commodities where greater strength is required, for example cement bags, and often have a polyethylene barrier ply in order to prevent moisture entering the sack and toxic contents from migrating to the outside of the sack.

Since this research focuses on the 17 µ Plastic VCB, the current situation with regards to paper bags is limited to the equivalent type of paper bags, namely “plain” paper carry bags used in the retail sector, and specifically the “shopper” type bag.

It is known that none of the large retail groups use paper bags, and research under a representative sample of the smaller retailers indicated the following:

- 4% of retailers sampled indicated that they use paper bags
- The average usage is 1828 paper bags per month.
- The total use of paper bags in the smaller retailer industry (88 000 retailers) is approximately 78 million bags per annum, which equates to 0.98% of the current VCB industry.

The characteristics of the current paper carry bag used for retail purposes, called the "shopper" bag in the paper industry, is as follows

| Dimensions | "Shopper" bag |
|---|---|
| Length (mm) | 420 |
| Width (mm) | 305 x 165 |
| Thickness (g/sq m) | 80 |
| Weight (kg/1000) | 32.6 |
| Carry capacity (kg) | 4 |
| Cost (R/1000 bags) | 340 |

A key characteristic of this bag is that it does not have carry handles. The addition of handles will increase the price significantly

## *5.4 Paper bag product change assumptions under proposed regulations*

The bag will be the same at the current "shopper" bag, as described. As in the case of plastic bags, the potential impact of recycled paper being utilised for the manufacture is excluded from the price per bag. As in the case of plastic, it will be dealt with when the impact of the regulations are determined, and any price changes due to increase in recycled content will be highlighted, and the necessary backwards calculations made.

## *5.5 Current cloth bag products*

In the context of bags, the terminology "cloth" bag relates to:

- Woven poly-propylene cloth bags
- Calico bags

Since a woven polypropylene bag is essentially a plastic bag, the research into a "cloth" bag as an alternative to a plastic bag, this part of the research focuses on the calico type bag, which is primarily cotton based.

The use for cloth bags within the retail industry is non-existent, except for a minimal amount (150 000) that was manufactured as a niche product in one large retail group. Industry sources are of the opinion that very few of the bags have actually been sold.

It is estimated that the cost of a cloth bag substitute to the current plastic VCB will cost about R 6.99 per bag. This makes it prohibitively expensive to be even considered as a substitute product, even considering its durability, and it is therefore excluded from the research

## 5.6 Bio-degradable plastic bags

During the past 25 years, plastic materials have gained widespread acceptance for use in numerous industries including packaging. Plastics offer a number of advantages over alternative materials since they are lightweight and durable. Plastics are based on petroleum-based compounds and are therefore resistant to biodegradation, which is the major disadvantage of plastics.

Degradable plastics can be categorized as either photodegradable or biodegradable. Photodegradable plastics have light sensitive groups directly incorporated into the polymer or as additives. Photo-degradation leads to breakdown of the polymer into non-degradable smaller fragments leading to loss of structural integrity of the material.

In the past 10 years, several plastics that were claimed to be biodegradable were introduced into the market. These products were composed of starch-based products (e.g. corn) combined with resins. The blend of organic and inorganic constituents could not be classified as biodegradable since only the inorganic constituents were degraded leaving fine powders of organic material intact. In addition biodegradable plastics containing starch are regarded as inefficient and increase the quantity of waste because more plastic is needed to provide the same strength.

There are many factors governing degradability timescales, therefore it is difficult to what the length of time should be before the product should biodegrade. It can take a few months to a few years and factors include the type of polymers used and the additives, fillers, weight of the product, bacterial environment, temperature and humidity.

In response to the need to place benchmark standards numerous international standards bodies have defined the term biodegradable. For example the German Standards (DIN 54900-1) defines a "plastic material as biodegradable if all organic components are subject to complete biological degradability", which is determined by standardized test procedures. The definition of the term therefore requires the complete biodegradation of organic constituents to $CO_2$, $H_20$, methane and biomass (other natural end products of biodegradation).

### 5.6.1 Categories of biodegradable plastics

Second generation biodegradable polymers can be categorized as follows:

- Polylactic acid copolymers: These materials have a broad spectrum of properties but are largely aimed at applications presently held by polyesters, including fibres and packaging, and polystyrene.

- Aliphatic/ aromatic polyesters and polyester amides: While a wide range of property combinations can be obtained, these materials are generally aimed at applications held by polyethylene and polypropylene.
- Starch copolymers and derivatives: These are generally polyethylene and polystyrene replacements.

The following products were found as examples of the categories above:

Polylactic acid copolymers

- Cargill Dow Polymers - NatureWorks.

Alphatic/ aromatic polyesters and polyester amides

- BASF – Ecoflex
- Eastman Chemical – EastarBio
- DuPont – BioMax
- Bayer – Bak

Starch copolymer and derivatives

- Novamat – MaterBi
- Biotec Natural Products - BioPlas

In a review of 170 international biodegradable polymer patents[9] it was noted that the second-generation polymers, however, have been estimated at approximately 20% higher price[10],[11] (Symphony/ EPI technology) than the commodity polymers typically used in packaging applications. The industry is currently working toward bringing down the cost of manufacturing biodegradable polymers by increasing production capacity, improving process technology, and using low-cost feedstock. In contrast, however, Bayer has withdrawn their BAK product range, believing there to be no economic justification for pursuing the costly development thereof[12].

Degradation timescales are difficult to predict as it depends on a range of factors including exposure to sunlight, humidity, temperature, etc. Testing protocols (such as those specified in DIN 54900-1) would need to be established within the South African environment to ensure compliance to local requirements.

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[9] Process Economics Report 115: Environmentally degradable polymers, October 1998

[10] Email communications with Tony Kingsbury (President of the International Biodegradable Products Institute), 27th August 2001.

[11] Biopolymers move into the mainstream, Alex Scott, Chemical Week, 13th September 2000, v162 i34 p73.

[12] Bayer Stops Production of BAK® Biodegradable Plastic, http://www.bayer.co.uk/news/bak_0401.html, 2nd April 2001.

### 5.6.2 Categories of photodegradable plastics

It is important to note that biodegradation and photo-degradation are two independent processes. The breakdown of photodegradable plastics depends on irregularities in the polymers. These irregularities cause all plastics to slowly degrade when exposed to ultraviolet (UV) light, typically sunlight. In photodegradable plastics, adding photosensitive substances called promoters increases the rate of degradation. Two common promoters are carbonyl groups and metal complexes:

- Carbonyl group: This is produced by adding a carbonyl group to polyethylene. The resulting copolymer degrades when the carbonyl group absorbs sunlight. This product, since it needs direct sunlight to initiate, is suitable to film products.
- Metal complexes: This involves the adding of metal salts to initiate the breakdown process. The main difference between plastics containing metal salts and other photodegradable materials is its ability to breakdown in the absence of light. Initiation however relies on adequate exposure to UV light.

The following products have been found as examples of photodegradable polymers:

- Ampacet Corp. – Poly-grade (masterbatch, II, III)
- Cabot Plastics International – Masterbatch
- Dow Chemical Company – Ecolyte
- Union Carbide

The degradation timescale of photodegradable polymers in the environment is also difficult to predict as it depends on exposure to UV light, among other initiators.

### 5.6.3 Applications of biodegradable and photodegradable products

The development of photo- and biodegradable polymers is relatively new and therefore modifications of polymers to all product types are still in progress. Material specification sheets maintain that the biodegradable products are suitable replacements for conventional polymers for all numerous production techniques. Testing undertaken at the CSIR has proven difficulties with extrusion on conventional machinery. Products tested by the CSIR have proven to have the following limitations[13]:

- Slower blowing rates
- Difficulty in maintaining required thickness
- Material strength is compromised

The CSIR is of the opinion that products are more suitable to injection and blow moulding than to Film blowing. It was noted that if blowing were to take place on machinery approximating that used in

[13] Interview with Dr. Eino Vuorinen, CSIR Pretoria, 21st August 2001

laboratory conditions then the limitations would not be as large. Machinery of this nature are not, yet, available for large production facilities.

Internationally examples do exist however of biodegradable polymers successfully used in numerous applications including blown film[14].

### 5.6.4 Conclusion

The South African plastics industry has a strong recycling component. The effect of the inclusion of degradable polymer in the recycling stream is not clearly understood. Manufacturers claim that the degradation process can be “switched off” during recycling however recyclers have voiced concerns that this is not the case. Clearly the inclusion of degradable polymers in product, made from recycled material, for which the desirable quality is longevity, is problematic.

Internationally biodegradable and photodegradable products are clearly differentiated from recycled products through two mechanisms[15]. Firstly, degradable products are typically used for products that are not prone to recycling (e.g. garbage bags, mulch films, etc). Secondly, the products are clearly identifiable as being made of degradable material so as not to be included in the waste-recycling stream.

Packaging waste destined for conventional landfill will not benefit from being biodegradable as degradation is unpredictable and long-term. Indeed, the packaging’s stability can be a positive with the landfill.

Photo degradation as a result of exposure to sunlight can be helpful for products used in rural and marine environments where litter is less likely to be cleared, but it will not make urban litter disappear within an acceptable time span or remove the social problems of litter.

The likelihood of production of degradable polymers in South Africa seems low due to the fact that big players can’t keep up with demand for traditional polymers. Big players are furthermore keen to stimulate a strong recycling industry.

[14]European Commission, “Success stories on composting and separate collection”, http://europa.eu.int/comm/environment/waste/compost/compost_en.pdf

[15] Discussion with Sasol Polymers

# 6 Detailed analysis of the current plastic VCB value chain

## 6.1 Polymer production

### 6.1.1 Monomers

The ethylene monomer is produced by Sasol Polymers based on a by-product stream that is produced by the synthetic fuel process at Sasol. Sasol Polymers then splits the ethane from the ethylene and then cracks the ethane to produce further ethylene. The total current ethylene produced is approximately 450,000 tons per annum that is then used downstream for polymer manufacture. Sasol allocates a portion of the ethylene production to DOW Polymers for the production of HDPE and then utilises the remainder in Sasol Polymers for the production of LDPE and LLDPE.

In the past not all the ethylene was available to the downstream petro-chemical sector. This is no longer the case and the total available capacity is currently being used for polymer manufacture. While the limits on ethylene capacity is not the only factor constraining downstream polymer manufacture it is one of the major impacting factors

Whether or not the proposed legislation increases demand for polymers, there is insufficient ethylene capacity to meet such demand and any additional polymer required will have to be imported, at least in the short term. Downstream capacity expansions (of polymer capacity) either at Sasol Polymers or DOW Plastics will require an increase in ethylene capacity as well as further investment in downstream plant. Sasol is currently considering such an expansion.

The question needs to be raised about this possibility of increasing ethylene capacity. We understand that Sasol is continually reviewing its position.

There is no doubt that any increase in monomer capacity will not be driven solely by any proposed legislation but rather by indications that domestic market demand has increased in a sustainable fashion by at least 100,000 tons per annum. In fact, indications are that the proposed legislation could create significant uncertainty among investors and in fact cause Sasol to delay or abandon any further investment plans in this sector.

If Sasol were to increase ethylene capacity, this would most likely be greater than 200,000 tons per annum in order to ensure economies of scale at both monomer and polymer level. Any increase in ethylene capacity would have to be accompanied by a simultaneous expansion of polymer capacity. Judging by the current South African supply/ demand balances this would most likely be in the area of LDPE and LLDPE. Some ethylene would probably also be made available to DOW Plastics to increase HDPE capacity if required.

**Note: The above volume estimates do not come from Sasol Polymers or DOW Plastics but are based on consultant estimates of requirements in an industry of this nature.**

### 6.1.2 Polymers

There are only two manufacturers of polymer in South Africa. In the case of ethylene based polymers there is only a single manufacturer of each product and in the case on polypropylene, both parties are involved in its manufacture. Only the polyethylene's are of interest in this assessment.

The table below depicts the current supply and demand balances for ethylene based polymers.

| **Polymer** | **Domestic Capacity/ tpa** | **Domestic Demand** | **Imports** | **Exports** | **Surplus/ (Shortage)** |
|---|---|---|---|---|---|
| HDPE | 165,000 | 155,000 | - | 10,000 | +10,000 |
| LDPE | 95,000 | 115,000 | 20,000 | - | -20,000 |
| LLDPE | 90,000 | 110,000 | 20,000 | - | -20,000 |

**Notes:**

**HDPE** – The plant is current running at 165,000 tons per annum. This is due to the ethylene shortage. If more ethylene was available then the plant could be debottlenecked to produce up to 220,000 tons per annum.

**LDPE** – The plant is running at maximum capacity. Market demand is higher than available capacity and Sasol Polymers is unable to meet domestic market demand from local production. The balance is imported by a number of parties.

**LLDPE** – The plant is running at 90,000 tons per annum although it has the potential to produce 110,000 tons per annum. The ethylene shortage drives the amount of capacity than can be utilised. Market demand is greater than domestic ability to supply and 20,000 tons per annum is imported. Approximately 50% of these imports are metallocenes which are not produced locally.

In summary:

- Due to the ethylene shortage there is no ability for South Africa to provide more domestically produced polymer into the local market – at least in the short tem. Any additional demand for polymer will have to be met through imports
- Any expansion will initially have to address the ethylene shortage
- Further capital investment is likely to take the form of expanding capacity of all ethylene based polymers i.e. HDPE, LDPE and LLDPE (some expansions will be debottlenecking of existing plant and other expansions may be new plant)

## 6.2 The VCB manufacturing (conversion) industry

It has been estimated elsewhere in the report that the current VCB manufacturing industry in South Africa converts 44 000 tonnes of polyethylene per annum into VCB's of different dimensions and with different properties, for different applications.

The total value (revenue) of the industry was calculated as part of this research to be in the region of R 550 million per annum.

The research identified 42 companies that produce VCB's, ranging from very small operations with turnovers of less than R 5 million per annum, and employing less than 15 people, to large companies with annual turnovers in excess of R 200 million, and employing up to 500 people.

Although the data collected was representative in terms of tonnages (75% of total production) produced, it was not representative in terms of the number of companies (26%) from whom data was collected.

Based on the data collected as part of this study, as well as supplementary information sourced from industry, it became quite clear that the VCB manufacturing industry displays the typical characteristics of a mature commodity industry, operating primarily in a limited domestic market, as follows:

- There are a small number of large companies that have significant (70 - 75%) market share. Being in a commodity market these companies cannot compete with each other on a product differentiation basis, and have to compete on efficiencies (optimisation of the cost and volume equation). Quality, which in this case means a printed bag that meets certain minimum specifications in terms of strength, dimensions etc., is a pre-requisite rather than a differentiator.
- There are a large number of small companies that seek out the niches in the market that is not served by the large manufacturers. The niche markets are created by two factors:
    - The "minimum run" factor: As part of the optimisation of the cost/volume curve by large manufacturers, there are certain minimum volumes of one type of bag that must be manufactured for the process to be economically viable. Such "minimum runs" could be as high as 300 000 for a printed bag. This obviously creates opportunities in the market for smaller players, with less sophisticated and lower volume machinery, to manufacture smaller orders of printed bags.
    - The demand for "plain carrier bag" that is primarily used by smaller retailers. These bags, which are unprinted, and normally "plain" grey or brownish in colour, are manufactured primarily from first generation reprocessed material. The demand for "plain carrier bags is driven by retailers who have no need for printed bags, wants to spend the absolute minimum on bags, and are not as quality conscious as the large retailers. The price difference between "plain" bags and "quality printed bags" is approximately 50%, for example printed Midi type bags are sold at between R 80 and 90 per 1000 bags, whereas the plain equivalent will sell for as low as R 35-40 per 1000 bags.

Although large manufacturers do produce “plain” bags, the volume is usually restricted to the equivalent of in-house waste material generated, typically 10% of total production. The outstanding demand is catered for by small manufacturers, who buy first generation or “clean” post consumer waste from recyclers.

It is therefore concluded that the VCB manufacturing industry can be segmented into two categories, as follows:

| Segment | Markets and products | Technology | Labour intensity |
|---|---|---|---|
| Large manufacturers pursuing efficiency | Large retail industry<br>High quality printed products<br>Three or four products | State of the art or first generation<br>Low flexibility<br>Large production runs | Low<br>Bags per person ration above 40 000 :1 |
| Small and medium size manufacturers pursuing niche markets | Small and medium retail industry<br>High quality printed and lower quality unprinted bags<br>Large variety | Third generation or older technology<br>High flexibility<br>Short production runs | High<br>Bags per person ratio 20 000 : 1 and lower |

### 6.2.1 Production, capacity and technology

The following provides a summary data collected from the survey on total plastic production, VCB production and VCB capacity.

| Segment | Total plastic production (t) | Total plastic capacity (t) | Total VCB production (t) | Total VCB capacity (t) |
|---|---|---|---|---|
| Large manufacturers pursuing efficiency | 29 610 | 30 766 | 28 780 | 29 766 |
| Small and medium size manufacturers pursuing niche markets | 9 786 | 12 955 | 5958 | 7418 |
| Total | 39 396 | 43721 | 34 738 | 37 184 |

A first observation is that the VCB industry can be considered to be a specialised industry in that company’s that manufacture VCB’s do not typically produce large volumes of other products as well. 88% of total production is for VCB’s only, and further analysis of the data reveals that the other 12% is plastic film. No products other than VCB’s or plastic film is being produced by any of the manufacturing plants surveyed.

There is currently excess VCB manufacture capacity of approximately 2 500 t. Of this 1300 tonnes (approximately 52%) is due to demand not meeting current supply capacity, and 48% is due most small companies electing not to manufacture over the weekend. It was established that on average, small and medium sized companies do not produce for 36 hours out of the maximum of 168 hours per week. This translates to 1200 tonnes, which cannot automatically be considered to be immediately available excess capacity. Many factors, such as cost of overtime, existing worker agreements, technological flexibility and availability of management, play a role when small and medium sized companies determine manufacturing.

### 6.2.2 Capital investment

Due to the lack of complete data provided by the VCB manufacturers it is impossible to determine exact figures of the current value of investment in the VCB industry, either from a book value or replacement value perspective. Nor is it possible to report on the historical investment in the industry over the last ten years. Based on the available data and information gathered from interviews with VCB manufacturers, the following can be concluded:

- 5 manufacturers, representing no more than 60% of the industry output provided data on current book value of equipment. The total book value of the equipment of these manufacturers equalled approximately R 50 million. The total current book value of equipment is unknown, but it can be concluded that it is in excess of R 50 million.
- The same 5 manufacturers indicated that they invested R 120 million over the last 10 years into VCB manufacturing equipment. The total historical investment in the VCB industry is also unknown, and it is concluded that it is in excess of R 120 million
- Equipment is generally depreciated over 5 years (straight line).
- Equipment life is in excess of 20 years. It was found that even the oldest technology in use has a remaining life in excess of 20 years.
- The capital investment profile is driven by four variables, namely:
    - The volumes produced. The relationship between volume and capital is not continuous, but step changes take place.
    - Print or non-print. Since there are markets for both printed and unprinted bags, the converter has the choice of investing in printing equipment or not.
    - The age of equipment, which is also indicative of the state of technological advancement.
    - The equipment supplier. There is a significant difference between the cost (and quality) of European equipment and those manufactured in Asia.
- The requirement for capital can not be seen to be a barrier to entry for SME's, neither are skill requirements.

The following diagram illustrates how a small company can enter the VCB market successfully with a relative low capital outlay of less than R 500 000

| | |
|---|---|
| Range of activities: | Extrusion and bag making |
| Volumes: | Extrusion: 12 t/month |
| | Bag making: 1-1.5 million per month |
| Equipment: | Either second hand European and can be 15 years and older |
| | Technology is then third generation or older |
| | Or can be newer Eastern equipment, which is newer technology but have a short lifespan |
| Capital requirement | Less than R 500 000 |

### 6.2.3 Cost and value add analysis

VCB converters were reluctant to provide accurate costing information, especially information on profit margins. The manufacturing costs of converters ranged according to a number of factors such as print or unprinted, amount of reprocessed used, labour intensity, etc. It was interesting to note that even information provided by some manufacturers that are comparable in terms of product offering and size, reported quite different cost structures. For example one producer reported an average production cost of well over R 15 000 per ton, whereas a comparable counterpart reported it to be R 12 000 per ton.

There was general agreement that manufacturing cost within the VCB manufacturing industry, being a commodity industry, is driven by raw material cost, which constitutes approximately 60% of the total product cost, Labour costs add another 20% and the remaining 20% is made up of various items such as consumables, rent, energy, etc.

It is interesting to note that the above 60:20:20 equation is very similar for both the larger companies whom are less labour intensive and achieve high efficiencies, and for the small companies whom are more labour intensive and less efficient. This is primarily due to the fact that high efficiencies gained through modern equipment by large manufacturers (throughput gains as well as being less labour intensive), are offset by increased labour costs (higher relative wage rates) as well as higher relative overheads.

It was also noted that the reported prices paid by large retailers, which one would expect to be fairly similar, was not similar in all cases. One large retail group, for example reported an average cost of R10 500 per tonne, whereas the other retailers reported higher costs, up to R14000 per tonne. An average cost of R13 581 per tonne is a calculated weighted average cost across large retailers.

In view of the lack of accurate and detailed information provided by converters, the cost analysis is done from data collected from retailers on the actual price paid. This was then compared with the data provided by VCB manufacturers as a reality check. The following summarises the costs used as baseline product costs for purposes of the research.

It must be noted that these are average costs. Current prices asked for VCB's range widely, depending on the type, the thickness, the quality, whether printed or not, and the quantities supplied.

For example: A good quality Handy type bag of 14µ and printed will be priced at approximately R65 per 1000, whereas a lower quality “plain” Handy of 10µ will be available at R 40 per 1000 bags.

| Retail category and products | Consumption (billions) | Cost per 1000 bags | Cost per ton |
|---|---|---|---|
| Large retailers, printed bags | 2.552 | R 79.28 | R 13 581 |
| Smaller retailers, printed bags | 2.314 | R 78.26 | R 13 332 |
| Smaller retailers, unprinted bags | 3.158 | R 59.66 | R 13 714 |
| Weighted average | | R 71.56 | R 13 581 |

It is concluded that the total value of the VCB industry is R 571 million per annum, with the value add component thereof representing 40%.

For purposes of this study the average costs are used as follows:

| | Percentage | Cost/ton |
|---|---|---|
| Raw material cost | 60% | 7 334 |
| Labour | 20% | 2 445 |
| Other | 20% | 2 445 |
| Total manufacturing cost | 100% | 12 223 |
| Margin | 10% | 1 358 |
| Sales price | | 13 581 |

Note that although the total average selling price per ton (R 13 581) is an accurate industry average, there are significant variations in the margins, labour cost and raw material cost between manufacturers. These variations however even out due to differences in efficiencies, as earlier explained.

The value of the VCB industry, as determined, includes the value added by secondary industries, of which the most significant are as follows:

- Transport: The larger manufacturers have generally outsourced their transport, whereas the smaller manufacturers use a combination of own transport and contracted transport. The cost of transport was found to be approximately 7% of total manufacturing cost.
- Ink suppliers: The cost of ink is relevant to companies that print bags.
- Engineering companies: The manufacturing of spares, etc.

### 6.2.4 Labour analysis

This section uses information collected by the research team to estimate the number of people employed within the VCB industry, the nature of employment, working conditions, remuneration, dependants, and prospects for re-employment. A final section summarises the views of worker representatives on the proposed regulations.

Two sources of data were used to establish employment and employment conditions in the VCB industry.

First, an extensive set of questions was included in the questionnaire sent out to VCB manufacturers. The overall response rate to this questionnaire of 28 percent was further decreased with regards to this section of the report as many companies were either unable or unwilling to complete the labour sections of the questionnaire as requested.

Second, a number of in-depth interviews were conducted with worker representatives. Where access to shop stewards was granted by companies this was generally of a good quality A total of 21 individuals were interviewed, of these 16 were considered to be *bona fide* shop stewards whose information was considered reliable by the interviewers.

| Shop Steward | Segment of industry | Company or Site | Union | Gender | Years employed in company | Years in the union |
|---|---|---|---|---|---|---|
| 1 | High Productivity | A | Ceppwawu | Male | 6 | 5 |
| 2 | High Productivity | A | Ceppwawu | Male | 5 | 5 |
| 3 | High Productivity | A | Ceppwawu | Male | 13 | 13 |
| 4 | High Productivity | A | Ceppwawu | Male | 7 | 7 |
| 5 | High Productivity | B | Ceppwawu | Male | 5 | 2 |
| 6 | High Productivity | C | Ceppwawu | Male | 2 | 0.5 |
| 7 | High Productivity | D | Ceppwawu | Male | 5 | 4 |
| 8 | High Productivity | E | Ceppwawu | Male | 4 | 3.5 |
| 9 | High Productivity | E | Ceppwawu | Male | 9 | 7 |
| 10 | Low Productivity | F | Ceppwawu | Male | 3 | 3 |
| 11 | Low Productivity | F | Ceppwawu | Male | 3 | 3 |
| 12 | Low Productivity | G | Ceppwawu | Male | 3 | 5 |
| 13 | Low Productivity | G | Ceppwawu | Male | 11 | 10 |
| 14 | Low Productivity | G | Ceppwawu | Male | 2 | 2 |
| 15 | Low Productivity | H | Numsa | Male | 11 | 7 |
| 16 | Low Productivity | H | Numsa | Male | 11 | 7 |

**Quality of Interview Data**

With the exception of five interviewees the evidence provided is believed to be relevant and reliable. Evidence from these five interviews was not used in the statistical analysis.

Three of these interviews were conducted with union members who were not shop stewards. The data provided by these individuals is believed to be reliable, the reason for not including them is that their job positions (HR manager, supervisor, and a fitter and turner) are not representative of the majority of workers in the industry. Use of this data would have biased the data as presented.

One interview was restricted due to a combination of language difficulties and limited privacy (from management) during the interview. In the case of this one interview the independence of the shop steward from management was doubted. This belief is based on the recent introduction of the union into the company (within three weeks of the interview) and the perception that the interviewee may have been selected by management. This, combined with a number of discrepancies in the evidence provided led to the rejection of this data as unreliable.

Despite the limited response from the questionnaire, the information provided, supplemented by the shop steward interviews, allows an understanding of employment and employment conditions to be developed.

**Analytical Framework**

As outlined elsewhere in this report the VCB manufacturing industry can be divided into two segments:

- A 'High Productivity Segment' pursuing efficiency, consisting of three companies (five sites) that produces an estimated 31,780 tonnes[16] of the industry total of 44,000 tonnes of VCBs.
- A 'Low Productivity Segment' pursuing niche markets, with an estimated 39 companies. In this segment production data was collected on ten companies with a total production of 5,958 tonnes.

**Features of the Two Industry Segments**

Productivity, measured as VCB output (tonnes) per employee, correlates well with different labour conditions in the two segments. This is more fully reported in the following sections.

The following table summarises the data on productivity, minimum wage levels, and the average size of sites in the two segments.

[16] This estimate consists of the 28,780 tonnes recorded from two companies with four sites and an estimate of 3,000 tonnes of production for the remaining company in this segment for which detailed labour but not production data was obtained.

| Variable | High Productivity Segment (5 sites) | Low Productivity Segment (10 sites) |
|---|---|---|
| Total VCB tonnage | 31,780 | 5,958 |
| VCB employment | 766 | 469 |
| Productivity (tonnes per employee) | 41.5 | 12.7 |
| Average number of VCB related employees per site | 153 | 47 |
| Average (un-weighted) minimum wage (Rands per hour) | 10.1 | 4.8 (information from fives sites only) |
| Range of minimum wage (Rands per hour) | 9.01 – 11.82 | 2.65 – 7.73 |

### Number of Employees in the VCB Industry

The number of employees in the VCB Industry is calculated on the following basis.

*Number of High Productivity Segment jobs recorded*

*+ Number of Low Productivity Segment jobs recorded in ten sites*

*+ Extrapolation of unrecorded employment based on unrecorded VCB polymer tonnage (6,262 tonnes) and estimated productivity for this segment.*

It is assumed that unrecorded employment is located in the Low Productivity Segment since it is highly unlikely that the research process did not locate all plants in the High Productivity Segment of the industry. It is further assumed that the productivity of unrecorded employees will be at or below the average productivity for the Low Productivity Segment. A credible range of employment is therefore provided by calculating the extrapolated employment at the average productivity for the Low Productivity Segment (12.7 tonnes per employee) and the lowest level of productivity recorded (9.2 tonnes per employee).

| VCB Industry Segment | Minimum estimate of employees.<br><br>(Unrecorded employees estimated at a productivity of 12.7 tonnes per employee) | Maximum estimate of employees.<br><br>(Unrecorded employees estimated at a productivity of 9.2 tonnes per employee) |
|---|---|---|
| Recorded High Productivity Segment | 766 (including overall estimate of outsourced functions) | 766 (including overall estimate of outsourced functions) |
| Recorded Low Productivity Segment | 469 | 469 |
| Estimate of remaining companies converting 6,262 tonnes | 493 | 681 |
| **Total** | **1728** | **1916** |

While extrapolations produce apparently precise estimates of the employment range this accuracy is likely to be 'spurious'. Thus, it is estimated that employment in the VCB industry lies somewhere between 1,700 and 2,000 employees.

**Employment Trends in the VCB Industry**

Employment trends in the industry are complex. In the High Productivity Segment of the industry, processes of capital concentration and production rationalisation have resulted in a trend towards decreased employment. In the Low Productivity Segment there are more mixed employment trends. The dominant influence here would appear to be market conditions. Given the small size of many of these companies these conditions may well be local in nature.

Some data was provided by the companies in response to the questionnaire, in a small number of cases this was provided for since 1992. In other cases information on employment was obtained during interviews with worker representatives. In this situation changes in employment over the last five years were asked for in the interests of reliability given that the information was dependent on individuals' recall.

**Employment Trends in the High Productivity Segment of the Industry**

In the High Productivity Segment of the industry changes in employment are dominated by a focus on increased capital intensity and accompanying rationalisation of production locations.

The largest company in this segment has as a result of extensive rationalisation of production reduced its directly employed VCB related workers by 35% (269 employees) between 1992 and 2001. However, if the effects of introducing subcontracting are taken into account this is reduced to approximately 29% (223 jobs).

If a shorter time period is taken into account the loss of jobs is more dramatic as employment in this company expanded between 1992 and 1995. If this latter date is used as the base line, rationalisation of production has resulted in a reduction of its workforce by 47% (436 employees), reduced to approximately 40% (376 jobs) if subcontracting is taken into account.

The second largest company (established in 1996) carried out the retrenchment of 10% (12 employees) of its workers in 1999 as a result of the purchase of new machines. However, half of the retrenched workers were subsequently re-employed as it was found that the cuts were not sustainable.

The other smaller and newer companies in this segment appear to have held employment constant over the last five years (the period in which worker representative were asked for information on retrenchments), presumably reflecting a newer capital base (1999 in one case) and/or increased production.

**Employment Trends in the Low Productivity Segment of the Industry**

At the Low Productivity Segment of the industry employment trends are more mixed. Where changes have occurred they appear to have been driven by market conditions rather than capitalisation processes. A union official responsible for the plastics industry indicated that a number of companies in the Low Productivity Segment of the industry in the Free State faced increasingly difficult market conditions. This was explained as the result of retrenchments in the mining industry as there had been a decrease in demand for low quality plastic bags from shops serving the mine workforces. This would indicate that the market conditions faced by small companies may often be local in nature.

Data on employment trends was obtained from four companies in this segment of the industry.

One company had steadily increased its workforce by 44% between 1993 and 2001 (to 26 employees).

One company had maintained employment levels (at 40 employees) over the past five years.

The other two companies had carried out retrenchments within the last five years.

One of these had retrenched 19% of its workforce (24 employees) due to market conditions (within the last five years, date not known) but had subsequently re-employed half of these. The other company retrenched 14% of its workforce (33 employees) in 2000 and since this date has operated a recruitment freeze resulting in a net reduction of a further four jobs.

**Nature of Employment in the Industry**

**Occupational Profile**

*Film Blowing, Printing, Bag Making and Packing*

The major employment categories in the manufacture of plastic bags are:

- Film blowing operators and (limited number of) assistants
- Printing operators and (limited number of) assistants
- Bag making machine operators and packers (approximately equal numbers)

These positions are generally semi-skilled (operators) and low-skilled (assistants and packers).

Employment in film blowing, printing, bag making and packing in the VCB Industry

| Segment of the Industry | Film blowing | Printing | Bag making and packing | Total film blowing, printing, and bag making |
|---|---|---|---|---|
| High Productivity Segment<br>(n = 5, with 766 employees) | 12%<br>(92) | 9%<br>(67) | 42%<br>(322) | 63%<br>(481) |
| Low Productivity Segment<br>(n = 4, with 317 employees) | 20%<br>(62) | 11%<br>(35) | 40%<br>(126) | 70%<br>(223) |
| Total: (High Productivity Segment and four Low Productivity Segment Companies, n = 9, with 1083 employees) | 14%<br>(154) | 9%<br>(102) | 41%<br>(448) | 65%<br>(704) |

**Note: totals do not add due to rounding.**

In the High Productivity Segment of the industry these three occupational categories employ 63% of the VCB labour force (481 employees). Reliable data from four companies in the Low Productivity Segment of the industry puts these employment categories at 70% of the VCB labour force (223 employees).

This difference in the percentage of labour absorbed by these key production functions between the High and Low Productivity Segments of the industry is increased if the different shift systems operating are taken into account. High Productivity Segment companies operate three or four shift systems (with one exception that uses a two shifts plus voluntary overtime and casuals at weekend), while Low Productivity Segment companies operate two or three shift systems.

This difference reflects the different capital intensities, focused on the main production processes, between the two industry segments. However, it should be noticed that increased capital intensity has a relatively greater employment impact on film blowing and printing operations. The ratio of these three categories of employment in the two industry segments are:

| **Segment of industry** | **Employment ratio film blowing** | **Employment ratio printing** | **Employment ratio bag making and packing** |
|---|---|---|---|
| High Productivity Segment | 1 | 0.9 | 2.9 |
| Low Productivity Segment | 1 | 1 | 1.9 |

### Other Occupations in the VCB industry

| **Occupation** | **Percentage of workforce in High Productivity Segment (n = 5)** | **Percentage of workforce in Low Productivity Segment (n = 4)** |
|---|---|---|
| In-company recycling | 2.2% | 4.4% |
| Mixing | 1.6% | 2.1% |
| Distribution and Transport | 9.5% (includes estimates of outsourced services) | 5.9% |
| Artisans and assistants | 4% | 0 |
| Supervisors | 1.6% | 3.3% |
| Administration | 2.9% | 3.0% (n = 3) |
| Management | 4.2% (n = 4) | 8.3% (n = 3) |
| Other occupations and unaccounted | 11% | 1% |

- *In-company recycling*

This is a small operation involving low or semi-skilled workers.

- *Mixing*

This function is often carried out by supervisors. Dedicated mixers represent a small percentage of the total workforce.

- *Distribution and Transport*

Employment in this section is uneven; most companies operate their own delivery systems while some expect customers to pick up their products. Additionally, these functions have been outsourced by the largest company in the segment (see section on outsourcing).

- *Artisans and assistants*

This employment category only exists in the High Productivity Segment of the industry. Maintenance and repairs in the Low Productivity Segment of the industry appear to be carried out either by management members or by outside contractors on a 'as needed' basis.

- *Supervisors*

This function is more important in the Low Productivity Segment of the industry. In the High Productivity Segment of the industry supervisory functions are often blended with operational duties.

- *Administration and Management*

Data on these occupations collected from interviews with worker representatives were less reliable than information collected on the workforce. This stemmed from the difficulty shop stewards had in differentiating administrative and management positions. Accuracy also appeared to decrease with large sites where shop stewards had less detailed knowledge of 'the office staff'. To the extent that the higher percentage of management in the Low Productivity Segment is reliable this could be accounted for by lack of management economies of scale in smaller companies and the fact that management in smaller companies tended to carry out functions of other occupations in the High Productivity Segment, for example the artisan function of machine maintenance and repair.

- *Other Occupations*

Cleaning is a minor employment category that a number of companies have outsourced. In the High Productivity Segment of the industry security is also outsourced. In the Low Productivity Segment of the industry a number of companies employ security directly.

A number of other positions that are not regularly represented across companies include:

- Canteen
- Stores (internal warehouse)
- Taxi drivers (for transporting workers)
- Doctor (part time)
- Sisters (part time)
- Social workers (part time)

These occupations are associated with the High Productivity Segment of the industry.

These other occupations (along with any error in estimations made by shop stewards) account for the unrecorded percentages of occupations of 11 % for the High Productivity Segment and 1% for the Low Productivity Segment.

Other factors that contribute to this 'dark figure' of 11% of occupational categories in the High Productivity Segment of the industry are the higher level of outsourcing for which detailed breakdown of occupation was not always possible, and the greater likely-hood of errors on the part of shop stewards in estimating the numbers of managers and administrators in larger operations.

### Race, Gender, and Age of the Workforce

#### Gender

Eight companies (11 sites) provided an overall gender breakdown for the current period and this information was obtained from one further company by means of worker representative interviews, providing a total of 12 sites.

| Industry Segment | Percentage male | Percentage female |
|---|---|---|
| High Productivity Segment (n = 5, with 748 employees, includes some non VCB, excludes outsourced workers) | 70% (536) | 30% (230) |
| Low Productivity Segment (n = 7, with 411 employees, includes some non VCB workers) | 75% (309) | 25% (102) |
| All (n = 11, with 1177 employees) | 73% (845) | 27% (332) |

Relatively little data was collected on occupational categories by gender. However, site visits revealed a visible gender division of labour. In production, operators and their assistance in film blowing and printing were almost exclusively male. Bag machine operators and packers were predominately, though not exclusively, female. This observation, linked to the different capital-labour ratios in the High Productivity Segment of the industry would explain the higher percentage of women workers in this end of the industry.

This pattern also indicates that women in the VCB industry are generally in lower skilled (and therefore less well remunerated) jobs than men, though statistical evidence to demonstrate this was not provided by companies.

**Race**

Seven companies (11 sites) provided data on the race of all employees for 2001; this information was also obtained from one other company during interviews with worker representatives.

| Industry Segment | African | White | Indian | Coloured |
|---|---|---|---|---|
| High Productivity Segment (n = 5, with 748 employees, includes some non-VCB, excludes outsourced workers) | 57.1% | 10.3% | 1.2% | 31.0% |
| Low Productivity Segment (n = 7, with 507 employees, includes some non-VCB employees) | 74.6% | 6.5% | 10.7% | 8.3% |
| All (n = 11, with 1255 employees) | 64.1% | 8.8% | 5.0% | 22.1% |

Differences between the two segments are dominated largely by geographical location (e.g. plants in the Western Cape having a high percentage of coloured workers and plants in Kwa-Zulu Natal having a high percentage of Indian workers). The slightly higher percentage of whites working in the High Productivity Segment of the industry would be consistent with higher capital intensity requiring a higher skills profile, such as more artisans (who are often, though not always, white).

No statistical data was provided on occupational categories by race. Where this was collected during worker representative interviews and observations during site visits it indicates that Africans workers (or coloured in the Western Cape, Indian in Kwa-Zulu Natal) predominate in shop floor occupations such as film blowing, printing, and bag making. The only whites encountered in shop floor positions were artisans and supervisors.

In the High Productivity Segment of the industry there tended to also be African, Indian, and coloured employees in managerial positions. In the Low Productivity Segment the racial division between shop floor and management/admin was often complete. During one interview with worker representatives the interviewer sought clarity over whether the figure for the number of people working in the company calculated by the shop stewards included management. The response from the senior shop steward was ‘no’ because they didn’t realise we wanted to know about both ‘blacks and whites’ in the company.

### Age

Information on age of all workers in 2001 was provided by five companies with eight sites. Four of these sites were in the High Productivity Segment of the industry and four sites in the Low Productivity Segment. The age distribution of workers is presented in the following table. Because companies only provided the age profile of their entire workforce it is not possible to provide more detailed breakdown based on age (e.g. occupations) nor link age to other demographic variable such as race and gender.

| Age of employees | High Productivity Segment (four sites) n = 663 | Low Productivity Segment (five sites) n = 384 | Total (eight sites) n = 1047 |
|---|---|---|---|
| <18 | 0 | 1.8% | 0.7% |
| 18 – 25 | 9.8% | 14.1% | 11.4% |
| 26 – 35 | 44.9% | 43.5% | 44.4% |
| 36 – 45 | 28.5% | 23.4% | 26.6% |
| 46 – 60 | 16.0% | 16.1% | 16.0% |
| >60 | 0.8% | 1.0% | 0.9% |

The majority of workers in VCB producing factories (71%) are between the ages of 26 and 45. The age profiles of the two industry segments are similar although the Low Productivity Segment has a wider variance, notably with employees younger than 26.

### The Nature of Employment Contracts

The vast majority of employees in the 10 companies (13 sites) that provided data were on permanent full-time contracts, this was consistent with information provided in interviews with shop stewards.

These interviews indicated that the use of casuals and temporary workers was much less than had previously been the case, an observation that is likely to reflect changes in the law around casual and temporary workers. Casual and temporary employment often provided an employment route into the company for now permanent workers.

What casual and temporary employment exists is largely concentrated in a restricted number (two) companies in the Low Productivity Segment of the industry. There was also use of some casuals on a regular basis by one company in the High Productivity Segment of the industry to supplement a two-shift system so as to allow continuous operations over weekends.

### Outsourcing

The data on outsourcing is particularly difficult as it involves other companies who were not interviewed. From the data that was collected it is clear that outsourcing is largely a phenomena of the High Productivity Segment of the Industry.

At the Low Productivity Segment of the industry outsourcing appears to be confined to security, cleaning, and maintenance, repair and other specialised functions. The first two of these categories were not always outsourced with a number of companies employing their own security and cleaning staff.

One company in the Low Productivity Segment of the industry claimed an outsourced Full Time Equivalent of 35 workers (with an estimated value of R 1,900,00), which would have represented 26% of the effective labour force (employed and outsourced services). However, this was not verified by interviews with shop stewards who could only list the company's armed response as outsourced. It was concluded that the company's evidence in this respect was unreliable.

This lack of outsourced activity in the Low Productivity Segment of the industry would be explained by the levels of remuneration in this segment That is, given the level of wages in this segment outsourcing would be unlikely to provide services at a lower cost.

In the High Productivity Segment of the industry outsourcing appears to be more common. While companies in this segment generally have better maintenance and repair capabilities in-house security and cleaning are more likely to be outsourced.

Additionally, one company had additionally outsourced canteen, distribution, and transport. At one site the dates given for this outsourcing by shop stewards were: canteen and security – longstanding outsourced services, transport – five years ago, cleaning – 3-4 years ago. This information was not collected from the companies other site. Subcontracting represented an estimated 10.7% of this company's total labour force.

**Remuneration**

Establishing remuneration of employees in the VCB industry is complex. The following factors effect the wages of employees.

- The employee's position and grade.
- The wage levels and other financial benefits operated by the company.
- The hours worked by the employee in a typical week.

**The employee's position and grade**

Since 1999 companies producing VCBs are covered by the Metal Industries Bargaining Council (MEIBC) Main Agreement.

As previously discussed, the majority of jobs in the production of VCBs are operators, operator assistants, and packers. All these categories of workers are classified within the lowest two grades of the 13-grade scale, G and H. The minimum wage level for these two grades was R10.95 and R10.30 per hour respectively at the time the research was carried out.

The Bargaining Council also sets the level of other benefits, such as shift allowances and sick pay.

**The Actual wage levels and other financial benefits operated by the company**

The situation in the VCB industry is more complex than that set out in the MEIBC's Main Agreement because on entry into the MEIBC a number of companies in the plastics industry negotiated exemptions on the minimum wage. This allowed for a three-year catch-up period to reach the then minimum wage level.

In addition to this transitional exemption, a number of companies have applied (and been granted) 'exemptions on the exemption', that is the originally negotiated increase designed to bring wages levels to an industry minimum is put aside. As a result, actual minimum wages, which set the floor for the wage range in each company, varies widely.

As previously indicated minimum wage levels differ between the High Productivity Segment and Low Productivity Segment of the industry. Some of this variation is indicated in the evidence presented below.

**The hours worked by the employee in a typical week**

This is primarily dependent on a) the number of hours per week that the company keeps machines running and b) the number of shifts employed by the company.

In the High Productivity Segment of the industry, machines are routinely kept running 24-hours a day, seven days a week, 11 months of the year. However, in terms of the number of hours worked by each employee this is often offset by a greater number of shifts (up to four) running the machines.

In the Low Productivity Segment of the industry companies employ a number of production strategies. While some attempt to keep machines running in a similar way to the High Productivity Segment of the industry, other close down their factories over the weekend. Companies in the Low Productivity Segment of the industry generally operate fewer shifts than the High Productivity Segment. This is possible through a combination of closing the factory over weekends, overtime, and the use of casuals.

As a result of these variables a wide range of overtime is possible. Companies reported a range in the average number of hours overtime for workers of between 2 and 22 hours per week.

**Minimum Wage Levels**

Combining data obtained from companies and from interviews with worker leaders data on the minimum wage for seven companies (11 sites) were obtained. This provides an important indicator the level of wages in the industry since most workers are at or close to this level.

In the High Productivity Segment of the industry minimum wages ranged between R9.01 and R11.82 per hour with an (un-weighted) average of R10.1 per hour.

In the Low Productivity Segment of the industry minimum wages ranged between R2.65 and R7.73 per hour with an (un-weighted) average of R4.8 per hour. Additionally, two companies in the Low Productivity Segment of the industry provided the *average* wage for low skilled workers. These were calculated at R5 and R5.40 per hour, consistent with the other data from this segment of the industry.

**Take Home Pay**

During interviews with worker representative questions were asked about wage levels. As previously outlined, 16 of the 21 interviews (nine in the High Productivity Segment and seven in the Low Productivity Segment) can be regarded as providing reliable information as to typical remuneration in this industry. Of the 16 interviewees, eight were bag machine operators, seven were extruder operators, and one was a quality controller.

Take home pay was calculated as the employers take home wages *plus* deductions taken for loan repayments. Deductions made from gross pay not included in this figure include tax, UIF, union stop orders, and pension or provident fund.

The following table gives details of worker representative's wages and benefits.

| Industry Segment | Average take home pay per month | Range of take home pay | Tax paid? | Company contribution to medical aid scheme? | Company contribution to pension or provident fund? |
|---|---|---|---|---|---|
| High Productivity Segment (n = 9) | R2,552 | R1,624 – R3,350 | All | None | All |
| Low Productivity Segment (n = 7) | R1,454 | R980 – R2,100 | Two out of seven | None | Five out of seven |
| All (n = 16) | R2,072 | R980 – R3,350 | 11 out of 16 | None | 14 out of 16 |

Differences between the two segments of the industry can be seen in the average take home pay. In addition, the division between the segments is manifested in whether employees pay taxes or not, since most worker representatives in the Low Productivity Segment of the industry earned wages below the tax threshold.

None of the companies contributed to medical aid cover and only two of the sixteen interviewees were members of a medical aid scheme.

By contrast, 14 out of 16 interviewees were members of a pension or provident fund that the employer contributed towards. The most common such fund were those organised by the Metal and Engineering Industries Bargaining Council, Ceppwawu (CINPF), and a company fund operated by one large firm in the High Productivity Segment of the industry.

In addition to pension/provident schemes workers in some companies in the High Productivity Segment of the industry had disability insurance schemes. Where this was the case the employer contributed towards the scheme.

Typically employers match contributions from workers. These are around 6% of gross wage for pension or provident funds and between 2.5 and 4.5% of gross wages for disability insurance.

### Travel Costs

Travel costs to and from work represents a significant cost to workers in terms of both time and money. The following table illustrates this using data from the 16 worker representative interviews.

| **Segment of Industry** | **Average travel cost per month** | **Average travel time to work (one way)** |
|---|---|---|
| High Productivity Segment (n = 9) | R228 | 39 minutes |
| Low Productivity Segment (n = 7) | R114 | 29 minutes |
| All (n = 16) | R178 | 35 minutes |

The lower average cost for the Low Productivity Segment interviews is a reflection of the average shorter travel time to work for the interviews and the fact that three interviewees in this segment walked to work (taking between 20 and 40 minutes).

### Wages and Dependency Ratios

With one exception, all the 16 interviewed worker representatives used their wages to support other people. These included spouses, children, siblings, parents, and other members of extended families. Some of these family structures had other sources of income (wages, pensions, and trading). This income was added to the interviewees take home pay, minus travel to work costs, to calculate the average monthly income available to people supported by workers' wages.

| Segment of Industry | Average take home pay minus travel to work costs per month | Average number of people depending on wage (including wage earner) | Average additional income to family structure per month | Average monthly income per person dependent on wage |
|---|---|---|---|---|
| High Productivity Segment<br>(n = 9) | R2,324 | 7.4 | R844 | R428 |
| Low Productivity Segment<br>(n = 7) | R1,340 | 5.3 | R420 | R332 |
| All<br>(n = 16) | R1,894 | 6.5 | R659 | R393 |

Wage earners in the High Productivity Segment of the industry have a higher number of dependants than wage earners from the Low Productivity Segment. While the sample size is small this would appear to be consistent with our understanding of dependency among extended family structures in which individuals congregate around resources.

This greater number of dependants on those in the High Productivity Segment of the industry is, in part, offset by the higher incomes in this sector and a higher average source of other incomes.

Additional income is relatively small compared to the wage of interviewee, 25.8% for all interviewees and their dependants.

### Working Conditions

#### The Nature of the Work Involved

For the majority of workers in the VCB industry (operators and packers) the work is highly repetitive. With the exception of one company in the High Productivity Segment of the industry, there is no opportunity for workers to exercise control over the work environment and almost no opportunity for career advancement.

#### Shifts

All companies producing plastic bags operate shift systems. This means that many workers in the industry work unsociable hours. This is generally compensated with a shift allowance (the MEIBC

Main Agreement stipulates an allowance of 7.5% for afternoon (evening) shifts and 15% for night shifts). Whether this compensates adequately for the disruption to family life that shift systems cause is impossible to calculate.

Where companies operate a two-shift system workers are required to operate 12-hour shifts. Companies operating a three-shift system also require workers to operate 12-hour shifts over some weekends if 24-hour production is to be maintained seven days a week.

In addition to these twelve-hour shifts, travel time to and from work must be taken into account. Within a work environment that is noisy, involves moving machinery, and is often subject to varied temperatures, such shifts are stressful. In an environment that has potential dangers, concentration is difficult to maintain.

**Health and Safety**

The main health and safety issues encountered in VCB manufacture are injuries resulting from fingers and hands been caught in machinery, damage to feet from dropped objects, and exposure to solvents during printing. This latter health hazard also poses a risk of burns.

In most cases the shop stewards interviewed were not health and safety officials and as a result reliable data on health and safety was only obtained from seven sites (the five High Productivity Segment sites, and two sites in the Low Productivity Segment of the industry).

The following table details key health and safety features at these sites.

| Site | Accidents in last 12 months | Last Department of Labour H&S inspection | Does the H&S Committee meet regularly? | Outstanding H&S issues being attended to? | What provision is made for health care by the company? |
|---|---|---|---|---|---|
| **High Productivity Segment** (n = 5, with 766 employees) | | | | | |
| 1 | Some minor | 2001 | Yes | Yes | P/T doctor and nurse |
| 2 | Non | Not known | No | Yes | P/T doctor and nurse |
| 3 | One (hand broken) | 2001 | No | Yes | Local clinic |
| 4 | Non | 2001 | No | No | Local clinic for which workers pay R2.60 weekly |
| 5 | One minor | Not known | No | Yes | Local clinic |
| **Low Productivity Segment** (n = 2, with 147 employees) | | | | | |
| 6 | Six<br><br>Three serious, two involving loss of fingers, one burn requiring one month off work | 2001 | No | No | P/T nurse and local clinic |
| 7 | Two<br><br>One damage to finger, one damage to foot, both required three weeks off work | Not known | No | No | Local clinic |

From the data collected accidents appear to be more common in companies in the Low Productivity Segment of the industry. This could be due to the greater labour intensity in this segment.

With the exception of one site in the High Productivity Segment of the industry Health & Safety Committees are not meeting regularly.

In the High Productivity Segment of the industry this would appear to be largely offset by action taken by management in conjunction with the Department of Labour's Health and Safety Inspections. In the Low Productivity Segment of the industry action on the part of management appears to be more limited.

### Training

Worker representatives were asked about training relevant to their work and whether this contained any off-the-job components.

| Segment of Industry | Did vocational training include any off-the-job components? |
|---|---|
| High Productivity Segment<br>(n = 9) | 3 Yes 6 No |
| Low Productivity Segment<br>(n = 7) | 0 Yes 7 No |
| All<br>(n = 16) | 3 Yes 13 No |

At the level of operators, (which this sample represents) it would appear that little other than on-the-job training has occurred in the industry. This limits the ability of workers to formally transfer skills to other employment.

### Relationships Between Management and Workers

Shop stewards in all the companies where in-depth interviews took place indicated that there were regular meetings between management and shop stewards. In the High Productivity Segment of the industry this sample represents the whole population (of sites) and is therefore an accurate reflection. At the Low Productivity Segment the sample is only a small proportion of the population and, with respect to this question, is biased since interviews were only conducted in unionised sites where management was willing for such interviews to be conducted.

### Migrant Workers

Worker representatives were questioned over their willingness to relocate in the event of retrenchment to help ascertain the impact of any job losses resulting from the proposed regulation.

In fact, questions on their housing situation revealed that many (11 out of 16 or 69%) were already migrant workers with permanent homes away from the area of their employment.

This prevalence of migrant workers resulted in part from continued influence of apartheid migrant labour policies with a number of workers having permanent homes in the former homelands and TBVC 'states'. It also resulted from early retrenchment processes in the industry and the offering of jobs to workers within the company but in a different location that had been accepted.

The impact of migrant work on family life and as a risk factor in the spread of HIV/AIDS is understood but is not possible to quantify.

**Prospect of Re-employment**

Worker representatives were asked what they thought their opportunities for re-employment were should they be retrenched from their present positions.

Fifteen out of the 16 interviewees indicated that finding alternative employment using their current skills would be difficult, very difficult, or impossible. Only one employee thought that finding alternative employment would be easy based on his experience.

Interviewees suggested a number of reasons as to why finding alternative employment would be difficult for them should the proposed regulations result in the closure of their company. These included:

- The high level of unemployment in South Africa.
- That their experience would not be relevant if the industry was closed down
- That companies in other industries had negotiated re-employment agreements with retrenched workers and that, in the event of an economic upturn, it would be these workers who would be employed.

The arguments put forward by shop stewards are entirely consistent with our knowledge of the South African labour market. Statistics South Africa estimates that the official rate of unemployment stands at 23.3% and an additional 12.9 % of the population are unemployed but have given up looking for work and do not therefore fall into the official definition of unemployment. Unemployment rates among low and semi-skilled Africans (i.e. most workers in the VCB industry) are even higher than these national averages[17].

Consistent with the number of employees who were already migrant workers, 14 out of the 16 interviewees indicated their willingness to move within the RSA if necessary to find employment as long as this employment allowed them to earn a living. As one shop steward put it, 'I'll move anywhere in South Africa *but* where I can earn a living.'

A number of shop stewards pointed out that they represented a biased sample with respect to these questions since, as shop stewards, they tended to be better educated and generally have more initiative than rank-and-file workers.

[17] Statistics South Africa. 2001. *South Africa in Transition: Selected Findings from the October Household Survey of 1999 and Changes that have Occurred Between 1995 and 1999. Pretoria.*

**Re-employment Estimates by Employment Category and Industry Segment**

Taking this information into account, the following table estimates the likelihood of employees in the VCB industry finding alternative employment by employment category and by segments of the industry.

| **Employment Category** | **Percentage of High Productivity Segment Employment** | **Percentage of Low Productivity Segment Employment** | **Would Employees find re-employment?** |
|---|---|---|---|
| Film blowing | 12 | 23 | No |
| Printing | 9 | 11 | No |
| Bag Making and Packing | 42 | 39 | No |
| Recycling | 2.2 | 4.4 | No |
| Mixing | 1.6 | 2.1 | No |
| Distribution and Transport | 8.5 | 5.9 | 50% Yes |
| Artisans | 4.0 | 0 | Yes |
| Supervisors | 1.6 | 3.3 | High Productivity Segment: Yes<br>Low Productivity Segment: 50% |
| Administration | 2.9 | 3.0 | Yes |
| Management | 4.2 | 8.2 | Yes |
| Other employment Categories | 11 | 1 | 50% Yes |
| **Percentage that would not find re-employment** | 76.6 | 84.6 | |

**Worker Representative Perspectives on the Proposed Changes**

At the end of the worker representative interviews shop stewards were asked if there was anything they would like to say about the proposed regulations on plastic bags and how it might effect workers in their company. While their responses to this opportunity reflected fear and anger at the situation they found themselves in, they also strove to provide considered and balanced responses to the wider issues involved. Additionally, they sought to suggest, often creatively, alternative solutions to the regulations.

Workers in the VCB industry are likely to bear the brunt of any industry restructuring as a result of the proposed regulations. This section attempts to present the voice of their representatives as directly and clearly as possible.

#### Fear

Within the context of mass unemployment and the absence of an adequate social security system the overriding concern voiced by shop stewards was the fear of poverty that would result for them and their dependants should they be retrenched.

#### Anger over a Lack of Consultation and Consideration

A number of shop stewards expressed anger over what they felt was a lack of consultation over the proposed regulations. They had heard about the regulations either through their employees or their union. As a result a number of shop steward committees had written letters to the Government or the press and provided copies of these to the researchers.

However, the researchers' presence in their factories represented the first time that they felt a channel was been made available for their voice to be heard directly by government after a year of uncertainty and worry. A number of shop stewards made impassioned plea's that their views be conveyed to the Minister [of Environment and Tourism].

> "The Minister did not think about us workers and the effect it [the regulations] would have on us. Ninety percent of what our company produces is VCB bags. If he goes ahead [with the regulations] ninety percent of employees will be out of work. He must bear in mind that each employee has a minimum of six or seven dependants. They are fully dependent on us."

#### Regulation

A number of shop stewards pointed out that the proposed regulations on the thickness of plastic bags were not the first set of regulations to effect the industry. Opening up South Africa to imports of cheaper and thinner bags had already put pressure on their companies. They pointed out the irony that in responding to the importation of thinner bags from overseas they now faced regulations that would force them to reverse this response.

Shop stewards pointed out that many of the countries from which these thin plastic bags were imported came from countries without the same level of labour regulations as South Africa. They felt that this was unfair.

> "We want the Minister to be clear on globalisation. If he wants to regulate [the domestic industry] how will he regulate those from the Far East selling bags here?"

**The Impact of Retrenchments**

Practically all shop stewards raised the likely impact of retrenchments on workers. A number pointed out the government would lose tax revenue if workers lost their jobs. Their more pressing concern was the impact that retrenchment would have on workers and their families.

> "The government must realise that it is not only about people on the shopfloor. It is about their families; there are mouths behind them."

In addition to the likelihood of hunger (which given the data collected on income and dependants would appear to be a real and not figurative outcome of retrenchments for workers in the VCB industry) shop stewards were also concerned about other effects of unemployment. These included increased crime, the break up of families, and the inability of children to continue education – a result that they pointed out would exacerbate the problem of unemployment.

**Suggested Alternative to the Problem**

Not all shop stewards were clear as to the reason for the regulations and on occasion there were internal debates during group interviews. However, the majority saw the regulations aimed at reducing litter.

Shop stewards recognised the 'need for a clean country' however they stressed that regulations to achieve this needed to be balanced against the impact of those regulations on employment.

A number of alternatives to the proposed regulations were suggested by these shop stewards. These included; educating people as why they should help keep the country clean by not throwing away rubbish, creating jobs through litter clearing schemes, and encouraging recycling of plastic bags that would create additional employment. One idea was that school children be encouraged to collect bags that would otherwise litter the country, which their school could then exchange for books.

## *6.3 The retail industry*

The retail sector was divided and dealt with in two sectors.

### 6.3.1 Large retail groups, that use predominantly printed bags

For the large retail sector it was found that 100% of the grocery retailers used 17/18 micron vest type carrier bags at checkout. Importantly the large retailers tended to have a large range of checkout carrier bags therefore the sum of percentages is greater than 100. It was found that 100% of the bags were printed.

Large retailers indicated that the most preferred carrier bags were the 17/18-micron vest type carrier (71.43%) and the 30-micron bags (28.57%, which are extensively used by clothing retailers). The primary drivers for both bags were found to be both functionality and cost. In follow up interviews with retailers of foodstuffs, the use of virgin polymer was found to be essential.

Large retailers indicated that the least preferred types of bags were the 80-micron (42.86%), paper (28.57%) and cloth (14.29%) primarily due to the cost of the bags.

### 6.3.2 Smaller retailers, which use a combination of printed and “plain” VCB’s

For the small retailers 80.90% used check out carrier bags broken down as presented in the table below. Importantly 19.09 % of retailers surveyed did not use checkout carrier bags.

| **Bag type** | **Percentage use** |
|---|---|
| 17/18 micron unprinted | 42.17% |
| 17/18 micron printed | 23.61% |
| 30 micron printed | 5.83% |
| Paper | 3.98% |
| 30 micron unprinted | 2.92% |
| 80 micron | 2.39% |
| Cloth | 0% |
| Total | 80.90% |

Mean monthly consumption figures were determined for the various types of bags used by small retailers as detailed in the following table.

| Bag type | **Mean monthly consumption per outlet (bags/ month)** |
|---|---|
| 17/18 micron unprinted | 8309 |
| 17/18 micron printed | |
| 30 micron | 1319 |
| 80 micron | 2387 |
| Cloth | - |
| Paper | 1828 |

The cost of carrier bags for small retailers is listed below:

| Bag type | Weighted Mean Cost (Rand/ 1000 bags) |
|---|---|
| 17/18 micron unprinted | R 59.66 |
| 17/18 micron printed | R 78.26 |
| 30 micron | R 113.00 |
| 80 micron | R 275.00 |
| Paper | R 192.00 |
| Cloth | - |

### 6.3.3 Imports in the retail industry

In the large retail sector, no respondents made use of imported carrier bags. It has however come to light that one of the larger retailer groups are important significant amounts of printed bags. For the small retailers however there were 3 users of 17/18 micron bag users using 7500 imported bags per month. In addition two 30 micron bag users using 4000 imported bags per month. Pricing information could not be uniquely identified for the imported bags as they did not represent 100 % consumption, and indications are that many small retailers are using imported bags without being aware of it.

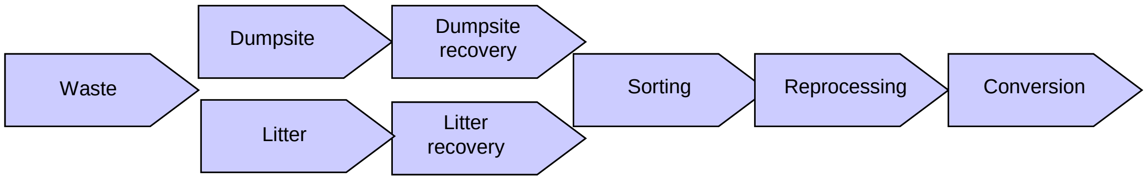
One large retailer was using cloth bags. The price per 1000 bags was R 7 000 for internationally produced bags and R 8 500 for locally produced bags. No small retailers were identified as using cloth bags.

### 6.3.4 Reuse and recycling in the retail industry

The prevalence of recycling of post consumer carrier bags has been found to be very low. Large retailers indicated that recyclers are not able to collect and recycle carrier bags from stores as this would not be cost effective. In support of this, 87% of 17/18 micron bag users indicated that there was no provision made for recycling of plastic bags. However 51.41% indicated that the reuse of 17/18 micron bags was actively encouraged.

## 6.4 Waste, including recycling

The key post consumption activities associated with VCB's are depicted in the following diagram




This research identified 85 companies whom are at present recycling plastic. There are only two of these that recycle post consumer VCB's. A thorough analysis of the current plastic recycling industry, and in particular the potential of the industry to recycle post consumer VCB' could not be done due to a lack of data. The findings of this section therefore had to rely heavily on other sources of information, such as prior studies conducted and general industry knowledge.

### 6.4.1 Applications for recycled plastics

The application for recycled polymer is generally categorised as follows (List not intended to be exhaustive)

- Film for building, agriculture, garbage bags, stretch wrap, shrink wrap and carry-out bags
- Pipes and hoses for the agricultural, industrial, mining, plumbing, garden hose, and other markets
- Other than for pipe many other profiles are also made from recyclates. This includes shoe and suitcase welting, assembling and decorative profiles and wire handle grip.
- Injection moulded products such as kitchen utensils, cups, industrial storage bins, shoe soles, refrigerator trays, etc.
- Roto-and compression moulded products such as garbage bins, floor coverings, outer covers for lead-acid batteries, etc.
- Blow moulded products such as bottles, containers and toys

In determining why such a low percentage of HD-VCB's enter the recycling process, a number of factors must be considered from both a supply and demand perspective.

### 6.4.2 Plastics recycling, and specifically HD-PE recycling

It is estimated that the total HD-PE recycled in South Africa in 1995 was 20 265[18] tonnes. This constitutes 18% of all plastics recycled, and approximately 16% of total HD-PE produced.

[18] Research report "The potential of using fiscal instruments to promote the recycling of plastic waste in South Africa" conducted by Deloitte and Touche for DEAT, 1995

It is however estimated that less than 1%[19] of high-density polyethylene VCB's manufactured is recycled after use. The relative amount that ends up as litter versus the amount that ends up in a dumpsite is unknown.

The reasons for the relative low recycling of VCB's compared to other HD products, can be determined by looking at the demand and supply balances of the market for reprocessed (post consumer) HD.

**Demand for reprocessed HD-PE**

The demand for reprocessed HD is determined by converters, who in turn base their demand on a number of factors, including:

- The market demand for products that can be manufactured from reprocessed HD-PE. At present it demand is limited to refuse bags (primarily), specific pipes, and carry out bags (limited),
- The technological implications for converters of introducing reprocessed material into their manufacturing process
- The price and availability of virgin polymer.
- The price and availability of reprocessed polymer.

**The supply of reprocessed polymer**

Based on the market demand for reprocessed polymers, the recyclers inform their collection network on the types and volumes of material required. Collectors have an intimate knowledge of the factors that determine the value of a certain products, and determine the economics of their collection by considering three factors

- The price paid (per kg), which is a factor of demand.
- The contamination (including printing) of the product – highly contaminated material costs more to recycle and is less valuable
- The product weight. This plays a major part in the efficiency of the collection process. The lower the weight, the less viable the collection process.
- The point of consumption, which in the case of VCB's is the domestic market. There are therefore no single points of collection of large volumes of the product available to the collector

[19] Industry estimate

An assessment of the above factors for the current recycling of VCB's explain the low percentage of post consumer VCB's being recycled, as follows:

- From a demand perspective the applications (which determine the market) for post-consumer VCB's are limited.
- The technology used to produce "thin" VCB's restricts the relative percentage of post consumer waste that can be used as raw material input. Variations in thickness, and "bubble brakes" due to inconsistencies in raw material quality as a result of the inclusion of reprocessed material, create limitations on the demand for post consumer reprocessed polymer.
- From a supply perspective the combination of low weight per bag, the high level of print contamination relative to the bag surface, and the lack of single points for collection makes in uneconomical for collectors to pursue VCB's

### 6.4.3 The cost of recycling

Due to the limited data received from plastic recyclers a detailed cost analysis could not be done. The following are estimated costs.

| | **Printed** | **Unprinted** |
|---|---|---|
| **Cost of collection (Price paid by recycler)** | R 600- 800 per tonne | R 1200 –1500 per tonne |
| **Input cost to converter (Price paid by Converter)** | Varies, but R 3400 per tonne can be used as an average | |

The difference in the price paid by recyclers to collectors for printed and unprinted VCB's reflect one of the primary constraints to the cost effective recycling of post consumer VCB's, namely the printing on bags. Although it is technically possible to recycle printed bags, additional costs, for example equipment to degasify the material, are incurred. The weight of the printing relative to the bag weight means that the actual material recovered is less than the actual weight of the bag, therefore the lower price paid for printed bags.

Although very little data is available on the current available capacity for recycling, industry sources indicated the following:

- Current capacity is fully utilised
- Additional capacity will require capital investment of approximately R 12 500 per tonne increase.

## 7 Supply and demand balances in the current VCB value chain

Since the usage of paper and cloth bags is minimal (less than 1%), the current supply and demand balance for VCB's exclude paper and cloth products.

The supply-and-demand balance for vest-type carrier bag industry can be determined from various angles. In theory they should result in similar answers, but due to differences in availability and accuracy of data this will not necessarily be the case. It must however still be done since the resultant triangulation is indicative of the magnitude of error. The following summarises the three approaches followed, and the level of accuracy expected based on the baseline data. The product mix is constant, as defined.

| **Approach** | **Baseline data** | **Accuracy of baseline data** |
|---|---|---|
| Calculate the size of the VCB industry and retailer demand based on raw material (polymer) supply<br><br>Adjust for export and import of both raw material, semi-processed goods, and finished products (VCB's) | Polymer supply to the VCB industry | Accurate – actual data available for complete polymer industry<br><br>Accurate polymer export data<br><br>Accurate polymer import data, but adjustments to actual bag numbers I (necessary because of the importation of VCB's) is uncertain |
| Calculate the raw material supply and retailer demand based on the size of the VCB conversion industry | VCB production | Not possible to do accurately unless data is available for a representative number of companies that produce VCB's. Research did not yield data from a representative number of companies. |
| Calculate the size of the VCB industry and polymer supply based on the demand of retailers | Retail demand | Accurate – representative data available. Uncertainty about imports and exports not relevant<br><br>Only uncertain variable is the lack of representative data on very small informal retailers and hawkers |

## 7.1 Supply and demand balance based on raw material volumes

### 7.1.1 Raw material and semi-processed polymer supply

Total polymer and semi-processed polymer supply to VCB industry:

| Raw material supply to VCB industry[20] | Tonnages | Notes on values |
|---|---|---|
| Locally produced polymer<br>• HD<br>• LLD<br>• Masterbatch | <br>37 000<br>4 760<br>1 740 | <br>Data supplied by polymer producers<br>Combined LLD and Masterbatch is 15% of total, with Masterbatch being 4[21]% |
| Total local polymer supply for local VCB industry | 43 500 | |
| Imported polymer and semi-processed[22]<br>• Imported HD-PE<br>• Imported HD -PE scrap and waste<br>• Imported LLD-PE<br>• Imported PE plates, film and foil | <br>400<br>0<br>100<br>0 | Although 16 799 t of HD was imported in 2000, this research indicated that very little[23] is consumed in the VCB industry<br>Although approximately 23 000 t of LLD-PE was imported in 2000, research indicated that very little[24] is consumed in the VCB industry.<br>It is more cost effective to import bags than rolls of PE. The 7000 t of PE plate and film is therefore for applications other than VCB |
| Total imported polymer supply to VCB industry | 500 | |
| Total polymer supplied to the VCB industry | 44 000 | |

Amounts of reprocessed material that is supplied for conversion is not shown separately in the above table. It does not mean that it has been neglected in the determination of the total material supply, and is included in the figures that represent “locally produced polymer”.

This is for the following reasons:

- Reprocessed HDPE is only first generation (in-house) reprocessed, and therefore included in the 37 000 tonnes
- It is estimated that less than 1%[25] of post-consumer reprocessed enters the recycle industry
- The figure for locally produced LLDPE is a calculated and would therefore include virgin, first generation as well as any post-consumer LLDPE.

[20] Data provided by the two polymer manufacturers in South Africa

[21] The 4 % master batch figure supplied by polymer producers match the actual usage, as supplied by converters

[22] DTI trade database, 2001

[23] The research into 30000 tonnages of HD consumed within the VCB industry indicated that only 100 t was imported material. A 1% imported HD assumption would therefore be realistic

[24] Imported LLD-PE is primarily specialised monomers, and the research indicated that only 20t was imported raw material.

[25] Estimate provided by plastic recyclers

### 7.1.2 Size of the VCB industry based on raw material supply

Due to the fact that no losses occur in the conversion of polymer into film and eventually bags (in-house waste is reprocessed, and material density stays constant), the size of the South African conversion industry can with confidence be estimated as being 44 000 tonnes.

### 7.1.3 Converting polymer volumes into units of bags produced

Using the weighted average weight of bags produced and consumed, as earlier calculated, the total number of bags consumed is calculated as follows:

| Type of bags | % of bags | Polymer tonnes | Weighted avg weight per bag | Number of bags (millions) |
|---|---|---|---|---|
| Mini | 7% | 3080 | 3.11 | 990. 354 |
| Handi | 17% | 7480 | 4.35 | 1 719.540 |
| Midi/Maxi | 55% | 24200 | 7.01 | 3 452. 221 |
| No data provided | 21% | 9240 | 5.87 | 1 574. 107 |
| Total | | | | 7 736.621 |

From the above it is concluded that the total number of bags locally produced is 7.736 billion

### 7.1.4 VCB imports and exports

To complete the supply-demand balance it is necessary to quantify the imports and exports of VCB's.

**Exports:** Exports of VCB's could be accurately quantified, as it is known that only one converter is currently exporting. The total export volume is 6000 tonnes and the number of bags (actual data provided by converter) is 560 million.

**Imports:** The quantity of bags being imported is a much more contentious issue. Industry sources estimate it to be approximately 1000 tonnes. The DTI indicated that the value of imported bags was R 64.2 million in 2000. This figure is a FOB value, and includes all bags and sacks made of PE, and not only VCB's. It can however be assumed that most of the imported bags would be VCB's since the market for LD bags in South Africa is relatively small and customised. Therefore assuming 70% of import is VCB's, and an FOB price of R 10 000/t, it equates to 4494 tonnes. Industry sources indicate that these bags are typically the Handi type, with a very low thickness of 10μ per bag. This calculates to a weight of 3.4 kg per 1000. The 4494 tonnes therefore equates to 1.32[26] billion bags imported.

### 7.1.5 Net VCB consumption based on polymer supply

Net VCB consumption, taking into account local production less exports and plus imports therefore equates to 8.496 billion bags per annum, or 42 500 tonnes

## 7.2 Supply and demand based on VCB industry conversion volumes

The research identified 42 companies that manufacture VCB's. Data was obtained from 10 companies, with a combined VCB production of 34 738 tonnes. Since the number of companies for whom data was collected cannot be considered to be representative of the industry, and considering that the nature of the companies are completely different in terms of technology, labour intensity, product mix, etc., it would not be prudent to estimate the supply and demand equation from this perspective.

The fact that the industry size could not be extrapolated is due to under-representation in the number of companies from which data was received. This should not distract from the fact that, from a product perspective (data received on 34 738 tonnes out of 44 000), the representation was found to be high (79%), and could successfully be interpreted for the industry as a whole.

## 7.3 Supply and demand based on formal and informal retailer demand

### 7.3.1 Demand volumes based on retailer data

The retailer market was segmented for research purposes as follows:

- Large retailer groups listed on the JSE
- Non listed smaller retailers segmented according to size (small, medium and large), as well as geographical location

**Demand profile of large retailers**

Although limited data was collected from large retailers, it confirmed the industry "rule of thumb", namely that spending on carrier bags is 0.45% of total turnover[27]. Considering that the food and clothing sector of the JSE is R 48 Billion, the spending equates to R 202 million per annum. Since retailers also indicated that they get on average 11 bags for every Rand spend, the total bag consumption is 2.552 billion per annum

[26] According to industry sources this figure could be on the high side. It is however impossible to research the exact number of bags being imported

[27] This figure is commonly agreed by retailers and converters and was confirmed by the research.

**Demand profile for non-listed smaller retailers**

The demand profile of non-listed, smaller retailers is extensively described elsewhere in the report. It was found that there are 88 000 retailers. The research obtained data from a representative sample of 377 companies, representing 723 retail outlets. Of these a total of 451 used VCB's. The mean monthly consumption was found to be 8309 bags. Statistically it can therefore be calculated that the total consumption of the 88 000 retailers is 5. 473 billion bags per annum. Analysis of the data provided by smaller retailers indicated an average cost of R 78.26/1000 bags for printed bags, and R 59.66 for unprinted bags. The total spending by smaller retailers equates to R 370 million per annum

The total VCB consumption by retailers in South Africa is therefore estimated to be 8.026 billion bags and a backwards calculation based on this demand, cost per bag and cost per tonne gives a polymer consumption of 42 316 tonnes.

## *7.4 Summary of the current supply and demand balances*

Having determined the number of bags being consumed independently from both a polymer supply and retail demand angle-produced results of the same magnitude, as follows

- Based on 42 500 tonnes polymer usage and the actual weight of bags, it was determined that 8.496 billion bags are annually consumed
- Based on the actual retail spending and bag consumption, it was determined that 8.026 billion bags are consumed.

With imports being the most uncertain factor, there is a possibility that the imported number of units could have been overstated, and the weight of the bags slightly understated. The demand figure is therefore based on the research into the retail market, and the polymer usage based on the 42 000 figures which correspond from both the retail and polymer production side.

This results in a balanced, with some slight adjustments, supply and demand equation as follows:

<table>
<tr><th>Retailer category</th><th>Spending on bags<br>R million</th><th>Bags consumed<br>(billion)</th><th>Conversion, exports and imports (units and tonnage)</th><th>Average weight per bag (g)</th><th>Polymer usage tonnes</th></tr>
<tr><td>Large retailer groups</td><td>202</td><td>2.552</td><td rowspan="3">Domestic<br>44000t (7.736 m bags)<br>Exports<br>6000t (560 m bags)<br>Imports<br>400t (848 m bags)</td><td>5,87</td><td>14728</td></tr>
<tr><td>Smaller retailers<br>Printed bags</td><td>181.09</td><td>2.314</td><td>5.87</td><td>13740</td></tr>
<tr><td>Smaller retailers Unprinted</td><td>188.45</td><td>3.158</td><td>4.35</td><td>13587</td></tr>
<tr><td>Total</td><td>571.54</td><td>8.024</td><td></td><td></td><td>42055</td></tr>
</table>

# 8 Socio - economic impact assessment of the proposed regulations

## 8.1 Theoretical approach to the impact assessment model

The socio-economic impact assessment model reflects the impact of the proposed regulations on the current industries relevant to vest type carrier bags, as well as industries that could possibly be affected in future. There are two main factors that drive all the impacts with regard to the proposed plastic bag regulations.

The first factor is that **products** will change based on the 30 micron or 80 micron criteria and that these product changes create a number of impacts. This product change will then create significant shifts in the market that will fundamentally affect **demand** for VCB type bags and subsequently create a number of upstream and downstream impacts. The demand change is however not only a function of product change since there are demand boundary constraints such as maximum affordable cost. Therefore, product change will also depend on demand changes. How these two factors combine determines what the nature of the impacts will be.

A number of scenario's, based on different products and varying levels of demand, is therefore created to illustrate the potential impact of the regulations. For each scenario the impact variables such as impact on investment, the changes in labour requirements, the price of the product, etc. is calculated, based on the product and demand assumptions

## 8.2 Product assumptions

Since the nature of the proposed regulations is such that it could result in a change of product, it is necessary to base the impact assessment on the product sets that come into play, individually or in combination, For each of the scenario's it is therefore necessary to make fundamental assumptions regarding the product, as follows:

- **The type of material**. The product will be constructed from a thicker plastic film and therefore will use more polymer on a per bag basis than the current product, or from a different type of material altogether. The research established that cloth bags cannot realistically be considered as an alternative product. The impact assessment therefore considers plastic and paper as the alternative types of material.
- **The dimensions of the product.** The fact that the type of material has different properties means that the bag is likely to be larger and be able to carry more goods. This means that fewer but larger bags will be required to carry the same amount of goods – it is a different product. The product (current and potentially adjusted) dimensions used in the scenarios are based on information provided by converters.

- **The raw material requirements**. In the case of plastics for example, the fact that the film is thicker means that there is a good probability that there will be changes in the type of polymer used in the product and in their relative proportions. The polymer mix will not remain the same and this will impact on the upstream segment, and specific assumptions need to be made on which to calculate impact on raw material requirements.

## 8.3 Demand assumptions

The most pertinent question, since it fundamentally determines the impact on the sector is "What is the size and composition of the new VCB market". This is not quantifiable and therefore a number of scenarios need to be developed which place upper and lower bounds on the size of the market. Therefore, on the demand side the assumptions made relate to specific demand boundaries and scenarios within the demand boundaries, as follows:

- The one demand boundary assumes that demand for VCB's will not increase. The upper demand boundary is therefore the current demand for VCB's (i.e. the number of bags consumed stays the same)
- The other demand boundary is based on the assumption that supply of bags will be limited by the amount of money that retailers are prepared to spend on bags. The lower demand level is therefore a function of current retailer spend on bags
- The upper demand boundary is unrealistic since demand for bags will change due to a number of factors. Three primary factors are considered in determining a more realistic demand.
    - Increased re-use of bags will reduce demand.
    - Product optimisation (changes in bags dimensions and material) will take place and reduce the demand for bags.
    - Packaging practices of retailers will change due to an increase in the cost of bags, and reduce the demand for bags.

## 8.4 Impact assessment scenario's

The impact assessment is done for four scenarios, which are based on the combined product and demand assumptions as stated. These scenarios were chosen specifically to reflect first of all the boundaries of the impact of the regulations (current demand scenario and limited retailer spend scenario), to reflect what could the realistic impact be (adjusted demand scenario), and lastly to reflect a worst-case scenario which should be avoided.

The order in which the scenarios are presented reflects a specific logic.

- The first scenario reflects the impact on the value chain if the proposed regulations have no impact on demand for bags. This **current demand scenario** is the upper-boundary limit, and although an unlikely scenario, will provide insight into one of two maximum impact situations based on current consumption levels. It assumes there are no limits to retailer spend, that products stay the same, and substitute products are ignored This scenario is unrealistic because it assumes no change in current bag demand, and no role for substitute products.

- The second scenario, the **adjusted demand scenario,** is more realistic in that it considers that the regulations will achieve a reduction in demand for bags and that market forces will introduce substitute products such as paper bags. The change in demand is realistically estimated considering three factors
  - Changes to the current VCB product characteristics, such as carrying volume and weight capacity, reduce the demand for bags.
  - Provision is also made for efficiency gains on the retailer side, since it can be safely assumed that more expensive bags would result in more efficient application of the product.
  - Re-use of the bags will increase and reduce demand.
- The third scenario reflects what the situation will be if no additional cost to the retailer (and therefore consumer) is to be incurred. This is the **current retailer spend scenario**. Retailer spend as a percentage of revenue stay the same, with adjustments for increased usage of paper bags as a substitute product. This can be seen as the other demand boundary. The need for adjustment for substitute products is driven by the change in the difference between the cost of plastic and paper bags due to the regulations. It assumes the bag characteristics remain unchanged.
- The scenarios conclude with a brief description of what could be a **worst-case scenario.** The worst-case scenario, which is where the total VCB manufacturing industry ceases to exist, could happen for two reasons. The first would be if converters were unable or unwilling to recapitalise their equipment to manufacture at the proposed minimum thickness, and exit the industry. The domestic supply would become zero. The second would be if the cost of bags increases to a point where retailers and consumers are unable to, or unwilling to buy bags. The demand for bags therefore ceases to exist. The impact is the same, and assessed in this scenario.

The first scenario is described in detail, highlighting the rationale and assumptions behind all calculations. The other three scenarios had the same rationale and assumptions as underpinning, but do not repeat all the calculations and assumptions in detail.

The calculation of the optimum scenario is beyond the scope of this research, as this would include thorough research into the consumer market to determine price elasticity of demand, potential changes in consumer behaviour, consumer spending patterns, and a host of other factors.

## *8.5 Scenario A: Current demand*

This is the upper-boundary limit and not a realistic scenario since the demand for units of bags stays the same. This is highly unlikely based on the significant price increases for the product. It provides insight into the potential impact of the regulations but needs to be recognised that this is a highly unrealistic scenario and is therefore of theoretical value only.

### 8.5.1 Assumptions and product data

The scenario is based on the following assumptions:

- The demand, in terms of units stays at current levels (8.024 billion bags)
- There are no limits to retailer spending (currently R 571 million per annum)
- The bag dimensions do not change
- There are no efficiency gains at the retailer (or consumer) side, i.e. the retailer (or consumer) makes no attempt to use less bags
- No substitute products are considered.

The product data is as follows:

| | Current VCB | 30 µ bag | 80 µ bag |
|---|---|---|---|
| **Bag dimensions** | Current | No change | 520 x (420+70) |
| **Product mix** | Current | No change | One type |
| **Weighted average thickness** | 14.24 | 30 | 80 |
| **Mass of bag (avg weighted)** | 5.87g | 12.36g | 34.4 |
| **Demand (units)** | 8.024 billion | 8.024 billion | 8.024 billion |
| **HDPE proportion** | 85% | 75% | 0 |
| **LLDPE proportion** | 10% | 20% | 20 |
| **LDPE proportion** | 0% | 0% | 75 |
| **Masterbatch proportion** | 5% | 5% | 5 |
| **Cost/1000 bags** | 71.56 | 167.87 | 467.30 |

The impact assessment is done by firstly illustrating how the supply and demand balance will change for this specific scenario. The impact on the value chain is then assessed, based on the supply-and demand balance changes.

### 8.5.2 The supply-and-demand balance

#### 30µ bag

<table>
<tr><th>Retailer category</th><th>Bags consumed<br>(billion)</th><th>Average weight per bag (g)</th><th>Required spending [28]on bags<br>R million</th><th>Conversion, exports and imports (units and tonnage)</th><th colspan="2">Polymer usage tonnes</th></tr>
<tr><td>Large retailer groups</td><td>2.552</td><td>12.36</td><td>428</td><td rowspan="3">Domestic<br>99 176 t (8 024 m bags)<br>Exports[29]<br>0<br>Imports[30]<br>0</td><td rowspan="3">HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch</td><td rowspan="3">74382<br>19835<br>0<br>4958</td></tr>
<tr><td>Smaller retailers<br>Printed bags</td><td>2.314</td><td>12.36</td><td>388</td></tr>
<tr><td>Smaller retailers Unprinted</td><td>3.158</td><td>12.36</td><td>530</td></tr>
<tr><td>Total</td><td>8.024</td><td></td><td>1347</td><td></td><td></td><td>99175</td></tr>
</table>

#### 80µ bag

<table>
<tr><th>Retailer category</th><th>Bags consumed<br>(billion)</th><th>Average weight per bag (g)</th><th>Required spending on bags<br>R million</th><th>Conversion, exports and imports (units and tonnage)</th><th colspan="2">Polymer usage tonnes</th></tr>
<tr><td>Large retailer groups</td><td>2.552</td><td>34.4</td><td>1229</td><td rowspan="3">Domestic<br>276 025 t (8 024 m bags)<br>Exports<br>0<br>Imports<br>0</td><td rowspan="3">HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch</td><td rowspan="3">0<br>55205<br>207019<br>13801</td></tr>
<tr><td>Smaller retailers<br>Printed bags</td><td>2.314</td><td>34.4</td><td>1114</td></tr>
<tr><td>Smaller retailers Unprinted</td><td>3.158</td><td>34.4</td><td>1529</td></tr>
<tr><td>Total</td><td>8.024</td><td></td><td>3872</td><td></td><td></td><td>276025</td></tr>
</table>

The key changes on the supply and demand balance is shown to be:

- Significant increased in the required retailer spending from current level of R 571 million per annum to R 1 347 million and R 3 872 million respectively
- Significant increase on raw material usage (and therefore required manufacturing capacity) from 42 000 tonnes per annum to 99 000 and 276 000 tonnes respectively.

[28] It is assumed that the average cost per ton stays the same, namely R 13 581, except for 80µ bags where the 10% price difference between HD and LD is included. Efficiency gains for whatever reasons is not passed on to the retailer (consumer)

[29] It is assumed that exports will discontinue in favour of using the capacity to supply the more profitable domestic market

[30] Although imports of bags could continue, the calculations assume that no imports will take place, for two reasons. It is firstly impossible to estimate the quantity of imports, and secondly the calculations reflect the maximum impact on the VCB industry.

### 8.5.3 Impact on the upstream sector

The changes in polymer demand based on the upper and lower boundaries

The upstream impacts are determined almost exclusively by the changes in demand within the domestic market.

The table below makes the flawed assumption that the total country's needs will be able to be produced domestically and that all converters will invest to expand capacity or modify capacity accordingly. It is nevertheless illustrative of the potential upstream impact. Many converters have indicated that they will not invest at the 80-micron scenario and therefore most bags will be imported and all the polymer currently going into VCB manufacture will have to be diverted into export markets.

| | **Current Situation**<br>**Actual demand** | **30 micron scenario**<br>**Changes in demand** | **80 micron scenario**<br>**Changes in demand** |
|---|---|---|---|
| **HDPE Demand** | 37,000 | +37,382 | -37,000 |
| **LLDPE Demand** | 4,760 | +15,075 | +50,445 |
| **LDPE Demand** | 0 | 0 | +207,019 |
| **Masterbatch** | 1,740 | +3,218 | +12,061 |

In summary the implications for each situation are:

**30-micron scenario:**

- Demand for all polymers increases with the increase in demand for HDPE being particularly significant

**80-micron scenario:**

- Demand for HDPE changes significantly with HDPE no longer being used for bag manufacture
- Demand for LLDPE and LDPE increases significantly with the increase for LDPE being huge would necessitate the establishment of a world scale plant in order to be able to provide the required volumes in the domestic market.

### 8.5.4 Analysis of the impact on the upstream sector

The polymer manufacturing sector is currently ethylene constrained and polymer capacity constrained, with available ethylene being the major constraint. Polymer capacity cannot be expanded without ethylene capacity first being increased.

**Impact on HDPE**

The 30 micron scenario shows HDPE demand changing to an increase in demand for 37,382 tons per annum. The first 10,000 tons will be able to be supplied from the current HDPE capacity surplus of 10,000 tons. This will have a positive impact on the profitability of DOW Chemicals since the production will be sold into the domestic market as opposed to exported.

The remaining 27,382 tons will have to be imported will all the associated negative impacts of importing polymer such as:

- Negative impact on trade balances
- Negative impact on exchange rate due to increased dollar demand
- Negative impact on trade balance
- Negative impact on balance of payments
- Increase in converter costs since they will have to hold greater stocks of polymer to guarantee supply with increasing uncertainty of on –time delivery and increased lead-times due to having to import the required polymer
- Increasing port delays due to increased volumes on a port infrastructure that is already under strain

The nature of polymer manufacture is one where the firms run their plants typically at full capacity in order to maximise economies of scale and then sell as much product as possible into the domestic market where margins are typically better and then sell the balance into the export market. In the case of the 80 micron scenario we would see all the 37,000 tons currently being sold to the VCB market having to be sold into the international market  at significantly lower margins than is current. This will have a significant impact on the profitability of DOW Plastics as well as on the investor confidence of an international firm which has made significant investments in South Africa. The impact is the same for HDPE regardless of whether or not the converters make the required investments to be able to produce 80 micron bags.

The exhibit below depicts the impact, on a per ton basis of shifting polymer sales from the domestic market to the export market and vice versa. This applies to all scenarios as a general rule.

| | |
|---|---|
| Import parity price =<br><br>Ruling FOB polymer price in country of origin<br><br>+ Freight (depending on region)<br><br>+ Duty at 10%<br><br>+ Landing/ wharfage<br><br>+ Coastal transport<br><br>+ Insurance, forward cover, stock provision of 3%<br><br>Rule of thumb for the additional factors is an increase of 25%.<br><br>e.g.<br><br>FOB price of $600 per ton implies a import parity price of $750 per ton. This is the revenue line to the domestic polymer producer | Export price =<br><br>Ruling FOB polymer price in country of destination<br><br>- Transport to coast<br><br>- Wharfage and port fees<br><br>- Freight to country of destination<br><br>Note: Freight is cheaper out of South Africa than into South Africa<br><br>e.g. (assuming no in-going duties)<br><br>FOB price of $600 per ton less $35 per ton "to port" less 4% less 3% agent commission provides a revenue line of $527 |

The above exhibit shows that the nett revenue line loss to a polymer producer of having to divert polymer from the domestic market to the export market is $223 per ton or R1895 per ton. This nett revenue line loss will directly affect the profit line. We will use this figure as illustrative of the market shift for all polymers.

The worst case impact for the 80 micron scenario is a reduction in profit to DOW Plastics of R70m per annum and a loss of taxes to the government of R21m per annum (assuming an average tax rate of 30%)

In the 30 micron scenario depending on the market size, the likely impact on DOW Plastics is increased profits of R18.95m.

**Impact on LLDPE**

For both the 30 micron and the 80 micron scenario, there is an increase in demand for LLDPE ranging from +15,075 to +50,445 tons per. There is currently a shortage of locally produced LLDPE in South Africa and all of the increased demand will have to be imported. The impacts fall into the same categories as above for imported product. Clearly if the converters do not make the required investments then demand for LLDPE will decline. The impact will not be high since there is currently a shortage of LLDPE and polymer is being imported to meet domestic demand.

**Impact on LDPE**

There is only an increase in LDPE demand in the 80 micron scenario. The increase in demand is 207,019 tons per annum. There is currently a shortage of locally produced LDPE in South Africa and all of the increased demand will have to be imported. The impacts fall into the same categories as above for imported product

The next question we need to ask is what is the likelihood of the above increases in demand for polymer having an impact on the investment and expansion plans of the monomer and polymer producers. In order to assess this we need to understand the investment planning approaches and cycles of such organisations ( the following discussion applies to all scenarios).

### 8.5.5 Nature of Upstream Investments

There are a number of possible investments in the upstream segment. These can be assessed in two main categories:

- Greenfields development of a cracker and associated downstream polymer plants
- Brownfields expansion and enhancement of existing infrastructure to increase capacity

In the current South African scenario only the second option really holds true. A feasibility study to develop a cracker on the coast using imported feedstock was developed in the mid-1990's and subsequently discarded. All current expansion plans are based on brownfields models.

It is furthermore important to note that large organisations of the nature of DOW Plastics and Sasol Polymers typically develop long term capital expenditure plans based on forecasts of market demand (among other factors) and that the time from decision until capacity comes on stream can be of the order of 5 or more years. The impact timeframe of the proposed legislation would be far shorter than the above.

The table below provides some idea of world scale with respect to plants of this nature. This shows the type of market increments that would be required in order to justify an investment of this nature.

| Investment | Capacity |
|---|---|
| Monomer plant (cracker) | 500,000 – 1,000,000 |
| Polymer plant | 200,000 – 400,000 |

In the case of LLDPE, the scenario indicates an increase in demand from +15,075 to +50,445 tons per annum. The upper figure would clearly have an influence on any investment decision. In the case of LDPE demand in the 80 micron scenario there is increased demand of 207,019 tons per annum. A world scale plant would be required to supply this demand domestically and the notion of a dedicated plant to supply the polymer required to produce “give-away” plastic bags is somewhat ludicrous. Furthermore an investment on hundreds of millions will be required to establish such a plant not taking into account the required monomer expansions that will also be required. This investment would require certainty that the converters will invest in new plant in order to be able to produce the 80 micron bags. With this an unlikely scenario, the demand uncertainty created would not positively impact on any such investment.

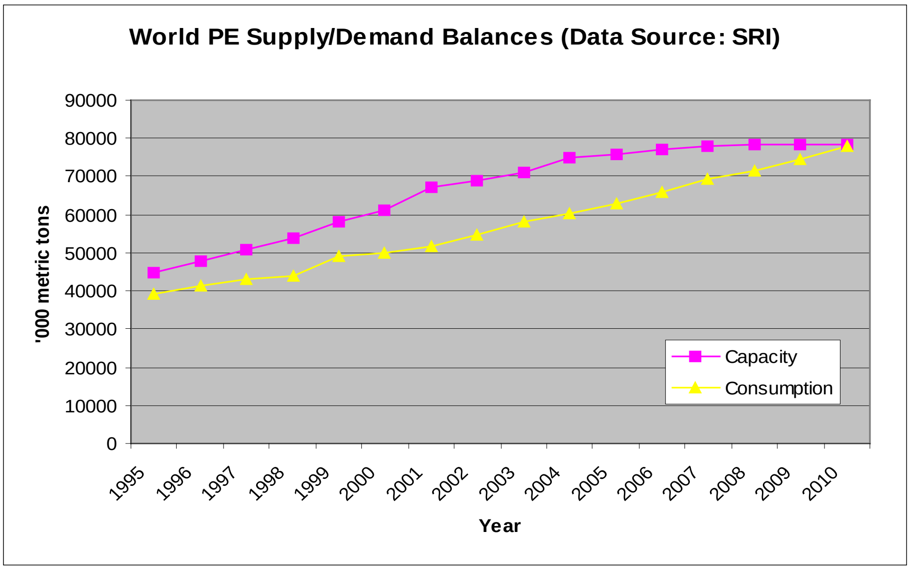
With the assumed figures above it is unlikely that demand figures of that nature with the uncertainty created in the market by the proposed regulations and the uncertainty around the propensity of the converters to make the required investments that the increased demand will in any way influence Sasol Polymers to accelerate its investment plans.

Any investment scenario needs to be informed by international supply/demand developments since these impact on ones ability to sell product into the international market at reasonable prices and also has impact on international prices for polymer. The current situation in this regard for ethylene based polymers is discussed below.

### 8.5.6 International ethylene based polymer position

Demand for olefins and polyolefins, globally is expected to be moderate to high over the next few years with polypropylene exhibiting significantly higher growth rates globally than the polyethylenes. According to SRI, global polypropylene demand is expected to grow at approximately 7% per annum to 2010 and polyethylene demand at 4.5% per annum. European growth rates are expected to be lower.

The world polyethylene supply / demand balance is a prime driver for upstream investment in crackers. The SRI supply/ demand balance forecast is depicted in the figure below.



The supply/ demand balance will be significantly affected by new ethylene investments in feedstock rich regions. The regions which currently have low cost ethanes or condensates are primarily the Middle East and in particular Iran. The availability of significant quantities of low cost feedstock make it an ideal investment area for gas-based chemicals and in particular ethylene crackers. Due to the complexities and costs associated with transporting ethylene (e.g. under pressure) it is expected that derivative capacity will be associated with these new ethylene plants. In contrast, Europe has very high feedstock cost (compared to most regions although the USA and Asia are also at a feedstock cost disadvantage to the Middle East) which have recently been exacerbated by higher crude oil prices. With the possibility of further instability in the Middle East, feedstock prices could be further adversely affected. These prices significantly affect the feedstock cost in Europe which as a high dependency on naphtha as a feedstock. The forecast supply/demand balance of SRI depicted above shows that the PE market will not start to recover until after 2004 when a narrowing of capacity and consumption is expected to commence (unless further plant rationalisation occurs). SRI forecasts that ten new crackers will be built between 2000 and 2005 in the Middle East with five of these crackers being in Iran.

Middle East market share of petrochemicals has grown significantly over the past 25 years and this market share growth is expected to continue to expand over the next decade

Capacity expansions are expected in Europe and are likely to come online in a more orderly fashion than in the past with capacity increments being spread over time. Ethylene capacity in Europe is expected to grow from approximately 21.5mt in 1999 to about 23.3mt in 2004. Forecast loading rates are expected to stay above 91% until 2004 with demand growth for ethylene expected to be about 2.3% per annum in line with GDP growth. Capacity creep and expansions are expected an average annual growth rate of 2.1%.  Europe is expected to require additional ethylene supply to fulfil the need for ethylene derivatives. This is likely to be met by imports since the decision to build a new cracker is hard to take in a fragmented market which is providing unsatisfactory ROI.

As far as derivative products are concerned the Middle East will enjoy a significant cost advantage in LDPE, LLDPE, HDPE and ethylene glycol. This will place significant pressure on high cost producers who will either have to exit the market or invest either in new technologies or in new markets/ regions.

The above scenario indicates that international capacity for polyethylenes will exceed demand until at least 2010 with the gap only starting to narrow after 2004. This means that the global outlook for a South African based investment in expanding monomer and polymer capacity is poor. Furthermore, the low cost plants being built in the Middle East are unlikely to be able to be emulated in South Africa which means domestic market considerations are paramount in the establishment of any plant.

### 8.5.7 Impact on the VCB conversion industry

**Production, capacity and technology**

The following factors should be considered under the 30 µ scenario:

- **Production process remains the same**. It is technically possible to manufacture a 30 µ VCB, and the production process will not change in terms of the primary activities of extrusion, printing and bag making.
- **The raw material mix and volume requirements will change.** Converters are of the opinion that it would not be necessary to manufacture a 30 µ VCB primarily from LLD or LD. The product will still be a HD product, but the raw material mix ratio's will change as earlier specified, and almost double in terms of volume.
- **Conversion of current technology is possible.** Converters indicated that it would be possible to modify existing extrusion and bag making equipment to produce bags at 30µ. The cost implications are dealt with in the next section of the report. Printing machines can operate at any thickness, and no modifications are required.

The following factors should be considered under a 80 µ scenario:

- **The production process changes**. It is technically not possible to manufacture a 80 µ VCB. The thickness at the gussets (320 µ) compared to thickness of the rest of the bottom of the bag (160 µ) is too great to allow for effective sealing. The implication is a change in bag type, typically to a bottom-seal bag, with either a separately attached handle, or "banana" cut out handle.
- **The raw material mix and volume requirements will change.** The bag will change from being primarily a HD bag to being purely LD bag, and the raw material mix ratio's will change as earlier specified.
- **Conversion of current technology is not possible.** Converters indicated that it is not possible to convert existing equipment to manufacture at 80µ's. This was confirmed with equipment manufacturers who indicated that totally new equipment is required.

A critical issue for both the 30µ and 80µ situation is the domestic capacity available to meet changed demand. The maximum available capacity is determined as follows:

| **Available capacity** | **Current VCB** | | |
|---|---|---|---|
| Current capacity for local market | 38 000 t | | |
| Current capacity for international markets | 6 000 t | | |
| Maximum additional capacity due to under-utilizes plant | 2 000 t | | |
| Maximum additional capacity if all companies produce maximum hours | 2 000 t | | |
| **Total available** | 48 000 t | | |
| | | **30 µ** | **80 µ** |
| **Required capacity** | | 99 175 t | 276 025 |
| | | | |
| **Capacity shortfall/excess** | | **51 175 t** | **228 025** |

From the above it can be concluded that even if no exports are pursued, and available capacity maximised through optimisation, less than 50% of demand will be met under the 30µ scenario, and less than 25% of demand under the 80 µ situation

The above is based on the assumption that throughput per annum will remain constant. This is however not true. Total throughput per annum is constrained within every manufacturing plant by the extrusion, printing and bag making throughput, whichever is lower. Under both the 30 and 80µ scenario machine throughput will be negatively affected. The bag making process will be slower (cycle reduction) due to the longer seal time per bag, and the extrusion throughput will be lower due to thicker film being extruded. Companies indicated that throughput will reduce by 40-50% of current.

This figure was correlated with equipment manufacturers who provided more detail on how throughput of equipment is affected by producing at 30 and 80 microns.

| | **Current** | **30 µ** | **80 µ** |
|---|---|---|---|
| Extrusion | 100 m/minute | 60 m/minute | 35 m/minute |
| Bag making | 220 cycles/minute | 140 cycles/minute | Can not be converted |

The implication is that capital investments required to meet increased capacity will have to consider both the cost of upgrading existing equipment, as well as the cost of investing in additional equipment in order to reach the required throughput per annum

**Capital investment**

The manufacturers of VCB have provided the following information regarding the capital investment required to meet demand under higher thickness. The capital investment reflects both the need to upgrade existing equipment (30µ situation only), as well as the need to buy additional equipment to meet throughput requirements.

| **Company** | **A** | **B** | **C** | **D** | **E** | **F** | **G** | **H** | **I** | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|
| Current capacity (t) | 24000 | 2380 | 3400 | 1592 | 1326 | 240 | 630 | 840 | 120 | 34528 |
| 30µ Investment requirement ( R mil) | 55 | 5.9 | 7 | 6 | 7.9 | 2 | 3 | 5 | 3 | 94.8 |
| 80 µ investment requirement ( R mil) | 260 | 25 | 35 | 20 | 16 | ? | ? | 10 | ? | 366 |

It is not possible to statistically analyse or extrapolate the above data in a great deal of detail due to a number of reasons, including for example the type of equipment used, the age of equipment, etc. This estimates provided by the converters however corresponds accurately with data provided by equipment manufacturers, who indicated the following:

- If either entry level new equipment, or second hand high quality equipment is purchased, the cost would be approximately R 400 000 for 350 t/annum on the extrusion side, which translates to approximately R 65 million for 50 000 tonnes capacity
- If either entry level new equipment, or second hand high quality equipment is purchased, the cost would be approximately R 270 000 for 350 t/annum on the bag making side, which translates to approximately R 35 million to convert 50 000 tonnes of film into 17µ bags

The following can therefore be concluded:

- The capital investment required by the VCB industry to adapt to a 30 µ situation and meet the existing demand would exceed R 150 million (R 35 million to compensate in reduction in throughput speed, R 100 million to increase capacity because of increased demand and R 15 million for modifications)
- The capital investment required by the VCB industry to adapt to an 80 µ situation and meet the existing demand, would be approximately R 526 million. (R 61 million to compensate in reduction in throughput speed and R 465 million to replace and increase capacity because of increased demand)

**Likelihood of re-capitalisation of the industry taking place under the proposed regulations**

The majority of large and small companies indicated that they would invest under the 30 µ scenario, depending on their ability to raise finance. Examples were provided where access to capital (hire purchase finance) was refused to manufacturers due to the uncertainty regarding proposed regulations.

The 80µ scenario is somewhat different. It must be realised that VCB manufacturing is a commodity industry with low margins. The 80µ situation essentially means the creation of a completely new industry, rather than an adaptation of an existing industry. Large companies who have access to finance indicated that they would rather exit the industry altogether, than invest in a new industry that produce low returns. The smaller companies indicated that they simply do not have access to such large amounts of capital, and will have no choice but not to invest in re-capitalisation. The consequences of re-capitalisation not taking place are severe, and dealt with extensively in the "worst case" scenario later on in the report

**It is worthwhile pointing out that no capital investments would be required if a minimum thickness of 22 - 24µ is specified[31]. There is agreement within industry that 24 microns is the maximum thickness at which manufacturing can take place, without any throughput capacity being lost, or any modifications to equipment is required.**

**A detailed analysis of the impact of regulations specifying a thickness of 22-24µ was outside the scope of the study, but some indication thereof is provided in the section that concludes the report.**

### 8.5.8 Impact on the retail industry and the consumer

The total cost of bags under the proposed regulations, assuming current demand, is summarised below.

| Retailer category | Current consumption (bag units, billions) | Current spending (R million) | Future required spending - 30 µ (R million) | % change | Future required spending - 80 µ (R million) | % change |
|---|---|---|---|---|---|---|
| Large retailer groups | 2.552 | 202 | 428 | 212 | 1192 | 591 |
| Smaller retailers Printed bags | 2.314 | 181.09 | 388 | 201 | 1081 | 574 |
| Smaller retailers Unprinted | 3.158 | 188.45 | 530 | 293 | 1475 | 815 |
| Total | 8.024 | 571.54 | 1347 | | 3748 | |

The impact on the retailers would be more than a 200% increase under a 30µ scenario, and more than 500% under the 80µ scenario, on VCB spending. With the retail industry being a low margin industry, it can be readily concluded that retailers will not be able to absorb increased costs of this magnitude. It

[31] This information was provided by the VCB converters, and confirmed with equipment manufacturers.

is worth noting that the smaller retailers will be affected more negatively than the larger retailers. It will inevitably end up in a situation where the additional cost of either R 776 million or R 3,27 billion be passed onto the consumer, who can ill-afford it.

### 8.5.9 Impact on the waste management industry, including recycling

It is known that currently only approximately 1% of VCB's are recycled after consumption. A key driver for increasing the thickness of VCB's is to stimulate recycling of VCB's. The fundamental premise is that a thicker bag has inherently more value than a thin bag, and collection and recycling becomes economically viable. There are a number of issues that need to be addressed in order to answer the question about whether VCB's will be collected and recycled after consumption. (Note that for this scenario demand for bags are not affected by re-use.)

The issues relate to the supply and demand balance, and the constraints associated with VCB recycling, and how such constraints can be overcome.

| **Supply side – Post consumer collection** | **Demand side – market for recycled polymer** |
|---|---|
| Currently less that 1% of post consumption VCB's collected for recycle | Market limited currently limited to refuse bags and some types of piping |
| Constraints to supply:<br>• Limited market<br>• Printing on bags<br>• Weight to volume ratio<br>• Contamination<br>• Lack of central collection points other than dumpsites | Limits to demand:<br>• Uneconomical collection<br>• Specifications to products, e.g. some municipalities specify refuse bags to be made from virgin material, bags used in the food industry must be made from virgin material<br>• Imported "plain" carrier bags |

From the above it can be seen that should the bags be specified to be of a minimum thickness, it will not necessarily result in increased recycling. Although many of the constraints on the supply side will be reduced, and recyclers indicated that this would be the case, recycling will not take place unless corresponding markets are created.

**30μ situation**

The total potential market for post consumption VCB's under the proposed 30μ regulations, for this specific scenario, is estimated as follows:

- It is unlikely that post consumer recycled HD will ever be used for the manufacture of bags for the food retail industry.

- Post consumer recycled HD can be used for the manufacture of "plain" carrier bags for the non-food retail industry. Therefore, under the 30µ regulation, the maximum market for that could be served by post consumer recycled HD, would be approximately 20 000[32] tonnes.
- If it is assumed that all refuse bags are specified to be manufactured from recycled material, it will represent an additional market of 5000 tonnes per annum.[33]

The net-effect of the proposed regulations at 30µ's could be an maximum increase of VCB recycling from the current 1% to a maximum of approximately 25%, assuming all plain bags are made from recycled material, additional demand is created by specifying recycled material for all refuse bags, and assuming not importation of "plain" carriers bags. If imports stay at current levels, and the situation regarding refuse bags do not change, the increase will be limited to 15% of VCB's manufactured.

It must also be considered that even if 25% recycling is achieved, the volume of polymer that will end up as either litter or disposed in landfills, will increase from 42 000 tonnes to 74 000 tonnes per annum. The cost associated with disposal in landfill is estimated to be R 220/tonne[34], and therefore total additional cost of R 7 million per annum.

**80 µ Situation**

Under a 80µ regulation the additional polymer (LD-PE) that will be released into the waste stream would be 236 000 tonnes. Since the present demand for recycled LD is being met, it can be concluded that unless additional markets for recycled LD is created; the only additional demand would be the VCB industry. It can therefore be estimated that a maximum of 20% of VCB's will be recycled The potential additional cost of landfill disposal would be in excess of R 40 million per annum.

[32] 30% of 100 000 tonnes, and less 10% that will be served by in-process waste

[33] Estimate supplied by industry

[34] Research report: "The potential of using fiscal instruments to promote the recycling of plastic waste in South Africa", Deloitte & Touche, 1995

### 8.5.10 Impact on labour

**The Social Impact Associated with the Scenarios**

The primary social impact associated with the scenarios outlined is the potential change in employment linked to the quality of these jobs. Flowing from this is the larger number of people affected as a result of job losses (or gains) given the high dependency ratios on wage earners in South Africa.

The four scenarios calculate estimated changes in employment and this can be linked to the approximate quality of jobs (with reference to the High and Low Productivity Segments of the VCB industry as a benchmark along with a third, lower, category approximating to informal employment), and the estimated number of dependants.

The estimated impact on employment is calculated for each scenario and summarised in tabular form. This is followed by a tabular summary of the socio-economic impact of these employment changes taking into account the quality of jobs involved and the estimated number of dependants affected.

Some of the qualitative dimensions of possible employment changes and the resulting socio-economic impact are discussed below.

**The impact of employment or unemployment on the income of VCB workers and their dependants**

Using evidence from the interviews with shop stewards in the VCB industry the following impact on wage earners and their dependants can be projected per job lost or created in the formal sector.

| Job category | Average take home income (per month) | Average number of dependants | Average income of dependants with wage income (includes other sources) | Average income of dependants without wage income |
|---|---|---|---|---|
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). | R2,552 | 7.4 | R428 | R114 |
| Low Productivity Segment of VCB industry. (Also formal recycling and retail packing jobs.) | R1,454 | 5.3 | R332 | R79 |

### Comparison with international poverty levels

The measurement of poverty (the inability to maintain a minimum standard of living) is difficult. The most common internationally used benchmark is US$1 per day[35] (or approximately R260 per month).

On this basis the loss of employment would result in workers and their dependants falling to income levels dramatically below this international poverty line. Conversely, job creation would reverse this situation.

### The impact of job losses on women

While women constitute a minority of workers in the VCB industry they appeared to be concentrated in lower-skilled jobs where prospects or re-employment are lowest.

Although packing jobs in the retail industry were not researched in this project, this low-skilled occupation also appears to be dominated by women.

While evidence on the situation of women as workers was not collected during the study (all in-depth interviews being with male shop stewards) it is likely that where women workers are the sole breadwinner these represent some of the most vulnerable households in society.

### The impact on job losses for migrant workers and their dependants

The evidence indicates that many workers in the VCB industry are migrant workers. Any loss of income experienced by them as a result of job losses will be felt not only in the immediate vicinity of the workplace but will be spread, though reduced remittances, to other locations. Given the motivation for migrant labour it is likely that these locations will be in some of the most economically depressed regions of the country.

### Un-quantifiable Costs Associated with Employment

While the income associated with job losses or gains can be calculated other less quantifiable factors also have to be considered. These include:

- Increase crime linked to unemployment.
- Stress on families due to unemployment and poverty.
- Psychological damage to individuals as a result of prolonged unemployment.

[35] May, Julian *et al.* 2000.The Nature and Measurement of Poverty and Inequality. In May, Julian. *Poverty and Inequality in South Africa: Meeting the Challenge.* David Phillip. Cape Town.

- The impact on the ability of families to secure education for children in families with limited income.

### The Impact on Taxation

Another, significant socio-economic implication is the loss or gain in tax revenue in the form of workers pay-as-you-earn contributions. This is primarily a feature of jobs in or similar to the High Productivity Segment of the VCB industry. Other workers are generally below the tax threshold.

### The Impact on UIF

All workers in the formal sector pay UIF contributions. In the event of job creation there will be increased revenue into the fund. In the event of job losses there will be a drain on the fund for the duration of payments to retrenched workers and a loss of future income to the fund.

### Calculating Changes in Employment Under the Four Scenarios

A number of assumptions have had to be made to reach estimations of the effect on employment of the proposed regulations in the four scenarios at 30 and at 80 microns. This section outlines these assumptions in the following notes.

#### Note 1: The Upstream Industry

Based on interviews with representatives from the upstream industry, it is assumed that where total VCB polymer demand increases by 100,000 tonnes or more there will be the upgrading of upstream production by 200,000 tonnes. It is estimated that this will result in the creation of between 20 and 100 jobs.

In the event of a decrease in domestic polymer usage it is assumed, on the basis of upstream interviews, that any reduction in domestic use will be exported. In this case there will be no change in employment.

#### Note 2: Re-capitalisation of the VCB Industry at 80 microns?

At 80 microns the cost of necessary re-capitalisation of the VCB industry is regarded as prohibitive (as previously discussed in this document). However, where the 80-micron scenarios indicate an increase in VCB polymer usage a range of employment implications are calculated assuming industry re-capitalisation. This is to provide a full development of the scenario and does not imply that this will necessarily happen.

**Note 3: Spare capacity in the VCB Industry**

As earlier calculated, approximately 4,000 tonnes of spare capacity exists in the VCB industry. Bringing this capacity on stream, which involve running machines - notably in the Low Productivity Segment of the industry – 24-hours a day, seven days a week, 11 months of the year. This will involve increased use of labour. In the short term this is likely to be met by increased overtime and the use of casual and temporary workers. In the longer run using this capacity is likely to involve the employment of additional shifts given the limits on overtime and casual work i.e. additional employment will be created.

The estimation of potential job creation in the event of increased polymer conversion is based on this long-term understanding of employment creation. Given this, it is assumed that bringing this space capacity on stream will have similar job implications to the installation of new capacity.

Thus, the base line from which any increase or decrease in employment in the VCB industry is calculated is 44,000 tonnes.

**Note 4: Retrenchment and re-employment of employees in the VCB industry**

From section it is estimated that 76.6 percent of employees in the High Productivity Segment of the VCB industry and 84.6 percent of employees in the Low Productivity Segment of the VCB industry would not find re-employment if retrenched. Where scenarios involve job losses in this industry these figures are used; i.e. total unemployment created in this sector and not actual retrenchments.

**Note 5: Re-employment of retail bag packers**

It is assumed no bag packers will find alternative employment should they be retrenched.

**Note 6: VCB Efficiency Gains and Employment Gains in the Event of New Capacity**

In the event of increased VCB polymer usage and the installation of new capacity it is likely that there will be efficiency gains and resulting higher productivity per employee. The extent of these gains is difficult to predict.

<u>30 Micron Scenarios</u>

In the 30-micron scenarios that anticipate increased conversion of polymer a range of employment implications is calculated.

The upper end of this range, in terms of job creation, assumes that both the High and Low Productivity Segments of the industry expand proportionally to their current share of conversion and that their current productivity rate (tonnes converted per employee) remains constant. That is, the industry becomes bigger but otherwise remains the same. This is based on the relative ease of conversion of machinery to 30 microns reported by employers. This implies that new capacity could be a mixture of new machines and newly installed second-hand machines.

Job increases at this upper range are, therefore, calculated on the basis of 72.2% of new tonnage being converted by an expanded High Productivity Segment at 41.5 tonnes per employee and 27.8% of new tonnage being converted by an expanded Low Productivity Segment at 12.7 tonnes per employee.

The lower limit of this range, in terms of job creation, is based on *all* new capacity being installed at the current highest recorded level of any VCB manufacturing site in South Africa - 46.7 tonnes per employee. This reflects a situation in which employers decide to only invest in high productivity machinery to meet increased demand.

<u>80 Micron Scenarios</u>

At the 80-micron level, on the basis that the industry does re-capitalise, it is assumed that this would be on the basis of high productivity plants given the expense involved. That is, the Low Productivity Segment of the industry would cease to exist and all production would take place at the current highest recorded level of any VCB manufacturing site in South Africa - 46.7 tonnes per employee.

**Note 7: VCB Employment Losses in the Event of Decreased Demand**

<u>30 Microns</u>

In the event of decreased polymer conversion it is likely that both segments of the industry will contract on a proportional basis, as their respective markets are likely to be equally affected.

With a major decrease in the size of the industry some increase in productivity might be expected as less efficient machines are scrapped and less profitable companies close down. However, if any decrease is relatively small then this effect is also likely to be limited.

It is therefore assumed in the relevant scenarios that output will be decreased on a proportional basis to the existing division of the VCB industry between the High and Low Productivity Segments. It is further assumed that these industry segments will continue to operate at their current average levels of productivity.

<u>80 Microns</u>

In the event of decreased polymer conversion under 80 micron conditions it is assumed that the reduction in capacity will be taken up first by the Low Productivity Segment and then by the High Productivity Segment of the industry.

**Note 8: Domestic Production of Thicker VCBs**

It is assumed that the production of thicker VCBs will be domestically based, other than in the worst case scenario where no bags are produced domestically.

**Note 9: Possible Job Creation in the Paper Bag Industry**

Only limited data was collected to allow the estimation of job creation from an increased share of the market by paper bags.

In order to make this calculation data was used from one large manufacturer of both VCBs and paper bags. Total VCB employment cost per employees in this company (approximately R90,000) was used with the percentage labour cost (approximately 20%) in the production of paper bags in this company to calculate the number of jobs that would be created for a given value of any created paper bag market.

Given the limited nature of the data used in calculating possible job creation in the paper bag industry, the employment estimated need to be treated with caution.

**Note 10: Possible Job Creation in the Plastic Recycling Industry**

Increased polymer use presents opportunities in the plastic recycling industry.

From limited evidence collected is estimated at an employment rate of 7 tonnes of collected recycled per collector and 84 tonnes of recycled material per recycling operator at dedicated recycling plants. This information is linked to estimated amounts of polymer available for recycling in the different scenarios.

Employment created as a result of collecting material is considered to be informal in nature. Employment created in the recycling plants is considered to be formal and similar in conditions to the Low Productivity Segment of the VCB industry.

Given the limited nature of the date used, the employment estimations need to be treated with caution.

Furthermore, given that it is not know whether this extra polymer in the form of VCBs will in fact be recycled, the estimate of possible job creation is ranged from no recycling of the extra material to complete recycling of the estimated available material.

**Note 11: Possible Job Creation in the Paper Recycling Industry**

The increase use of paper bags presents opportunities in the paper recycling industry, primarily in the demand for recycled material as an input into paper bags rather than in the recycling of bags. The employment implications of this are not known and are not included in the scenario calculations.

**Note 12: Impact of 30 and 80-micron bags on retail packing jobs**

Retailers were not asked for the impact of 30-micron bags on the employment of packers. It is assumed that there will be no employment effects as bags will continue to be used in the retail sector.

Responses from small and medium retailers indicated that at the 80 micron level a number of outlets would require customers to use their own bags and that, consequently, the jobs of their packers would become redundant.

This (but not other reasons given for retrenchments of packers, such as use of paper bags) is extrapolated to the whole of the small and medium retail sector. The figure of 5,228 retail packing job losses is used in the appropriate scenarios.

Evidence from large retailers indicated that there would be no impact on the employment of packers in this sector.

In the event of consumers shifting to their own bags (e.g. 'bags for life') it is assumed that all packing jobs in retail will be lost. On limited data this is estimated to be approximately 70,000 jobs. More detailed research may well alter this figure and also provide a detailed breakdown in terms of employment contracts. However, the magnitude of the figure is not implausible given that the Wholesale and Retail Sector SETA's sector profile estimates that there are 163,000 elementary occupations (sales and service) workers in the sector, a figure that does not include checkout cashiers[36]. Consequently, this figure is used in the relevant scenario.

**Note 13: Quality of jobs gained or lost and number of dependant affected**

The four scenarios calculate estimated changes in employment and this can be linked to the approximate quality of jobs (with reference to the High and Low Productivity Segments of the VCB industry as a benchmark along with a third, lower, category approximating to informal employment), and the estimated number of dependants.

- It is assumed that jobs in the upstream industry, and paper bag manufacturing are similar in characteristics to those in the High Productivity Segment of the VCB industry. The number of dependants (including the wage earner) is calculated from the interviews with worker representatives in this segment at 7.4 people.
- It is assumed that jobs in plastic recycling companies and retail packing jobs are similar to the Low Productivity Segment of the VCB industry The number of dependants (including the wage earner) is calculated from the interviews with worker representatives in this segment at 5.3 people.
- It is assumed that jobs in plastic recycling collection are a form of informal employment. Data was not collected on this form of employment. It is assumed that workers in this occupation have incomes at or below poverty levels. For the purpose of estimating the socio-economic impact it is assumed that they have a smaller number of dependants to the Low Productivity Segment of the VCB industry. For the purposes of calculations this is assumed at three including the informal worker.

[36] Wholesale and Retail Sector Skills Plan. 2000.

The impact on labour, based on the above assumptions, and for the current scenario is summarised in the tables of the following pages.

| **Scenario A, 30 Microns: No change in the number of VCBs demanded** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 99,175 tonnes.<br>Increase in polymer conversion: 55,175 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream<br>(Note 1) | Increase in polymer conversion < 100,000 tonnes. Therefore no change in employment. |
| VCB manufacturing | **Increase in employment**<br><br>**Upper limit to job creation** (Notes 3 and 6)<br>New jobs in the High Productivity VCB companies:<br>72.2% of 55,175 tonnes at productivity of 41.5 tonnes per employee = 960 new jobs.<br>New jobs in the Low Productivity VCB companies:<br>27.8% of 55,175 tonnes at productivity of 12.7 tonnes per employee = 1,208 new jobs<br>Total new jobs = **2,168**<br><br>**Lower limit to job creation** (Notes 3 and 6)<br>100% of 55,175 tonnes at productivity of 46.7 tonnes per employee = 1,181 new jobs<br>Total new jobs = **1,181** |
| Paper bag manufacturing | Not applicable |
| Plastic recycling<br>(Note 10) | Estimated range of plastic recycling: 0 – 20,000 tonnes<br>**Higher limit to job creation:**<br>Jobs in recycling plants: 20,000 tonnes at 84 tonnes per employee = 238 new jobs<br>Jobs in collecting plastic: 20,000 tonnes at 7 tonnes per worker = 2,857<br>Total higher estimate of job creation = **3,095**<br>**Lower limit to job creation** = **0** (non of available extra polymer is recycled) |
| Retail<br>(Note 12) | No change |

### Total impact on employment of Scenario A, 30 microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | +1,181 | +960 |
| Low Productivity VCB industry | 0 | +1,208 |
| Paper bag manufacturing | 0 | 0 |
| Plastic Recycling (plants) | 0 | +238 |
| Plastic Recycling (collectors) | 0 | +2,857 |
| Retail | 0 | 0 |
| **Total** | **+1,181** | **+5,263** |

### Direct Socio-economic Impact of Scenario A, 30 microns

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | +1,181 | +960 | 8,739 | 7,104 |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | 0 | +1,446 | 0 | 7,664 |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | +2,857 | 0 | 8,571 |
| **Total** | **+1,181** | **+5,263** | **8,739** | **23,339** |

| Scenario A, 80 Microns: No change in number of VCBs demanded | |
|---|---|
| **Change in polymer conversion** | New tonnage of polymer converted: 276,025 tonnes (Note 2).<br><br>Increase in polymer conversion: 232,025 tonnes |
| **Employment area** | **Bases for calculation of change in employment** |
| **Upstream** | Increase in polymer conversion > 100,000 tonnes.<br><br>Therefore, increased capacity with between **20** and **100** jobs created (Note 1). |
| **VCB manufacturing** | **Increase in employment**<br><br>**Upper limit to job creation** (Notes 2 and 6)<br><br>Jobs in the High Productivity VCB companies producing at 46.7 tonnes per employee:<br><br>276,025 tones at 46.7 tonnes per employee = 5,799<br><br>Minus existing jobs in the High Productivity Segment (766) = 5,033<br><br>Minus existing jobs in the Low Productivity Segment (1,700) = 3,333<br><br>Total new jobs = **3,333**<br><br>**Lower limit to job creation** (Notes 2 and 6)<br><br>Jobs in the High Productivity VCB companies producing at 46.7 tonnes per employee:<br><br>276,025 tones at 46.7 tonnes per employee = 5,799<br><br>Minus existing jobs in the High Productivity Segment (766) = 5,033<br><br>Minus existing jobs in the Low Productivity Segment (2,000) = 3,033<br><br>Total new jobs = **3,033** |
| **Paper bag manufacturing** | Not applicable |
| **Plastic recycling**<br><br>**(Note 10)** | Estimated range of plastic recycling: 0 – 50,000 tonnes<br><br>**Higher limit to job creation:**<br><br>Jobs in recycling plants: 50,000 tonnes at 84 tonnes per employee = 595 new jobs<br><br>Jobs in collecting plastic: 50,000 tonnes at 7 tonnes per worker = 7,143<br><br>Total higher estimate of job creation = **7,738**<br><br>**Lower limit to job creation** = **0** (non of available extra polymer is recycled) |
| **Retail** | At 80 microns returns from retail questionnaire indicated an estimated 5,223 packers would loose their jobs in the small and medium retail section (Note 12). However, this contradicts the assumptions on this scenario in which VCB demand is not reduced. To maintain the integrity of the scenario it is, therefore, assumed that there is not impact on retail jobs. |

### Total impact on employment of Scenario A, 80 microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | +20 | +100 |
| High Productivity VCB industry | +5,033 | +5,033 |
| Low Productivity VCB industry | -2,000 | -1,700 |
| Paper bag manufacturing | 0 | 0 |
| Plastic Recycling (plants) | 0 | +595 |
| Plastic Recycling (collectors) | 0 | +7,143 |
| Retail | Assume 0 | Assume 0 |
| **Total** | **+3,053** | **+11,171** |

### Direct Socio-economic Impact of Scenario A, 80 microns

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | +5,053 | +5,133 | 37,392 | 37,984 |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -2,000 | -1,105 | (10,600) | (5,857) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | +7,143 | 0 | 21,429 |
| **Total** | **+3,053** | **+11,171** | **26,792** | **53,556** |

## 8.6 Scenario B: Adjusted demand scenario

The previous scenario cannot be considered to be realistic as it assumes current demand levels. The following scenario is more realistic since it considers the expected change in demand due to the regulations, and also considers substitute products such as paper bags.

### 8.6.1 Assumptions and product data

The scenario is based on the following assumptions:

- Paper, as a substitute product becomes a factor. Under a 30 μ situation the share of paper bags in the VCB industry increases from 1% to 5% and under a 80 μ scenario it is estimated that 35% of market share will shift from plastic to paper, as previously explained

  The net effect is therefore a reduction of 35 and 50% on the demand for plastic VCB's, respectively, and an increase in 5 and 35% respectively for paper bags.

- The demand for bags change as follows:
  - Under a 30 μ situation there is a 20% reduction in total demand for units of bags due to a more efficient bag being introduced, and increased re-use taking place. The bag dimensions are changed, i.e. it is a larger bag with a 70% volume increase. The carry capacity in terms of weight increases, but it must be remembered that there are limitations to the weight that one person can comfortably accommodate. Issues related to how products are packed, for example "rat poison and bread in one bag", must also be considered.
  - There is also 10% decrease in the demand for bags due to improved packaging practices at retail outlets, for example double packaging is limited. This of for both the 30 and 80μ scenario.
  - Under an 80 μ situation the change in demand due to the bag being larger is limited to 5%. This is because the 80μ plastic bag is smaller than the optimized 30μ plastic bag, and the bag cost to functionality ratio have already been optimized. The paper bag is similar is size to the current VCB's in use, is not re-usable and there is therefore no reduction in demand due to the paper bag.

- Retailer spending is not limited.

The product data is as follows:

| | Current VCB | Adjusted 30 µ bag | 80 µ bag | Paper bag |
|---|---|---|---|---|
| **Bag dimensions** | Current | 600 X 480 | 520 x 420 | 420 x(305 + 165) |
| **Product mix** | Current | One type | One type | 80g paper |
| **Weighted average thickness** | 14.24 | 30 | 80 | - |
| **Mass of bag (avg weighted)** | 5.87g | 16.6g | 34.4 | 32.6 |
| **HDPE proportion** | 85% | 75% | 0 | - |
| **LLDPE proportion** | 10% | 20% | 20 | - |
| **LDPE proportion** | 0% | 0% | 75 | - |
| **Masterbatch proportion** | 5% | 5% | 5 | - |
| **Cost/1000 bags** | 71.56 | 225.46 | 467.30 | 340 |

### 8.6.2 Change in the supply-and-demand balance

#### 30µ situation

***Plastic bags – 35% reduction in demand, of which 5% is due to paper increasing market share***

| Retailer category | Bags demand (billion) | Average weight per bag (g) | Cost to retailer R million | Conversion, exports and imports (units and tonnage) | Polymer usage tonnes | |
|---|---|---|---|---|---|---|
| Large retailer groups | 1.658 | 16.6 | 373.96 | Domestic<br>86 579 t (5 214 m bags)<br>Exports<br>0<br>Imports<br>0 | HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch | 64 936<br>17 315<br>0<br>4328 |
| Smaller retailers Printed bags | 1.504 | 16.6 | 339.116 | | | |
| Smaller retailers Unprinted | 2.052 | 16.6 | 462.838 | | | |
| Total | 5.214 | | 1175.914 | | | 86 579 |

***Paper bags – capture 5% market share***

| Retailer category | Bags demand (billion) | Average weight per bag (g) | Cost to retailer R million | Conversion, exports and imports (units and tonnage) |
|---|---|---|---|---|
| Large retailer groups | 0.127 | 32.6 | 43.3 | Domestic<br>13 079t (401 m bags) |
| Smaller retailers printed | 0.115 | 32.6 | 39.3 | |
| Smaller retailers Unprinted | 0.157 | 32.6 | 53.6 | |
| Total | 0.401 | | 136.4 | |

Key changes to the supply and demand balance is as follows:

- Total demand for bags reduce to 5.6 billion from just over 8 billion.
- The total cost to the retailer increases from R 571 million to R 1.2 billion.

### 80µ situation

***Plastic bags – 15% reduction in demand due to efficiency gains, and paper captures 35% market share***

| Retailer category | Bags demand (billion) | Average weight per bag (g) | Cost to retailer (R million) | Conversion, exports and imports (units and tonnage) | Polymer usage tonnes | |
|---|---|---|---|---|---|---|
| Large retailer groups | 1.276 | 34.4 | 614.521 | Domestic<br>138 012 t (4 012 m bags)<br>Exports<br>0<br>Imports<br>0 | HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch | 0<br>27 602<br>103 509<br>6 900 |
| Smaller retailers Printed bags | 1.157 | 34.4 | 517.211 | | | |
| Smaller retailers Unprinted | 1.579 | 34.4 | 760.446 | | | |
| Total | 4.012 | | 1.932 | | | 138 012 |

### Paper bags – capture 35% of the market

| Retailer category | Bags demand (billion) | Average weight per bag (g) | Retailer spend (R million) | Conversion, exports and imports (units and tonnage) |
|---|---|---|---|---|
| Large retailer groups | 0.893 | 32.6 | 303 | Domestic<br>91 554 t (2 807 m bags) |
| Smaller retailers printed | 0.809 | 32.6 | 275 | |
| Smaller retailers Unprinted | 1.105 | 32.6 | 375 | |
| Total | 2.807 | | 954 | |

Key changes to the supply and demand balance is as follows:

- Total demand for bags reduce to 6.8 billion from just over 8 billion.
- The demand for plastic bags reduce to 4 billion, and paper bags increase to 2.8 billion
- The total cost to the retailer increases from R 571 million to R 2.8 billion.

### 8.6.3 Impact on the upstream sector

The table below depicts the changes in demand for the two products for scenario B.

| | **Current Situation**<br>**Actual demand** | **30 micron scenario**<br>**Changes in demand** | **80 micron scenario**<br>**Changes in demand** |
|---|---|---|---|
| **HDPE Demand** | 37,000 | +27,936 | -37,000 |
| **LLDPE Demand** | 4,760 | +12,555 | +22,842 |
| **LDPE Demand** | 0 | 0 | +103,509 |
| **Masterbatch** | 1,740 | +2,588 | +5,160 |

In summary the implications for each situation are:

**30-micron scenario:**

- Demand for all polymers increases with the increase in demand for HDPE being particularly significant

**80-micron scenario:**

- Demand for HDPE changes significantly with HDPE no longer being used for bag manufacture
- Demand for LLDPE and LDPE increases significantly with the increase for LDPE being very larg

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### 8.6.4 Analysis of the impact on the upstream sector

**Impact on HDPE**

HDPE demand increases by 27,936 tons per annum in the 30 micron scenario. As before the first 10,000 tons will be able to be supplied from the current HDPE capacity surplus of 10,000 tons. This will have a positive impact on the profitability of DOW Chemicals since the production will be sold into the domestic market as opposed to exported.

- The remaining 17,936 tons will have to be imported will all the associated negative impacts of importing polymer as mentioned before in scenario A.

In the 80 micron scenario we would see all the 37,000 tons currently being sold to the VCB market having to be sold into the international market at significantly lower margins than is current. The impacts again are as per scenario A.

**Impact on LLDPE**

For both the 30 micron and the 80 micron scenario, there is an increase in demand for LLDPE ranging from +12,555 to +22,842 tons per annum. There is currently a shortage of locally produced LLDPE in South Africa and all of the increased demand will have to be imported.

**Impact on LDPE**

There is only an increase in LDPE demand in the 80 micron scenario. The increase in demand is 103,509 tons per annum. There is currently a shortage of locally produced LDPE in South Africa and all of the increased demand will have to be imported.

### 8.6.5 Impact on Upstream Investments

In the case of LLDPE, the scenario indicates an increase in demand from +12,555 to +22,842 tons per annum. The upper figure would clearly have an influence on any investment decision. In the case of LDPE demand in the 80 micron scenario there is increased demand of 103,509 tons per annum. A world scale plant would be required to supply this demand domestically with the same ramifications as described in scenario A.

### 8.6.6 Impact on the VCB conversion (plastic) industry

**Production, capacity , and technology implications**

The implications for production at 30µ for this scenario are similar to the previous scenario, namely that the production process remains essentially the same, the raw material mix will change as specified, and that that conversion of existing technologies is possible, but there will be a cost implication.

The implications for production at 80µ for this scenario where paper captures 35% of the market share are again that a vest type carrier bag cannot be manufactured at 80µ and that the type of bag will change. The raw material mix will change as identified, and conversion of current equipment is technically impossible.

| Available capacity | Current VCB | 30 µ | 80 µ |
|---|---|---|---|
| Total currently available | 48 000 t | | |
| Required capacity | | 65 000[37] t | 138 013 t |
| **Capacity shortfall/ (excess)** | | **17 000 t** | **90 013 t** |

The shortfall in capacity for both the 30 and 80µ situation will require capital investment.

**Required capital investment**

The capital investment required for the 30µ situation is calculated in a similar fashion to the calculations in the previous scenario's. The results are as follows:

The following can therefore be concluded:

- The capital investment required by the VCB industry to adapt to an 30 µ situation and meet the existing demand would be R 84 million (R 35 million to compensate in reduction in throughput speed, R 34 million to increase capacity because of increased demand and R 15 million for modifications)
- The capital investment required by the VCB industry to adapt to an 80 µ situation and meet the existing demand, would be approximately R 241 million. (R 61 million to compensate in reduction in throughput speed, and R 180 million to replace and increase capacity because of increased demand.

The issues around the ability of companies to recapitalise is the same as previously mentioned, namely that recapitalisation in the plastic conversion industry will probably not take place if a 80µ thickness is specified.

[37] The required capacity is not the same as the polymer tonnages. The additional tonnages are because the product is thicker, but over 30µ the throughput rate does not change. It is assumed that equipment modifications are done once

### 8.6.7 Impact on the paper bag manufacturing industry

**Production, capacity, and technology implications**

Although incomplete data was received from the paper manufacturing industry, the following is estimated:

- The technology to manufacture paper shopping bags is available in South Africa
- The availability of raw material (paper) in not a production constraint.

The bag manufacturing industry at present have limited capacity available for the production of “shopper bags”, and spare capacity equates to approximately 200 million bags (7000 tonnes) per annum.

The demand for paper bags under a 30μ situation would exceed current capacity by approximately 7000 tonnes. This is not substantial, and will require an investment of R 10 million.

The increase from current demand for paper bags would be substantial under the 80μ situation (92 500 tonnes, and 2.8 billion bags). Considering the limited capacity available, it would require significant capital investments in excess of R 120 million from the paper manufacturing industry.

It was pointed out to the study team that the upstream paper manufacturing industry could supply the raw material, but it would probably be material that is currently being exported.

### 8.6.8 Impact on the retail industry and the consumer

The total cost of bags under the proposed regulations, assuming current demand, is summarised below.

| **Retailer category** | **Current spending** | **Future required spending - 30 μ** | | **Future required spending - 80 μ** | |
|---|---|---|---|---|---|
| | **(R million)** | **(R million)** | **% change to current** | **(R million)** | **% change to current** |
| Large retailer groups | 202 | 417.35 | 205 | 954 | 451 |
| Smaller retailers Printed bags | 181.09 | 378.454 | 205 | 832 | 451 |
| Smaller retailers Unprinted | 188.45 | 516.524 | 277 | 1 136 | 609 |
| Total | 571.54 | 1 312.329 | | 2 887 | |

The above analysis indicates that under the 30μ the efficiency improvements of a larger bag and improved packaging practices are largely offset by the increase in the cost of the bag due to its increase in dimensions. The implications are that much higher efficiency gains will have to be achieved if the cost to the retailer, who will inevitably pass it on to the consumer, is to be minimised.

Whether efficiency increases additional to those assumed in this scenario can be achieved is debatable.

The impact of cheaper paper bags as a substitute product to a 80μ plastic bag still produces increased costs to the retailer in the region of 400% and more. The conclusion is therefore regardless of efficiency gains, or the utilisation of paper bags as an alternative, there are substantial cost implications to the retailer, who will pas it on to the consumer. (R 500 million for a 30μ situation and in excess of R 2 billion for a 80μ situation.

### 8.6.9 Impact on the waste management industry, including recycling

For a 30μ specification the impact on the waste management industry, and specifically the recycling industry, is similar to that identified in the first scenario, namely that unless additional markets are created, a maximum of 15% of VCB's produced can be realistically expected to be recycled.

Under the 80μ situation, where paper bags capture a significant portion of the market, the waste management of paper should be considered. Although not researched in depth, paper recyclers indicated that less than 10% of domestic paper waste is currently recycled, and that it will be even lower for paper grocery bags. The percentage of post consumption paper bags that will end up in landfill could not be determined, and the cost of paper disposal in landfills is unknown.

### 8.6.10 Impact on labour and the society

The assumptions and associate social economic impact are to those stated under the previous scenario.

| **Scenario B, 30 Microns: Adjusted Upper Boundary (35% reduction in demand, paper takes 5% of the market)** | |
|---|---|
| **Change in polymer conversion** | New tonnage of polymer converted: 86,579 tonnes.<br>However, increase in size of bags in this scenario means that the effective tonnage in polymer use for calculations using labour productivity is 64,465 tonnes.<br>Increase in polymer conversion: 20,465 tonnes |
| **Employment area** | **Bases for calculation of change in employment** |
| **Upstream**<br>**(Note 1).** | Increase in polymer conversion < 100,000 tonnes. Therefore no change in employment. |
| **VCB manufacturing** | **Increase in employment**<br><br>**Upper limit to job creation** (Notes 3 and 6)<br>New jobs in the High Productivity VCB companies:<br>72.2% of 20,465 tonnes at productivity of 41.5 tonnes per employee = 356 new jobs.<br>New jobs in the Low Productivity VCB companies:<br>27.8% of 20,465 tonnes at productivity of 12.7 tonnes per employee = 448 new jobs<br>Total new jobs = **804**<br><br>**Lower limit to job creation** (Notes 3 and 6)<br>100% of 20,465 tonnes at productivity of 46.7 tonnes per employee = 438 new jobs<br>Total new jobs = **438** |
| **Paper bag manufacturing** | Estimated paper bag market is R13,640,800.<br><br>Estimated number of jobs created (Note 9) = **28** |
| **Plastic recycling**<br>**(Note 10)** | Estimated range of plastic recycling: 0 – 30,000 tonnes<br><br>**Higher limit to job creation:**<br>Jobs in recycling plants: 30,000 tonnes at 84 tonnes per employee = 357 new jobs<br>Jobs in collecting plastic: 30,000 tonnes at 7 tonnes per worker = 4,286<br>Total higher estimate of job creation = **4,643**<br><br>**Lower limit to job creation** = **0** (non of available extra polymer is recycled) |
| **Retail** | No change (Note 12) |

### Total impact on employment of Scenario B, 30 microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | +438 | +356 |
| Low Productivity VCB industry | 0 | +448 |
| Paper bag manufacturing | +28 | +28 |
| Plastic Recycling (plants) | 0 | +357 |
| Plastic Recycling (collectors) | 0 | +4,286 |
| Retail | 0 | 0 |
| **Total** | **+466** | **+5,475** |

### Direct Socio-economic Impact of Scenario B, 30 microns

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | +466 | +384 | 3,448 | 2,842 |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | 0 | +805 | 0 | 4,267 |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | +4,286 | 0 | 12,858 |
| **Total** | **+466** | **+5,475** | **3,448** | **19,967** |

| **Scenario B, 80 Microns: Adjusted Upper Boundary (50% reduction in demand, paper takes 35% of the market)** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 138,013. (Note 2)<br>Increase in polymer conversion: 94,013 tonnes |
| **Employment area** | **Bases for calculation of change in employment** |
| Upstream<br>(Note 1) | Increase in polymer conversion < 100,000 tonnes. Therefore no change in employment. |
| VCB manufacturing | **Upper limit to job creation** (Notes 2 and 6)<br>Jobs in the High Productivity VCB companies producing at 46.7 tonnes per employee:<br>138,013 tones at 46.7 tonnes per employee = 2,955<br>Minus existing jobs in the High Productivity Segment (766) = 2,189<br>Minus existing jobs in the Low Productivity Segment (1,700) = 489<br>Total new jobs = **489**<br>**Lower limit to job creation** (Notes 2 and 6)<br>Jobs in the High Productivity VCB companies producing at 46.7 tonnes per employee:<br>138,013 tones at 46.7 tonnes per employee = 2,955<br>Minus existing jobs in the High Productivity Segment (766) = 2,189<br>Minus existing jobs in the Low Productivity Segment (2,000) = 189<br>Total new jobs = **189** |
| Paper bag manufacturing | Estimated paper bag market is R95,485,600<br>Estimated number of jobs created (Note 9) = **199** |
| Plastic recycling<br>(Note 10) | Estimated range of plastic recycling: 0 – 50,000 tonnes<br>Higher limit to job creation:<br>Jobs in recycling plants: 50,000 tonnes at 84 tonnes per employee = 595 new jobs<br>Jobs in collecting plastic: 50,000 tonnes at 7 tonnes per worker = 7,143 new jobs<br>Total higher estimate of job creation = **7,738**<br>Lower limit to job creation = 0 (non of available extra polymer is recycled) |
| Retail | At 80 microns returns from retail questionnaire indicated an estimated 5,223 packers would loose their jobs in the small and medium retail section (Note 12). However, this contradicts the assumptions on this scenario in which reduced VCB usage is a result of more efficient packaging and use of paper bags – which, it is presumed, would not effect the number of packers. To maintain the integrity of the scenario it is, therefore, assumed that there is not impact on retail jobs. |

## Total impact on employment of Scenario B, 80 microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | +2,189 | +2,189 |
| Low Productivity VCB industry | -2,000 | -1,700 |
| Paper bag manufacturing | +199 | +199 |
| Plastic Recycling (plants) | 0 | +595 |
| Plastic Recycling (collectors) | 0 | +7,143 |
| Retail | Assume 0 | Assume 0 |
| **Total** | **+388** | **+8,426** |

## Direct Socio-economic Impact of Scenario B, 80 microns

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | +2,388 | +2,388 | 17,671 | 17,671 |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -2,000 | -1,105 | (10,600) | (5,857) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | +7,143 | 0 | 21,429 |
| **Total** | **+388** | **+8,426** | **7,071** | **33,243** |

## 8.7 Scenario C: Limited retailer spend

The previous scenario's both assumed that retailer spend (and therefore the cost to the consumer) is unlimited. The following scenario reflects the situation if current retailer spending is unchanged.

### 8.7.1 Assumptions and product data

The scenario is based on the following assumptions:

- The demand is determined by the current retailer spend
- Paper, as a substitute product becomes a factor. Under a 30 μ situation the share of paper bags in the VCB industry increases from 1% to 5[38]%. This increase is not due to paper becoming a cost-effective alternative. It is because switching costs (the difference between the cost of paper and plastic bags) are reduced. More companies who want to switch for reasons other that cost, e.g. environmental reasons, will make the switch.

  Under a 80 μ scenario it is estimated that 35% of market share will shift from plastic to paper. Thus is based on the rationale that although paper becomes a cheaper alternative, it's application has limitations, and the cost difference is not that substantial that it will result overnight in a massive shift towards paper bags. The paper manufacturing is of the opinion that the market-share could eventually stabilize at 50%, but this is a long-term scenario.
- The plastic bag dimensions do not change. Due lower volumes of bags, there is no incentive to optimize bag dimensions
- There are no efficiency gains at the retailer (or consumer) side, i.e. the retailer (or consumer) makes no attempt to use less bags. (There would be no incentive since costs remain the same)

The product data is as follows:

| | Current VCB | 30 μ bag | 80 μ bag | Paper bag |
|---|---|---|---|---|
| **Bag dimensions** | Current | No change | 520 x 420 | 420 x(305 + 165) |
| **Product mix** | Current | No change | One type | 80 |
| **Weighted average thickness** | 14.24 | 30 | 80 | - |
| **Mass of bag (avg weighted)** | 5.87g | 12.36g | 34.4 | 32.6 |
| **Retail spending** | Total retail spending is curtailed at current limit of R 5.745 million, plus or minus the switching costs | | | |
| **HDPE proportion** | 85% | 75% | 0 | - |
| **LLDPE proportion** | 10% | 20% | 20 | - |
| **LDPE proportion** | 0% | 0% | 75 | - |
| **Masterbatch proportion** | 5% | 5% | 5 | - |
| **Cost/1000 bags** | 71.56 | 167.87 | 467.30 | 340 |

[38] This is an estimate generally agreed on by the paper industry

### 8.7.2 Change in the supply-and-demand balance

#### 30µ situation

***Plastic bags – retain 95% market share, limited retail spending***

| Retailer category | Available spending on bags<br>R million | Average weight per bag (g) | Bags consumed<br>(billion) | Conversion, exports and imports (units and tonnage) | Polymer usage tonnes | |
|---|---|---|---|---|---|---|
| Large retailer groups | 191.52 | 12.36 | 1.141 | Domestic<br>39952 t (3 232 m bags)<br>Exports<br>0<br>Imports<br>0 | HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch | 29964<br>7990<br>0<br>1998 |
| Smaller retailers<br>Printed bags | 179.02 | 12,36 | 1.066 | | | |
| Smaller retailers Unprinted | 172.08 | 12.36 | 1.025 | | | |
| Total | 542.62 | | 3.232 | | | 39952 |

***Paper bags – capture 5% market share***

| Retailer category | Available spending on bags<br>R million | Average weight per bag (g) | Bags consumed<br>(billion) | Conversion, exports and imports (units and tonnage) |
|---|---|---|---|---|
| Large retailer groups | 10.080 | 32.6 | 0.060 | Domestic<br>5 546 t (170 m bags) |
| Smaller retailers printed | 9.442 | 32.6 | 0.0561 | |
| Smaller retailers Unprinted | 9.057 | 32.6 | 0.0539 | |
| Total | 28.579 | | 0.17 | |

**The key changes to the supply and demand balance are as follows:**

- The total number of bags available for consumption, as determined by current retailer spend reduces from just over 8 billion to 3.3 billion
- Although the number of bags reduces significantly the capacity requirements for the VCB conversion industry, as well as for polymer, reduces only slightly.

## 80µ situation

### *Plastic bags – retain 65% market share – limited retail spending*

| Retailer category | Available spending on bags R million | Average weight per bag (g) | Bags consumed (billion) | Conversion, exports and imports (units and tonnage) | Polymer usage tonnes | |
|---|---|---|---|---|---|---|
| Large retailer groups | 131.040 | 34.4 | 0.272 | Domestic<br>26 529 t (770 m bags)<br>Exports<br>0<br>Imports<br>0 | HD-PE<br>LLD-PE<br>LD-PE<br>Masterbatch | 0<br>5304<br>19890<br>1326 |
| Smaller retailers Printed bags | 122.489 | 34.4 | 0.254 | | | |
| Smaller retailers Unprinted | 117.748 | 34.4 | 0.244 | | | |
| Total | 371.277 | | 0.77 | | | 26520 |

### Paper bags – capture 35% of the market

| Retailer category | Available spending on bags R million | Average weight per bag (g) | Bags consumed (billion) | Conversion, exports and imports (units and tonnage) |
|---|---|---|---|---|
| Large retailer groups | 70.56 | 32.6 | 0.146 | Domestic<br>13 533 t (413 m bags) |
| Smaller retailers printed | 69.95 | 32.6 | 0.136 | |
| Smaller retailers Unprinted | 63.40 | 32.6 | 0.131 | |
| Total | 203.91 | | 0.413 | |

Key changes to the supply and demand balance for an 80µ situation are as follows:

- The total number of bags available for consumption reduces from just over 8 billion to just over 1 billion
- The required VCB manufacturing capacity reduces from 44 000 to 26 520 tonnes per annum.

### 8.7.3 Impact on the upstream sector

The table below depicts the changes in demand for the two products for scenario C.

| | **Current Situation**<br><br>**Actual demand** | **30 micron scenario**<br><br>**Changes in demand** | **80 micron scenario**<br><br>**Changes in demand** |
|---|---|---|---|
| **HDPE Demand** | 37,000 | -7,036 | -37,000 |
| **LLDPE Demand** | 4,760 | +3,230 | +544 |
| **LDPE Demand** | 0 | 0 | +19,890 |
| **Masterbatch** | 1,740 | 258 | -414 |

In summary the implications for each situation are:

**30-micron scenario:**

- Demand for HDPE declines by approximately 20%
- Marginal increase in demand for LLDPE and Masterbatch

**80-micron scenario:**

- Demand for HDPE changes significantly with HDPE no longer being used for bag manufacture
- Marginal increase in demand for LLDPE
- Significant increase in demand for LDPE but not nearly as large as for previous scenarios

.

### 8.7.4 Analysis of the impact on the upstream sector

**Impact on HDPE**

Demand for HDPE declines in all scenarios. In the 30 micron scenario, demand declines by 7,036 tons per annum and in the 80 micron scenario by 37,000 tons per annum. All of this product will have to be sold into the international market with the profit impact to DOW Plastics being a decline of R13m to a decline of R70m per annum.

**Impact on LLDPE**

For both the 30 micron and the 80 micron scenario, there is an increase in demand for LLDPE ranging from +544 to +3,230 tons per annum. There is currently a shortage of locally produced LLDPE in South Africa and all of the increased demand will have to be imported.

**Impact on LDPE**

There is only an increase in LDPE demand in the 80 micron scenario. The increase in demand is 19,890 tons per annum which is not insignificant. There is currently a shortage of locally produced LDPE in South Africa and all of the increased demand will have to be imported.

#### 8.7.5 Impact on Upstream Investments

In the case of LLDPE, the scenario indicates a small increase in demand which is unlikely to influence any investment decision. In the case of LDPE demand in the 80 micron scenario there is increased demand of 19,890 tons per annum which could have a small influence on a currently planned upstream investment.

### 8.7.6 Impact on the VCB conversion (plastic) industry

**Production, capacity, and technology implications**

The implications for production at 30μ for this scenario are in some respects similar to the previous scenario, namely that the production process remains essentially the same, the raw material mix will change as specified, and that that conversion of existing technologies is possible, but there will be a cost implication.

It is however different in that the required capacity will go down (40 000 tonnes). This does not mean that there will be no need for additional capacity. There will be a need for additional capacity because of a reduction in throughput speed, as previously explained.

The implications for production at 80μ for this scenario where paper captures 35% of the market share are first of all that a vest type carrier bag cannot be manufactured at 80μ and that the type of bag will change. The raw material mix will change as identified, and conversion of current equipment is technically impossible. The demand for bags comes down significantly to 26 500 tonnes per annum, and capital expenditure will relate to partial replacement of the industry with equipment to manufacture as required.

Should converters wish to continue production with existing equipment, it will have to be for markets other than VCB's (which means the bag making equipment will become redundant), or for VCB export markets. It is highly unlikely that any manufacturers except for the two largest manufacturers will be able to pursue export markets. The barriers to entry into the export markets relate to minimum volumes, extensive warehousing facilities, and sufficient cash flows. The small and medium sized manufacturers will not meet these requirements.

**Required capital investment**

The capital investment required for the 30 μ situation will therefore relate to:

- The upgrade of existing capacity to produce at 30μ– R 15 million
- The investment in additional capacity to compensate for a 40% loss in throughput speed, but also considering that there is 48 000 tonnes available in the industry. – R 19 million

The capital investment requirements under the 80μ situation will relate to:

- Investment in new equipment to produce 26 500 tonnes per annum – R 54 million

The issue as to whether companies will make the required capital investments required remains the same. It can be expected that the majority of manufacturers will make the investment under the 30 μ situation, but it can be expected that most, especially the smaller manufacturers will not make the investments under the 80 μ situation. Small and medium sized companies indicated that they rather try and find alternative markets (in most cases markets for HD film), and if not successful exit the industry altogether.

### 8.7.7 Impact on the paper bag manufacturing industry

**Production, capacity, and technology implications**

Although incomplete data was received from the paper manufacturing industry, the following is estimated:

- The technology to manufacture paper shopping bags is available in South Africa
- The availability of raw material (paper) in not a production constraint.
- The bag manufacturing industry at present have limited capacity available for the production of "shopper bags", and spare capacity equates to approximately 200 million bags (7000 tonnes) per annum.

**Capital investment requirements**

- For the 30µ specification under the curtailed retailer spend scenario, where paper capture 5% of the market, there is available capacity, and no capital investment would be required
- For the 80µ specification under the curtailed retailer spend scenario, where paper capture 35% of the market, there will be a capacity shortage of approximately 7000 tonnes (200million bags). The capital investment required to fulfil the demand would be approximately R 10 million.

### 8.7.8 Impact on the retail industry and the consumer

The key impact under this scenario would be that there are limited number of bags available to the retailer (curtailed spend implies limitation on the number of bags).

| Retailer spending (R million) | | Current consumption (bag units, billions) | Maximum bag consumption 30 µ - billions | | | Maximum bag consumption - 80 µ | | |
|---|---|---|---|---|---|---|---|---|
| | | | Plastic bags | Paper bags | % reduction | Plastic bags | Paper bags | % reduction |
| Large retail | 203.44 | 2.552 | 1.14 | 0.06 | 53 | 0.27 | 0.14 | 84 |
| Small printed | 184.86 | 2.314 | 1.06 | 0.056 | 51 | 0.25 | 0.13 | 83 |
| Small unprinted | 188.45 | 3.158 | 1.02 | 0.053 | 64 | 0.24 | 0.13 | 88 |
| Total | 571.54 | 8.024 | 3.23 | 0.17 | 58 | 0.77 | 0.41 | 85 |

The key question is, will retailers be able to meet the demand of their customers with fewer bags available to provide free of charge? It is a critical question, which cannot be answered comprehensively as part of this study, but the following should be considered.

If retailers cannot meet their customer demand, they will probably have to change to the completely opposite side, and make no free packaging available. It is questionable whether retailers can realistically have a situation where free bags are limited. From their perspective it must be either free checkout bags, or customer must pay.

Under the 30μ regulation it will require substantial increases (58%) in packing efficiencies for retailers to still provide bags free of charge (The next scenario will investigate the impact of realistic efficiency gains)

Under the 80 μ regulation it will become impossible for retailers to provide customers with bags, free of charge. The implication is that retailers will either have to make consumers pay for bags (a scenario which the large retailer groups view as unacceptable since it reduces customer service as well as customers' disposable income), or consumers will have to bring their own bags. Regardless of the direction the retailers follow, two points are of cardinal importance

- It will have a negative effect on consumer spending power
- The current VCB industry will cease to exist unless exports (not viable for small and medium converters) can be pursued, or manufacturing re-directed into alternative products. The latter is also unlikely unless there is presently un-served demand. This then translates to the worst case scenario, which is dealt with elsewhere in the report

#### 8.7.9 Impact on the waste management industry, including recycling

There is no impact on the market since the total tonnages of waste is very similar to what is currently experienced, for the introduction of paper to the waste stream. The implications thereof have been discussed under the previous scenario.

#### 8.7.10 Impact on labour and the society

The assumptions and associate social economic impact are to those stated under the previous scenario.

| **Scenario C, 30 Microns: Limited Retailer Spending (Retailer spend remains the same, paper takes 5% of the market)** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 39,953 tonnes.<br>Decrease in polymer conversion: 4,048 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream<br>(Note 1) | Decrease in domestic polymer conversion. Therefore no change in employment. |
| VCB manufacturing | **Decrease in employment** (Note 7)<br>Jobs lost in the High Productivity VCB companies:<br>72.2% of 4,048 tonnes at productivity of 41.5 tonnes per employee = 70 job losses<br>Jobs lost in the Low Productivity VCB companies:<br>27.8% of 4,048 tonnes at productivity of 12.7 tonnes per employee = 89 jobs lost<br>Total jobs lost = **159** |
| Paper bag manufacturing | Estimated paper bag market is R13,640,800.<br>Estimated number of jobs created (Note 9) = 28 |
| Plastic recycling | Decrease in polymer used in VCBs. No change in employment. |
| Retail | No change (Note 12) |

### Total impact on employment of Scenario C, 30 Microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | -70 (54 not re-employed, Note 4) | -70 (54 not re-employed, Note 4) |
| Low Productivity VCB industry | -89 (75 not re-employed, Note 4) | -89 (75 not re-employed, Note 4) |
| Paper bag manufacturing | +28 | +28 |
| Plastic Recycling (plants) | 0 | 0 |
| Plastic Recycling (collectors) | 0 | 0 |
| Retail | 0 | 0 |
| **Total** | **-101** | **-101** |

### Direct Socio-economic Impact of Scenario C, 30 Microns

| Change in Employment | Number of Workers (from previous table) | | Number of people effected by change in income (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | -26 | -26 | (192) | (192) |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -75 | -75 | (398) | (398) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | 0 | 0 | 0 |
| **Total** | **-101** | **-101** | **(590)** | **(590)** |

| **Scenario C, 80 Microns: Curtailed Retailer Spending (Retailer spend remains the same, paper takes 35% of the market)** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 26,520<br>Decrease in polymer conversion: 17,480 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream<br>(Note 1) | Decrease in domestic polymer conversion. Therefore no change in employment. |
| VCB manufacturing | **Decrease in employment** (Notes2, 7 and 8)<br>**Upper limit to job losses**<br>12,220 tonnes of reduced conversion is taken up by the closure of the Low Productivity Segment of the industry.<br>Jobs lost = 1,150 (higher estimate of employment in Low Productivity Segment)<br>5,260 tonnes of reduced conversion is taken up by the High Productivity Segment of the industry.<br>5,260 tonnes at 41.5 tonnes per employee = 127 jobs lost<br>Total jobs lost = **1,277**<br><br>**Lower limit to job creation**<br>12,220 tonnes of reduced conversion is taken up by the closure of the Low Productivity Segment of the industry.<br>Jobs lost = 962 (lower estimate of employment in Low Productivity Segment)<br>5,260 tonnes of reduced conversion is taken up by the High Productivity Segment of the industry.<br>5,260 tonnes at 41.5 tonnes per employee = 127 jobs lost<br>Total jobs lost = **1,089** |
| Paper bag manufacturing | Estimated paper bag market is R95,485,600<br>Estimated number of jobs created (Note 9) = **199** |
| Plastic recycling | Decrease in polymer used in VCBs. No change in employment. |
| Retail | At 80 microns returns from retail questionnaire indicated an estimated **5,223** packers would loose their jobs in the small and medium retail section (Note 12). |

### Total impact on employment of Scenario C, 80 Microns

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | -127 (107 not re-employed, Note 4) | -127 (107 not re-employed, Note 4) |
| Low Productivity VCB industry | -962 (814 not re-employed, Note 4) | -1,150 (973 not re-employed, Note 4) |
| Paper bag manufacturing | +199 | +199 |
| Plastic Recycling (plants) | 0 | 0 |
| Plastic Recycling (collectors) | 0 | 0 |
| Retail | -5,228 | -5,228 |
| **Total** | **-5,950** | **-6,109** |

### Direct Socio-economic Impact of Scenario C, 80 Microns

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | +92 | +92 | 681 | 681 |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -6,042 | -6,201 | (32,023) | (32,865) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | 0 | 0 | 0 |
| **Total** | **-5,950** | **-6,109** | **(31,342)** | **(32,184)** |

## 8.8 Scenario D: Worst-case scenario

The worst-case scenario, which is where the total VCB manufacturing industry ceases to exist, could happen for two reasons.

- Converters are unable or unwilling to recapitalise their equipment to manufacture at the proposed minimum thickness, and exit the industry. The domestic supply would become zero and all packaging needs will have to be imported.
- The cost of bags increases to a point where retailers and consumers are unable to, or unwilling to buy bags. The demand for bags therefore ceases to exist.

The impact of the scenario will be as follows:

**Impact on the upstream sector**

- Revenue loss for the local manufacturers of polymer, who will have to divert to the less profitable export market for all polymer currently supplied to the domestic VCB industry
- Negative impact on international investor confidence due to the negative impact on the international polymer supplier

**Impact on the VCB conversion industry**

- The industry will be lost to South Africa
- In the case of manufacturers not re-capitalising, bags will be imported, which has a negative impact on South Africa’s broader economy
- Unrealised capital investment in excess of R 50 million
- Significant job losses – see separate section on the impact on employment
- Loss in export revenue of R 81 million per annum
- The current VCB industry has low barriers of entry to SMME’s, as demonstrated by the large number of SME’s. Opportunity for SME development, which is an integral part of South Africa’s growth strategy will be lost

**Impact on the retailers and consumer**

- If domestic VCB manufacturers exist the market, 30 or 80 μ bag will have to be imported, or substitute products used. The increased cost of bags (imported or substitute) will not be avoided and passed on to the consumer. It will be the low-income consumer who will be impacted most.
- If retailers stop supplying bags, there will be a cost to the consumer to supply their own bag. Although consumers will seek out the lowest cost alternative, it will always be higher than the current cost to the consumer, which is zero.

### 8.8.1 Impact on labour and the society

The assumptions and associated social economic impact are similar to those stated under the previous scenario.

| **Scenario D.1: Closure of Domestic Industry – VCB Bags are imported** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 0<br><br>Decrease in polymer conversion: 44,000 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream(Note 1) | Decrease in domestic polymer conversion. Therefore no change in employment. |
| VCB manufacturing | **Decrease in employment** (Notes 7 and 8)<br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (highest estimate of jobs in Segment)<br><br>Total jobs lost = **1,728**<br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (lowest estimate of jobs in Segment)<br><br>Total jobs lost = **1,916** |
| Paper bag manufacturing | VCBs imported. Assume no change in market. |
| Plastic recycling | VCBs imported. Assume no change in employment. |
| Retail | No change (Note 12) |

## Total impact on employment of Scenario D.1

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | -766 (587 not re-employed, Note 4) | -766 (587 not re-employed, Note 4) |
| Low Productivity VCB industry | -962 (814 not re-employed, Note 4) | -1,150 (973 not re-employed, Note 4) |
| Paper bag manufacturing | 0 | 0 |
| Plastic Recycling (plants) | 0 | 0 |
| Plastic Recycling (collectors) | 0 | 0 |
| Retail | 0 | 0 |
| **Total** | **-1,401** | **-1,560** |

## Direct Socio-economic Impact of Scenario D.1

| Change in Employment | Number of Workers (from previous table) | | Number of people effected by change in income (note 13) | |
|---|---|---|---|---|
| | Lower Estimate | Higher Estimate | Lower Estimate | Higher Estimate |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | -587 | -587 | (4,344) | (4,344) |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -814 | -973 | (4,314) | (5,157) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | 0 | 0 | 0 |
| **Total** | **-1,401** | **-1,560** | **(8,658)** | **(9,501)** |

| **Scenario D.2: Closure of Domestic Industry – VCB Bags Replaced by Paper Bags** | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 0<br><br>Decrease in polymer conversion: 44,000 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream<br><br>(Note 1) | Decrease in domestic polymer conversion. Therefore no change in employment. |
| VCB manufacturing | **Decrease in employment** (Notes 7 and 8)<br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (highest estimate of jobs in Segment)<br><br>Total jobs lost = **1,728**<br><br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (lowest estimate of jobs in Segment)<br><br>Total jobs lost = **1,916** |
| Paper bag manufacturing | Value of paper bag market R272,816,000<br><br>Estimated number of jobs created (Note 9) = **569** |
| Plastic recycling | VCB replaced by paper bags. Assume no change in employment. |
| Retail | No change (Note 12) |

### Total impact on employment of Scenario D.2

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | -766 (587 not re-employed, Note 4) | -766 (587 not re-employed, Note 4) |
| Low Productivity VCB industry | -962 (814 not re-employed, Note 4) | -1,150 (973 not re-employed, Note 4) |
| Paper bag manufacturing | +569 | +569 |
| Plastic Recycling (plants) | 0 | 0 |
| Plastic Recycling (collectors) | 0 | 0 |
| Retail | 0 | 0 |
| **Total** | **-832** | **-991** |

### Direct Socio-economic Impact of Scenario D.2

| **Change in Employment** | **Number of Workers** (from previous table) | | **Number of people effected by change in income** (note 13) | |
|---|---|---|---|---|
| | **Lower Estimate** | **Higher Estimate** | **Lower Estimate** | **Higher Estimate** |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | -18 | -18 | (133) | (133) |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -814 | -973 | (4,314) | (5,157) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | 0 | 0 | 0 |
| **Total** | **-832** | **-991** | **(4,447)** | **(5,290)** |

| Scenario D.3: Closure of Domestic Industry – Consumers shift to own bags (e.g. 'bags for life') | |
|---|---|
| Change in polymer conversion | New tonnage of polymer converted: 0<br><br>Decrease in polymer conversion: 44,000 tonnes |
| Employment area | **Bases for calculation of change in employment** |
| Upstream<br><br>(Note 1) | Decrease in domestic polymer conversion. Therefore no change in employment. |
| VCB manufacturing | **Decrease in employment** (Notes 7 and 8)<br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (highest estimate of jobs in Segment)<br><br>Total jobs lost = **1,728**<br><br>**Upper limit to job losses**<br><br>Closure of High Productivity Segment = 766 jobs lost<br><br>Closure of Low Productivity Segment = 1,150 jobs lost (lowest estimate of jobs in Segment)<br><br>Total jobs lost = **1,916** |
| Paper bag manufacturing | No increase in market for paper bags. Therefore, no change in employment |
| Plastic recycling | Assume no change in employment. |
| Retail | Assumed that all packers would be retrenched as their jobs become superfluous if customers bring their own bags. This would lead to a tentatively estimated loss of **70,000** jobs (Notes 5 and 12). |

### Total impact on employment of Scenario D.3

| Industry | Lower Limit to Employment Change | Higher Limit to Employment Change |
|---|---|---|
| Upstream | 0 | 0 |
| High Productivity VCB industry | -766 (587 not re-employed, Note 4) | -766 (587 not re-employed, Note 4) |
| Low Productivity VCB industry | -962 (814 not re-employed, Note 4) | -1,150 (973 not re-employed, Note 4) |
| Paper bag manufacturing | 0 | 0 |
| Plastic Recycling (plants) | 0 | 0 |
| Plastic Recycling (collectors) | 0 | 0 |
| Retail | -70,000 | -70,000 |
| **Total** | **-71,401** | **-71,560** |

### Direct Socio-economic Impact of Scenario D.3

| Change in Employment | Number of Workers (from previous table) | | Number of people effected by change in income (note 13) | |
|---|---|---|---|---|
| | Lower Estimate | Higher Estimate | Lower Estimate | Higher Estimate |
| High Productivity Segment of VCB industry. (Also upstream and paper bag manufacturing industries). (Note 13) | -587 | -587 | (4,344) | (4,344) |
| Low Productivity Segment of VCB industry. (Also recycling jobs in plants and retail packing jobs.) (Note 13) | -70,814 | -70,973 | (375,314) | (376,157) |
| Informal jobs in collecting plastic for recycling. (Note 13) | 0 | 0 | 0 | 0 |
| **Total** | **-71,401** | **-71,560** | **(379,658)** | **(380,501)** |

# 9 Conclusions

The Study Terms of Reference required a socio economic analysis of a number of factors. The following can be concluded to be primary findings, based on the impact assessment according to the scenarios created

- A first and most important finding is that the proposed "two step" introduction of the regulations, i.e. firstly a minimum thickness of 30μ and then after six months, a minimum thickness of 80μ, is not feasible at all. An 80μ bag is a very deferent bag to a 30μ bag. It requires totally different manufacturing technology (equipment) to that currently used, is primarily made from LD-PE compared to the current HD-PE bag, and will require extensive capital investments. No manufacturer will be prepared to make a capital investment to manufacture a 30μ bag, and then scrap the equipment 6 months later in order to invest in the manufacture of 80μ bags.

- A second important finding is that there is a real chance that, under an 80μ regulation, the local VCB manufacturing industry could shut down altogether, and be replaced by imported product. It was found that there are a number of forces that come into effect under an 80μ situation, which will result in manufacturers exiting the industry. The first factor is the extent of capital investment required, as extensively dealt with later on. The second is the current structure of the industry, namely it being a relatively mature commodity industry with low margins. The third factor relates to the prevalence of imports and the difficulties (especially for SME's) in accessing alternative, and specifically, export markets.

  The research found that the small and medium enterprises will not have access to the capital required, and be forced to either shut down or find alternative markets under the 80μ scenario. Export markets are not accessible to such SME's, and the potential to enter alternative domestic markets is limited due to the specific application of current equipment.

  Large companies who have access to finance indicated that their shareholders would be reluctant to approve large capital investments in a low margin industry. The large company that is currently exporting indicated that the margins on exports are so low that business can probably not be sustained solely on exports.

  The implications of the domestic VCB industry ceasing to exist are severe and include massive job losses, negative impact on international investor confidence especially in the upstream sector, unrealised capital investments, negative impact on South Africa's balance of payments, negative impact on socio-economic development in rural areas such as KwaZulu-Natal and the Eastern Cape, etc.

- A third key finding is that although an increase the thickness of bags will stimulate recycling, the increase in recycling will be limited (maximum 10-15%of production, based on recovery economics) unless other factors that constrain recycling are addressed. The most important factor is the need to create additional demand for recycled polymer. A frequently mentioned example of how additional demand can be created relates to the merits of specifying a minimum recycle content of refuse (and possibly other) bags. Further investigation of the merits of such interventions was beyond the scope of the study.

- The findings of this study relate only to the impact on the VCB manufacturing sector of the plastic industry. Other sectors, such as the manufacturing on non-VCB's will also be affected by the regulations. The impact on other sectors of the plastic industry could not be established since Government were not is a position to clarify the scope of the regulations in the detail required for successful extrapolation, when this research was conducted.

## 10 Annexure A – The Proposed Regulations

The proposed Plastic Bag Regulations were published in the Government Gazette of 19 May 2000 (No. 21203, GN 1994 of 2000) for public comment. The text of the regulations and the accompanying explanatory memorandum were published by Government as follows.

NOTICE 1994 OF 2000

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM

PROPOSED REGULATIONS UNDER SECTION 24 OF THE ENVIRONMENT CONSERVATION ACT (ACT NO. 73 OF 1989)

The Minister of Environmental Affairs and Tourism intends making regulations under Section 24(1) (a) and (k) of the Environment Conservation Act (Act No. 73 of 1989) as set out in the Schedule hereto. Interested Parties are requested to submit comments in connection with the proposed regulations within 3 months from the date of publication of this notice. Comments must be submitted to the Director-General, Department of Environmental Affairs and Tourism, Private Bag X447, Pretoria 0001.

All correspondence should be clearly marked for the attention of the Director: Integrated Pollution Prevention and Waste Management, Telephone (012) 310-3654; Fax (012) 322 1167; e-mail wscott@ozone.pwv.gov.za.

DR CRISPIAN OLVER

DIRECTOR-GENERAL: ENVIRONMENTAL AFFAIRS AND TOURISM

SCHEDULE

PLASTIC BAG REGULATIONS

1. Definition

In these regulations "the Act" means the Environment Conservation Act, (Act No. 73 of 1989) and any word or expression in which a meaning has been assigned in the Act shall bear the meaning so assigned to it in these regulations and, unless the context indicates otherwise: -

1.1 "carry bag" means a plastic bag or a plastic packet which is distributed to a consumer.

1.2 “distribute" means making carry bags directly or indirectly available and without charge to consumers for the packaging or carrying of goods purchased by consumers and "distribution" has a corresponding meaning.

1.3 "supply" means distribution of or trading in carry bags.

1.4 "trading" means the sale of carry bags as a commodity to any person (including but not limited to manufacturers, wholesalers or retailers of goods).

2. Prohibition on the supply of carry bags

2.1 With effect from 1 January 2001, no person may supply carry bags of a thickness of less than 30 microns.

2.2 With effect from 1 June 2001 no person may supply carry bags of a thickness of less than 80 microns.

3. Offences and penalties

Any person who contravenes any provision of these regulations is guilty of an offence and liable on a first conviction to a fine not exceeding R10 000 or imprisonment for a period not exceeding one year or to both such fine and such imprisonment, and in the case of a second or subsequent conviction to a fine not exceeding R100 000 or to imprisonment not exceeding ten years or to both such fine and such imprisonment.

EXPLANATORY MEMORANDUM

The collection and disposal of plastic bags is a growing problem in South Africa. The use and free availability of plastic bags has increased significantly in recent years and large amounts of bags have resulted in pollution and degradation of the environment. Thin non-reusable bags are indiscriminately dumped and not collected for recycling or disposal since they have little commercial value. The problem is severe in low-income areas where waste collection services are inadequate. The aim of the regulations is to restrict the production of non-reusable plastic shopping bags and to promote re-use and recycling.

## 11 Annexure B – The Study Terms of Reference

*FUND FOR RESEARCH INTO INDUSTRIAL DEVELOPMENT, GROWTH AND EQUITY*

*TERMS OF REFERENCE FOR A STUDY TO EXAMINE THE ECONOMIC IMPACT OF THE PROPOSED PLASTIC BAG REGULATIONS*

### 1. BACKGROUND

1.1 Increasingly, attention is being given to issues that have an impact on the environment and many initiatives are being driven with the view to assessing the impact of these conditions on the South African economy and society. Sustainable development implies that the promotion of economic and social development must occur in conjunction with the protection of the environment for present and future generations. This principle is embodied in inter alia, section 24 of the *Constitution of the Republic of South Africa* 108 of 1996 as well as the *National Environmental Management Act*.

1.2 The Department of Environmental Affairs and Tourism (DEAT) has identified littering in general as a great problem facing the South African environment and has focused on the effect of the indiscriminate dumping of thin plastic bags in particular, believing that this contributes greatly to the problem. As such, the DEAT has proposed new plastic bag regulations under section 24 of the *Environmental Conservation Act (73/1989)*, which were published in the Government Gazette of 19 May 2000 No. 21203, GN 1994 of 2000). The DEAT invited public comments on the proposed regulations as per the text of the published regulations. Consequently, the DEAT produced a report on the various comments received, which was officially tabled at the National Economic Development and Labour Council (NEDLAC) in November 2000. The report summary, it is stated that "The aims of the regulations are to restrict the production of very thin non-reusable plastic bags that are indiscriminately dumped into the environment and to promote recycling by specifying a minimum thickness for plastic shopping bags"[39].

1.3. As per the DEAT report, an overview of the industry was provided in a joint submission from the Plastics Federation of South Africa, the Chemical and Allied Industries Association, the South African Chamber of Business, the South African Retailers Association and the Steel and Engineering Industries Federation of South Africa. According to this overview, "approximately 350 000 tons of polyethylene per year is produced by two companies which are then converted to plastic products by the plastic converters. Polyethylene comes in different types including high density (PE-HD) and low density (PE-LD). From the total of approximately 600 plastic converters more than 200 produce thin film for the packaging industry. Approximately 230 000 tons of polyethylene are converted to thin film packaging each year. Of this 160 000 tons are used for some or other form of plastic bag. The vest type carrier bag component consists one quarter of this total i.e. 40 000 tons per year. There are 52 companies producing these bags, employing around 2 600 people in production capacities and approximately 1 200 in service capacities. The 40 000 tons of polyethylene converted into vest type bags are supplemented with another 4 000 tons of imported bags resulting in a total 8 billion bags with an average mass of 5.5 g/bag. With an average selling price of R10/kg the market demand by supermarkets, stores and other vendors is in excess of R440 million. The

[39] Department of Environmental Affairs and Tourism, Proposed Regulations under section 24 of the Environment Conservation Act (73/1989): Plastic Bag Regulations: Report on Comments Received, submitted to NEDLAC for discussion and formally tabled at NEDLAC in November 2000.

current consumption of vest type carrier bags is estimated at 160 bags/capita/annum or 880g/capita/annum". South Africa also exports a range of bags to the value of R 80 million.

1.4. Nedlac's business and labour constituencies had expressed concern that the phasing out of vest type carrier bags would have a significant impact on the South African social and economic situation. The envisaged impact is expected to include direct job losses, investment losses resulting from expensive machinery becoming obsolete and the increased costs of alternatives to consumers (of particular concern to those in the lower income groups).

1.5. From the public comments received in response to the DEAT's invitation mentioned above, the exploration of various possibilities have been suggested. These include: the production of more durable and reusable bags thereby growing the recycling industry (and creating jobs); the introduction of customer levies to promote recycling; the manufacture of degradable plastic bags; the introduction of educational programs and anti-littering campaigns; and the introduction of heavy anti-littering fines. The issue however, is that none of these have been quantified.

1.6. The regulations, along with a report on the public comments received, and a set of questions from DEAT, were tabled at the Nedlac Trade and Industry Chamber on 23 November 2000. All constituencies agreed that joint research should be urgently conducted in order to develop a shared understanding of the potential socio-economic impact of the regulations. This research would include an analysis of the likely impact on investment, employment and distortionary effects of isolating one aspect of the packaging industry for regulation. A task team was established under the auspices of the Trade and Industry Chamber to develop a terms of reference and guide the research process and make recommendations.

1.7. Therefore, in an attempt to cover possible contingencies, the proposed research would need to focus on the impact on five main areas, namely:

- employment (including both direct and indirect job losses, changing working conditions and the impact of these on workers and their families.
- the manufacture of plastic bags ;
- the potential for alternatives and their manufacture;
- consumers;
- distortions that may arise in the markets.

These are set out in more detail below under heading 3.

## 2. SCOPE OF STUDY

For the purposes of this research, data collection should be restricted to vest-type carrier bags, which are technically described as follows:

*These bags are manufactured from extruded tubular polyethylene film in varying thickness.*

*The tube is folded lengthwise on both sides (side gussets).*

*A bag is then formed by heat sealing at both ends with a profiled cut at one end resulting in the formation of two handles.*

*The resultant bag has the shape of a "vest" or "T-shirt".*

The reason for the focus on these thin, plastic bags with handles, such as those distributed in retail outlets, is the volume of production and usage relative to other forms of disposable consumer plastic. This was decided in order to define the scope of the study more accurately and facilitate sampling for the study. However, it was agreed that this would be done on the understanding that findings would therefore represent changes in vest-type bag production, and would need to be extrapolated to represent the impact on the plastic bag industry as a whole. Potential distortions resulting from the possible restriction of the final regulations to this narrower scope must be highlighted. For the purposes of the study, alternatives are restricted to paper bags and cloth bags. The potential for using biodegradable or photo-degradable plastic bags is also included in the scope of this study.

## 3. OBJECTIVES AND EXPECTED RESULTS

The fundamental objective of this research is to develop a shared understanding among constituencies of the potential positive and negative impacts of the proposed regulations on the following:

- investment and dis-investment, including the nature of the investment (whether it is capital intensive, labour intensive, as well as the geographic location of the investment)
- employment (job losses, job creation, shifts in the nature of work/employment patterns), including the profile of the workforce, skills profile and conditions of employment
- distortions in the market by isolating one aspect of the packaging industry,
- the knock-on effect of closing or transforming these industries (thereby impacting on other linked business and services, such as food suppliers, transport suppliers etc. and in particular consumers

To this effect, the research will be required to produce a socio-economic analysis of the following:

- Current state of the industry
- Ability to convert existing equipment to produce other goods
    - Ability to convert to heavier micron level
    - Options for phasing out/converting existing machinery – age and future life-span of current machinery
    - Planned future capital investment (10 year projection)
    - Investment, restructuring and employment patterns over the last 10 years
- Potential plant closures
- Potential job losses or changes in employment patterns in vest type carrier bag subsector.
- Potential job creation in paper or cloth bag sector, including the nature of that employment (wages, conditions of employment, etc. )
- Potential mobility of workers (in terms of skills, willingness to move (related to dependency ratios) and geographical shifts in the industry).
- Potential impact on consumers.

- Potential increase in recycling of bags and job creation (wages, conditions) in recycling sector.
- Potential distortionary impact of regulations on packaging industry.
- Comparison between cost of locally manufactured vest type carrier bags and imported bags of 30 and 80 micron.
- Impact on balance of payments of loss of exports
- The potential impact of the regulations on the plastic bag value chain as follows:
  - Polymer manufacturers
  - VCB manufacturers
  - Retailers (taking into account distribution and storage)
  - Consumers
- Current informal industry usage and reliance on thin plastic bags and alternatives

# 4. METHODOLOGY

It is anticipated that the project will comprise two phases namely collection of data and evaluation of impacts. It is intended that the project will be characterised by a consensus-driven approach, with close interaction between the consultants and constituencies at all stages of the research process. Constituencies, as represented in the task team, will approve each step of the research and inform the activities that will follow.

representative sample

## 4.1. Approach to data collection

It is envisaged that data will be collected by uniform questionnaires specifically designed (by the consultant) for each group identified in this document. Thequestionnaires will be followed up by interviews with a representative sample selected from each group. Responses should be coded to allow for confidentiality.

## 4.2. Scope of data collection

- Manufacturers of polymer (2 companies)
- Manufacturers of vest type of bags (52 companies)
- Follow up sample of manufacturers; sample to be proposed by consultant.
- Representative sample of retailers, sampling to be developed by consultants (*See Annexure 2 for a summary of the grocery component of the retail sector*).
- Manufacturers/suppliers of alternative bags sample to be proposed by consultant

- Recyclers (Currently only two companies process vest type carrier bags. Sampling would, in addition, include a selection of other recyclers to evaluate the extent to which they may extend their activities to include the proposed thicker bags. )
- Informal sector- sample of hawkers association representatives and craft workers.

### 4.3 Manufacturers of Polymer

The following information must be obtained from the polymer manufacturers:

4.3.1 Name of plant

4.3.2 Geographic location of plant

4.3.3 Amount of polymer supplied to plastic bag manufacturers of vest-type carrier bags.

4.3.4 Potential to find other markets for polymer if proposed regulations are implemented

4.3.5 Current investment in equipment for making the polymer

4.3.6 Potential need to manufacture different polymer type to manufacture thicker bags

4.3.7 Potential responses to the regulations, and the resultant implications on employment (e.g. job losses (with a profile of those who would lose their jobs) movement of workers, potential changes in working conditions, geographical location

### 4.4. Manufacturers of vest type carrier bags.

**The following data will be collected from each plant:**

4.4.1. Plant name

4.4.2. Geographical location

4.4.3. Breakdown of goods produced

– their % contribution to turnover

- value added and quantity of goods produced;

- size of bags produced

4.4.4. Exports and destination of exports in terms of turnover, product and volume;

4.4.5. Identified opportunities for increasing export of thinner bags;

4.4.6. Opportunities for utilisation of thinner plastics other than in shopping bags

4.4.7. Total production cost

4.4.8. % Labour cost of total cost, including a breakdown of the wages and benefits according to grade, occupational capacity, race and gender in real and percentage terms

4.4.9. Environmental cost of current production (including production transport and disposal) and projected environmental cost of 30 and 80 micron bag production.

4.4.10.Capitalisation of plants and the age of the machinery, with data over the past 10 years, as well as the date of any upgrades or purchases made of new machinery

4.4.11.Labour intensity of production processes for current, 30 and 80µ plastic bags over the past 10 years.

4.4.12.Profile of location of workers in the production process, , including the nature of the worker's contract, as well as their skills level, race and gender. .

4.4.13.Breakdown of workforce in terms of permanents, casuals & subcontracted workers, as well as the associated costs, over the past 10 years.

4.4.14.Gender breakdown of workers over the past 10 years.

4.4.15.Age breakdown of workers over the past 10 years.

4.4.16.Amount spent on education and training (absolute amount and % turnover), distinguished according to grade, occupational capacity and gender over the past 10 years.

4.4.17. Degree to which worker skills are portable.

4.4.18.Manufacturer's ability and options to convert existing equipment to produce higher micron levels

4.4.19.Additional or future plans for the plant, e.g. extending other product lines, in response to the implementation of the proposed regulations.

4.4.20.Planned future capital investment (10 year projection)

4.4.21.Possible responses if regulations are implemented

Questions for worker representatives in companies (specifically manufacturers of vest type carrier bags)

- Where do you live?
- How long does it take for you to travel to work?
- What are the wages and working conditions in the company?
- How many temps/ casuals
- How many people have been retrenched in the last 5 years?
- How much training takes place and who is trained and in what?
- How many people do workers support including spouses, parents, children and other family?
- Would you be able to move to find other work?
- Do you have a pension or provident fund and how much does the company contribute towards that?

## 4.5. Retailers

4.5.1.Current demand for

- Plastic bags 17/18 micron,
- Plastic bags 30 micron
- Plastic bags 80 micron
- Paper bag alternative to vest type carrier bags.
- Cloth bag alternative to vest type carrier bags.

4.5.2. Projected demand profile for 30 and 80µm plastic carrier bags

4.5.3. Projected demand profile for

- paper bag alternative to vest type carrier bags.
- cloth bag alternative to vest type carrier bags.

4.5.4. Proposals for absorption of cost of alternatives to 17/18 micron plastic bags

4.5.5.Possible responses should the regulations be implemented.

### 4.6. Manufacturers/Suppliers of alternatives:

The following information must be collected from paper bag manufacturers.

#### 4.6.1. Paper bags:

(i) Plant name

(ii) Geographical location

(iii) Breakdown of goods produced

(iv) % contribution to turnover

(v) Value added and quantity of goods produced;

(vi) Size of bags produced

(vii) Exports in terms of turnover, product and volume and identified opportunities for increasing export

(viii) Total production cost

(ix) % Labour cost of total cost, including a breakdown of the wages and benefits according to grade, occupational capacity, race and gender in real and percentage terms

(x) Labour intensity of production over the past 10 years.

(xi) Potential to produce sufficient suitable alternatives to the current plastic bags.

(xii) Impediments to manufacturing alternatives should the regulations be implemented.

(xiii) Additional worker profile questions.

- Where are the workers working in the production process, including the nature of the worker's contract, as well as their skills level, race and gender. Figures for the past 10 years are required.
- Breakdown of workforce in terms of permanents, casuals & subcontracted workers, as well as the associated costs, over the past 10 years.
- Gender breakdown of workers over the past 10 years.
- Age breakdown of workers over the past 10 years.
- Amount spent on education and training (absolute amount and % turnover), distinguished according to grade, occupational capacity and gender over the past 10 years.
- Skill level of workers and degree to which these skills are portable.

(xiv) Planned future capital investment (10 year projection)

#### 4.6.2. Manufacturers/suppliers of cloth bags

There are no large-scale manufacturers of cloth bags in South Africa. The potential to undertake large-scale production of sufficient bags must be investigated. The small-scale local manufacture of cloth bags and importation of cloth bags must be investigated to determine the:

- potential cost to the consumer
- potential for job creation, specifying the nature of employment created (wage and skills levels, contracts, working conditions, geographical location

#### 4.6.3. Potential Use of Biodegradable or Photo Degradable Plastic

An analysis of the potential use of biodegradable or photo degradable plastic in bags distributed by retail outlets, must be undertaken. This analysis should include potential shifts in production by polymer producers, and potential use by manufacturers. An indication must be given of whether existing operations might convert or expand, or whether new operations might be established. The implications of this for employment would need to be identified, including job creation, job losses, wage levels, nature of the workers' contracts, and impact on worker profiles (skills, race, gender and geographical).

### 4. 7. Recyclers

4.7.1. Plant name

4.7.2. Geographical location

4.7.3 Amount of plastic recycled

4.7.4. Type of polymer recycled

4.7.5. Amount of vest type carrier bags recycled

4.7.6 Collection method

4.7.7. Area from which plastic is drawn

4.7.8. Total operational cost

4.7.9. % Labour cost of total cost, including a breakdown of the wages and benefits according to grade, occupational capacity, race and gender in real and percentage terms

4.7.10. Capitalisation of plants and the age of the machinery, with data over the past 10 years, as well as the date of any upgrades or purchases made of new machinery

4.7.11. Breakdown of workforce in terms of permanents, casuals & subcontracted workers, as well as the associated costs, over the past 10 years.

4.7.12. Gender breakdown of workers over the past 10 years.

4.7.13. Age breakdown of workers over the past 10 years.

4.7.14. Amount spent on education and training (absolute amount and % turnover), distinguished according to grade, occupational capacity and gender over the past 10 years.

4.7.15. Skills levels of workers and degree to which these skills are portable.

4.7.16. Planned future capital investment (10 year projection)

4.7.17. Feasibility of recycling used thick plastic bags, including:

- Technical feasibility of recycling (dirty) thicker plastic carrier bags
- Cost of recycled material,
- Possible uses of recycled material (including projected analysis of supply and demand).

4.7.18. Potential impediments for recyclers to benefit from the potential of the regulations.

4.7.19. Estimate of potential additional jobs which may be created as a result of the proposed regulations.

## 4.8. Informal Sector

4.8.1. Sources of vest type carrier bags.

4.8.2. Volumes of vest type carrier bags used.

4.8.3. Potential responses to the regulations.

## 4.9. Government

A number of background questions need to be addressed in order to place the results of the research into context. These questions need to be posed to government. Consultants will be referred to the relevant government officials for this section. The following questions need to be addressed.

4.9.1. Motivation for 30 & 80 micron thickness

4.9.2. How will the regulations apply to imported bags? How will overseas manufacturers be subjected to the same penalties as local manufacturers in respect of lifecycle responsibility?

4.9.3. Confirmation that the prescription is restricted to “distribution” locally and that local manufacturers will still be able to manufacture thinner bags for the export market.

4.9.4. Motivation for the concept that the thicker bags will not cause visible pollution.

4.9.5. Is the government prepared to legislate a prescribed recycled content for certain products like refuse bags?

4.9.6. Government’s proposals on enforcing the regulations in respect of importation of thinner bags.

4.9.7. Procurement policy with regards vest type carrier bags. Quantitative figures of procurement of vest type carrier bags.

4.9.8. Amount of polymer imported for use in current VCB manufacture.

4.9.9. Support offered by government to convert from 17/18 micron bag manufacture to thicker bags for conversion and conditions attached, (including supply side measures).

### 4.10. Lifecycle Analysis of Various Packaging Materials

A lifecycle analysis including the resource utilization and environmental impact cost must be carried out on the following bags.

- VCB plastic 17/18 micron
- VCB plastic 30 micron
- VCB plastic 80 micron
- Paper bag
- Cloth bag

## 5. INFORMATION WHICH WILL BE PROVIDED

The following information will be provided to the consultant by constituencies.

- List of manufacturers of polymer
- List of manufacturers of vest type bags
- List of recyclers to be sampled
- List of manufacturers of paper bags

## 6. RESEARCH PROCESS, TIMEFRAMES, AND DELIVERABLES

The research process will be managed by the plastic bag task team under the auspices of the Trade and Industry Chamber, which will serve as the Counterpart Group for the study. The responsibilities of the Counterpart Group will be to: -

6.1. Initially, evaluate the tenders received from the prospective consultants;

6.2. Thereafter, interact with consultants to approve each step in the research (e.g. design of questionnaires, interview schedules)

6.3. Report on the progress of the investigation;

6.4. Assist consultants to access reliable information;

6.5. Consider and approve the final report and recommendations of the consultant;

5.6. Ensure that sufficient and effective measures are introduced to enable the recommendations of the consultant to be implemented effectively;

The successful consultants would be expected to liaise with other stakeholders not represented on the Counterpart Group. The consultants shall be required to take into account other research being done in this area.

The anticipated timeframe is 3 months for the entire process, including appointment of consultants and completion of research.

| **Deliverable** | **Description** | **Timeframe for Completion *** |
|---|---|---|
| 1 | Development of questionnaires and interview schedules<br>Development of sampling frame | |
| 2 | Data collection and compilation from:<br>- Polymer producers<br>- Manufacturers<br>- Retailers<br>- Producers/suppliers of alternatives<br>- Recyclers<br>- Government departments<br>- Informal sector<br><br>(Raw data made available to counterpart group) | |
| 3 | Analysis, with assumptions clearly stated | |
| 4 | Interim report | |
| 5 | Final report | |

** A realistic timeframe for each deliverable would need to be agreed by the counterpart group and the consultants.*

**Annexure 1:Acronym List**

| | |
|---|---|
| CG: | Counterpart group (FRIDGE) |
| DEAT: | Department of Environmental Affairs and Tourism |
| Fridge: | Fund for Research into Industrial Development, Growth and Equity |
| Nedlac: | National Economic Development and Labour Council |
| PE - HD: | Polyethylene High Density |
| PE-LD: | Polyethylene Low Density |
| PE- LLD: | Polyethylene Linear Low-Density |

**Annexure 2:**

**Retailer figures (grocery stores only:)**

| **Category** | **Number** |
|---|---|
| Hyper stores & supermarkets | 998 |
| Superettes | 1872 |
| Urban grocers | 13421 |
| Rural grocers | 13638 |
| Cafes | 15624 |
| Total within RSA | 45554 |

**Regional turnover in groceries, toiletries and cosmetics:**

| | |
|---|---|
| Free State, Northern Cape: | 6.8% |
| Eastern Cape: | 8.7% |
| Western Cape: | 5.6% |
| Mpumalanga, Northwest and Northern Province: | 17.8% |
| Gauteng: | 31.1.% |