TRADE AND ENVIRONMENT: SOUTH AFRICAN CASE-STUDIES

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Abstract

The purpose of this study is to examine the relationship between trade and environment in a developing country by means of selected case studies. This study begins with a brief overview of trade reform in South Africa and makes some preliminary assessments of whether the country's external sector is going through any structural changes. This is followed by an identification of some of South Africa's major traded products that are likely to be important in terms of the environmental externalities they generate.

The paper then identifies three sectors that are important exporting sectors, have significant environmental impact and are potentially vulnerable to environment-related trade measures. These sectors are analysed as case-studies to provide insight into the trade and environment relationships that may affect the South African economy. The sectors looked at are the coal export sector, basic iron and steel production and citrus exports.

The three sectors studied provide a number of insights into the growing connection between environmental issues and the South African trade sector. A range of linkages are identified including potential changes in world markets for South African exports; new requirements on exporters and producers to meet environmental demands; and threats of new barriers to trade. Data limitations, limits in the scope of the study and uncertainties as to the future course of current processes prevent detailed predictions of the impact of these issues on the sectors studied but useful general insights into developing trade and environment relationships are developed. The case studies indicate a number of areas for future research and also point the way towards some policy suggestions.

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PART I: TRADE AND ENVIRONMENT: OVERVIEW OF THE SOUTH AFRICAN ECONOMY

1 INTRODUCTION

The research presented here forms part of a broader international project on Capacity Building for Trade and Sustainable Development. This joint IISD, IUCN and UDRC project has as one of its components country level research in developing countries on trade and environment linkages. Three case studies are presented here, along with some background information on South Africa, which consider such linkages in three export sectors of the economy. The country studies are not aimed at providing a comprehensive overview of trade and environment relationships and will be supported by additional research in the form of thematic papers which will provide more comprehensive surveys of key issues in the field. The studies are aimed at identifying linkages at the domestic level and suggesting policy options to address either threats or opportunities arising.

The trade and environment issue is a particularly pertinent issue for South Africa at the moment because:

- South Africa is undergoing a process of trade liberalisation;
- South Africa is a classical small open economy dependent on its export sector for its future growth plans ; and
- Some elements of the South Africa economy are heavily dependent on natural resource use, high levels of energy use or polluting emissions for their competitiveness.

This set of factors makes exporters, and hence South Africa, potentially vulnerable from two sides. Firstly they may face environment related trade restrictions. Secondly the imposition of more stringent domestic environmental regulations or actions under international conventions may adversely affect the country's trading sectors. In this regard the case studies focus largely on the vulnerability of exports due to environmental issues. The question of environmental risks from import flows is not addressed. The impacts on the South African environment of expanded exports has also not been addressed but is also obviously an area that needs to be considered when analysing appropriate development paths for the country.

1.1 The Trade and Environment Debate

The background issues of the trade and environment debate will not be addressed in this paper at this stage. The thematic papers being developed under the project will serve to provide the broad context for this research. It is thus assumed here that these papers will be available in conjunction with these case studies and will provide details of the theoretical issues underlying the trade and environment debates as well reviews of major current issues such as the current approaches of the Committee on Trade and Environment of the World Trade Organisation (WTO) and the results and implications of the key trade/environment disputes in international law.

2 THE SOUTH AFRICAN ECONOMY IN PERSPECTIVE

2.1 Introduction

As an economy with an estimated GDP per capita of $3 000 and a fairly diversified industrial sector South Africa is classified as a middle income country. However, South Africa's export patterns are fairly narrow and there is a large disparity between export patterns and production patterns. This implies that mineral commodities account for a large percentage of South Africa's exports at one level while South Africa produces a highly diversified range of products for the domestic market. The relative significance of gold as a foreign exchange earner is declining while the importance of other commodities over the last year has been steadily increasing. Gold's percentage contribution to total exports declined from 39.7% in 1988 to 19% in 1995. Manufacturing accounts for some 25% of total exports and agriculture less than 10%. Although agriculture accounts for a fairly small proportion of South Africa's exports it is important in the sense that the agricultural export/employment ratio is higher than in any other sector.
The mineral sector is an important source of tax revenue and foreign exchange, which are essential to the South African economy. The downside of mining is that most of the life cycle processes ranging from production to mineral processing, inevitably results in environmental degradation or pollution of a sort. As the mineral sector accounts for nearly 40% of total South African exports any trade restrictions on environmental grounds would tremendously negatively impact on the country's already pressurized balance of payment position.

The country's other economic sectors have their own associated environmental impacts. The petrochemical industry contributed 7% to South African GDP in 1993 and has a number of environmental impacts worth investigating, such as a high production of toxic wastes and high energy use. The tourism industry, being service in nature, has good potential for growth but expectations are that environmental degradation from the sector will grow alongside tourism growth in the absence of strict controls. Other important sectors are forestry and agriculture which although they constitute only 5% of GDP and less than 10% of South Africa's total exports, are very labour intensive sectors. Here, environmental concerns are not only related to land-management and natural resource depletion both in terms of land and water, but also secondary activity associated with forestry processing and agricultural processing. In the case of forestry the pulp and paper industry uses a variety of chemicals that are released into rivers and streams causing downstream impacts.

Another major sector upon which the South African economy is dependent upon is the energy sector. In fact cheap energy is considered to be a comparative advantage for South African industry. Manufacturing sectors that are highly energy-intensive include the basic iron and steel industries, non-ferrous metal industries, the chemical sector and the pulp and paper industry. Energy production in South Africa is reliant on the availability of cheap coal sources which are expected to last for about 200 years. Coal based energy production in South Africa however also contributes to a large share of global carbon dioxide emissions. Some estimates suggest that South Africa is the world's 32nd largest contributor on a per capita basis (WWF, 1998). A critical issue is whether the country will come under significant pressure to reduce the energy intensity of production and whether this will remove an important comparative advantage underlying the government's export drive.

This study investigates trade and environment linkages in three different areas of the economy. These are coal production (within the mining and minerals export sector), steel and metals manufacture (within manufacturing exports), and citrus fruit growing (within the agriculture industry). The trade and environment relationships of energy use and electricity production underlie some of the discussion of the first two sectors and will also be discussed. The analysis is conducted via three sector studies. The study is by design not comprehensive but rather looks at some of the developing trade and environment relationships within the economy through fairly limited case studies. This is aimed at providing examples of how the relationship can affect the economy and examples of how trade environment relationships can be explored and evaluated in terms of their economic and policy importance.

2.2 Trade Policy Reforms in South Africa

The South African economy like most other countries in the world is going through structural changes induced by a systematic trade liberalisation program in line with our commitments submitted to the Uruguay Round in 1992. Import surcharges in the country have been completely abolished, export-subsidies have terminated and tariffs are being reduced. In view of this changing environment South African firms are restructuring as the composition of the country's imports and exports begin to change.

Trade policy changes in South Africa have included tariff rationalization and tariff reductions in accordance with South Africa's WTO commitments. In addition they have included accelerated liberalization of the clothing and textile and motor assembly and component sectors. The average weighted import duty for manufactures in South Africa in 1994 was 15% with consumption goods at 34%, intermediate goods at 8% and capital goods at 11%. South Africa's average tariff in the year 2002 will be as follows: 17% for consumption goods, well below the GATT binding rate of 26%, 4% for intermediate goods, compared to 11% for the GATT binding rate, and 5% for capital goods, compared to 15% for the GATT.

Table 1 Tariffs on South African Imports (IDC, 1997)

	SA TARIFFS IN 2002 (%)	GATT BINDING RATE (%)
Consumption Goods	17	26
Intermediate Goods	4	11
Capital Goods	5	15
AVERAGE	7	16

It can be seen that both South Africa's tariffs in capital goods and intermediate good today are already well below the GATT binding rate. It is in some key sections of consumption goods, such as clothing, where tariffs still have to come down. In 1993 South Africa eliminated all surcharges on imports which ranged from 4% to 15%. Various quantitative restrictions have also been eliminated. In addition to the elimination of import controls and the reduction in tariffs,

South Africa has eliminated export subsidies.

Despite these changes there is still some debate as to how dramatic South Africa's trade liberalization has been and whether trade liberalization is inducing real changes to the country's trade profile. The anti-export bias, which refers to the difference in value-added between producing for the local market and the export market, is one way of measuring changes induced by South Africa's export policy orientation. The higher the co-efficient the higher the difference in value-added which implies higher protection. Recent data which shows that the anti-export bias has decreased imply that the environment has become more favourable towards exports.

Calculations of anti-export bias show a decrease from 1.63 in 1993 to 1.49 in 1996 for the total economy but slightly higher for manufacturing from 1.98 to 1.69 for the same period. Given below are anti-export bias that include South Africa's export incentives. It clear that the anti-export bias would go up in 1998 because the export incentives were phased out although tariffs may have come down marginally.

Table 2. Anti-Export Bias of the South African Economy (IDC, 1997)

	1993	**1996**
Total Economy	1.19	1.32
Manufacturing	1.27	1.45

A straightforward analysis of the country's import and export profile also provides some useful insights. It seems that from the 1990 that was a structural break in the export and import trends as we see a consistent rise in both exports and imports (See Figure 1. below).

Figure 1. Imports and Exports from South Africa, 1981-1996

FIGURE 1.1

1.3 STRUCTURAL CHANGES IN THE SOUTH AFRICAN ECONOMY

Appendix 1A shows the South African GDP by the kind of economic activity

2.3 Structural changes in the South African Economy

Appendix A shows the South African GDP by the kind of economic activity from 1987 to 1997 in real terms (deflated by means of CPI with 1990 as base year). Considering the main sectors the following indications are evident (SA Reserve Bank: 1997). The primary sector offers the lowest contribution to GDP and the tertiary sector the highest. The ratio of contribution of the primary1[1], secondary2[2] and tertiary3[3] sectors over the study period (1987 to 1997) is roughly

[1] Primary Sectors refer to raw material producing sectors. Mining and agriculture are typical examples

1:2:4. For instance in 1996 the relative contribution by the primary, secondary and tertiary sectors were 14%, 32% and 53% respectively. The primary sector is a slow growing stagnant sector growing in absolute terms at 0.55% per annum over the study period as evidenced by figure 1a. Relative to the secondary and tertiary sectors there is in fact a slight decline of about 0.0.81% per year (figure 1.2b).

The secondary sector is experiencing a moderate growth of 1.27% per annum in absolute terms. The contribution to GDP for this sector has increased in real terms from R77, 3 billion in 1987 to R87, 7 billion 1997 (14% change within period under review) with a period average of R81.4 billion. However relative to the other sectors the contribution of the secondary sector is slowly declining at a rate of 0.10% per year.

The tertiary sector is the fastest growing sector, growing at a rate of 1.67% per year. There is an increase in GDP in real terms from R120.6 Billion in 1987 to R142.3 Billion in 1997 (17% increase), this represents a growth in its relative contribution to the total South African GDP from 51.5% to 53.1%. This is one sector experiencing a real growth in relative terms at a rate of 0.29% per year.

The main areas of activity within the primary sector are mining, agriculture, forestry and fishing. Figure 1.3a and figure 1.3b illustrates graphically the relative contributions of the specific industries within the aforementioned sectors. The mining industry has experienced a decline in real terms in relative contribution to GDP from 10.3% in 1987 to 8.6 % in 1997, this representing a decline rate of 1.8% per year. The mining industry has experienced a steady decline in employment at a rate of 0.25% per year. The industry accounted for 5.5% of total 1996 employment. The key mineral products include gold, coal and platinum group metals (PGMs).

The agricultural sector is a dynamic sector growing at a rate of 3.1% per annum. The growth rate relative to the other sectors is also high, 1.7% per year. The manufacturing sector is one of the fastest declining sector in real terms, dropping in relative contribution to GDP from 25.7% in 1987 to 21.1% in 1997, this representing a relative decline of 1.89% per year. To put it in better perspective there is a real rate of decline of 0.54% per annum in absolute terms. The manufacturing sector accounted for 14% total employment in 1996 and construction 3.2% of total in 1996 and both sectors have experienced a decline in employment in the last few years.

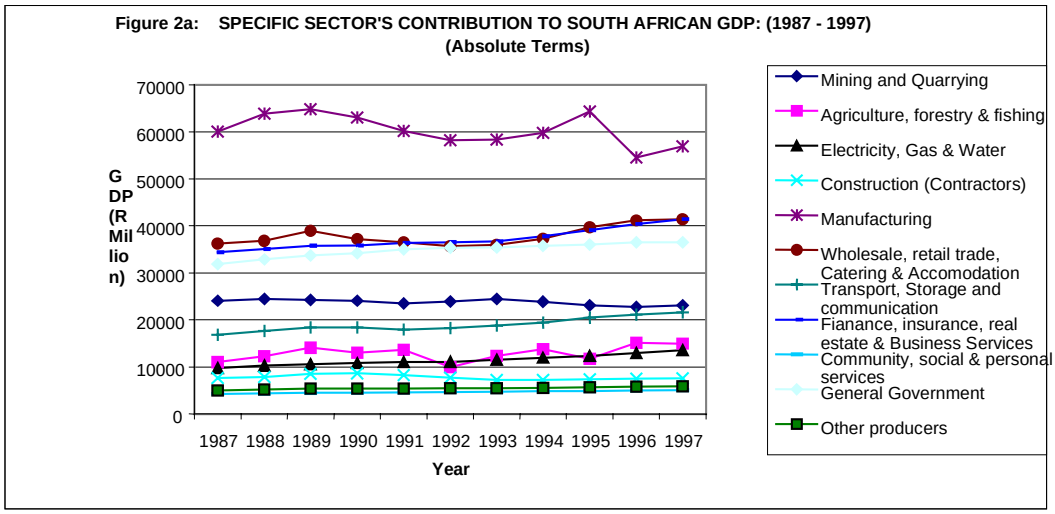
A brighter picture is portrayed by the electricity sector, which is growing in real terms at a rate of about 3.3% per year. Relative to other sectors this represents a growth rate of 1.94% per year. The direct impact of the electricity sector in the South African economy presently is small but predicted to grow fast. For instance the combined contribution of electricity, gas and water to 1997 GDP was 5%. Wholesale, retail and accommodation industry, like the electricity sector, is growing at a fast of 1.3% per annum. Other tertiary sectors like transport, storage, and communication are also growing at a fast rate of 2.56%. The decline in importance of South Africa's primary extractive and secondary manufacturing industries relative to the growth in importance of tertiary industries is an issue worthy of investigation for both economic development and environmental reasons. Whether these are merely temporary fluctuations or whether the economy is moving away from being a natural resource dependent economy and is also "deindustrialising" has profound importance to the country. In environmental terms the environmental impacts and challenges facing South Africa will change as the economic structure changes.

Important as such questions are, the focus of this research is on the country's trade and environment linkages. In this light a picture of the external sector of the economy is provided in the next section. The economic relationship of South Africa with the rest of the world provides the background for the more detailed case studies of these linkages between trade and the environment.

[2] Secondary Sectors refer to manufacturing. Examples include agro-processing and clothing manufacturing
[3] Tretiary Sectors deals with general services. Examples include transport, banking, insurance etc

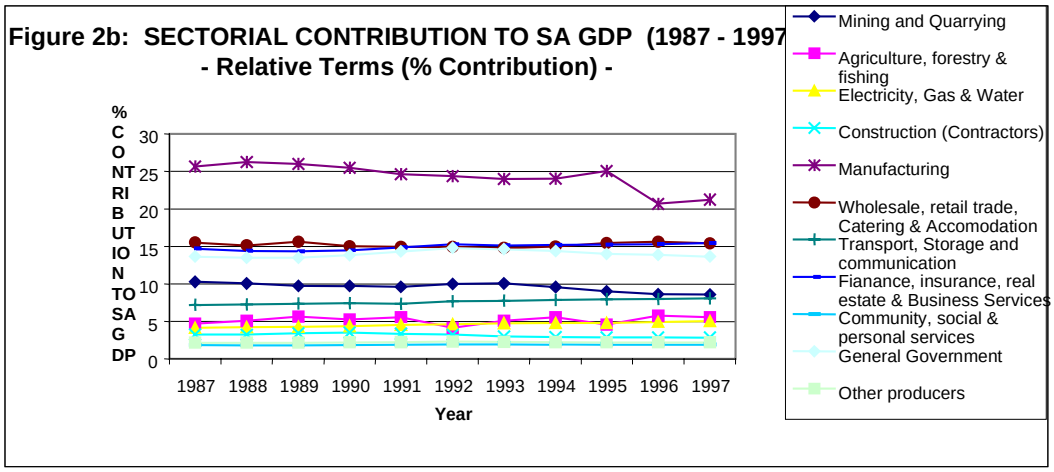
Figure 2 Sectoral Composition of the South Africa Economy

1990 = 100



Source: South African Reserve Bank, Economics Departmeent.

1990 = 100



Source: South African Reserve Bank, Economics Departmeent.

2.4 South Africa's External Sector

South Africa' export sector has become increasingly diversified, especially since the early 1990s. Table 3. shows the changing composition of South Africa's exports, from the late 1980s.

Table 3 South Africa's Export Profile, 1988-1996 (IDC, 1997)

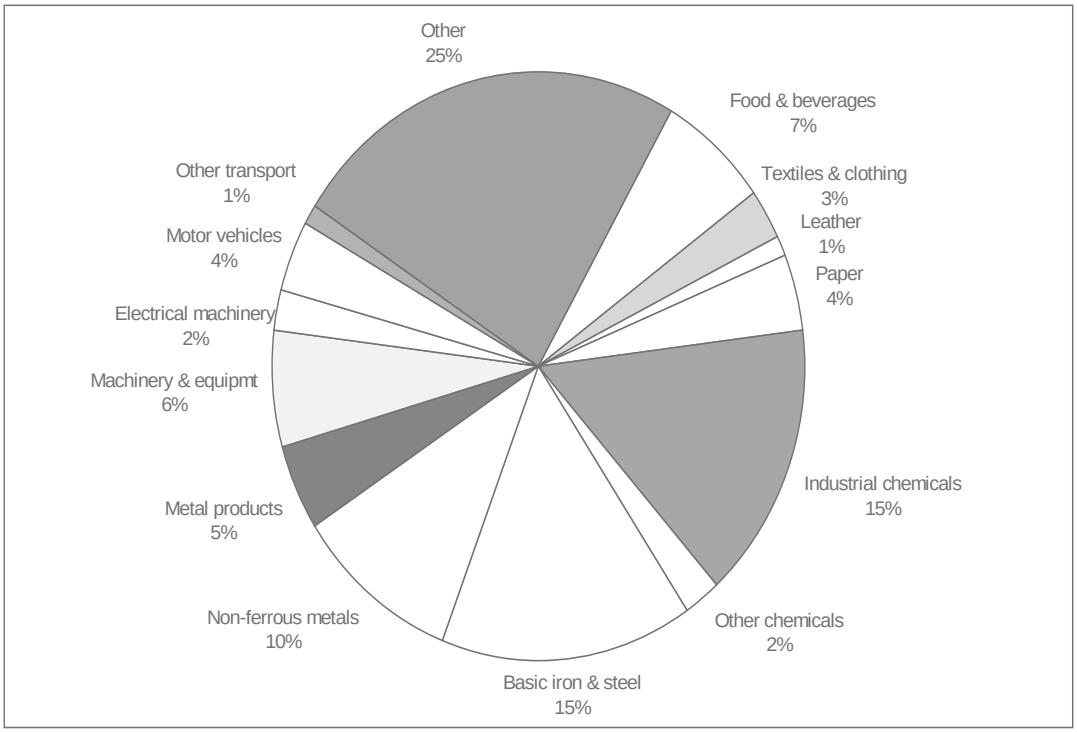
Category	1988	1992	1996
Gold	36%	27%	22%
Primary Products	20%	21%	20%
Beneficiated Primary Products	23%	23%	28%
Material Intensive Products	5%	5%	7%
Manufactures	6%	13%	18%

The traditional significance of gold in terms of its contribution to GDP and to export earnings has during the recent past shown a marked decline. Gold's percentage contribution to total exports declined from 36% in 1988 to 22% in 1996. By contrast the relative importance of other commodities has increased. However, despite gold's decline in importance and evidence of diversification, primary commodities still dominate South Africa's trade profile. Most of the main mineral products have a market share (South Africa exports a noticeable percentage of total world imports in particular product categories). Not surprisingly South Africa has a particularly high market share in gold and coal of 13.4% and 8.5% respectively. Its clear that South Africa's market share is concentrated in mineral-intensive and material intensive products.

Although South Africa's manufactured exports are growing from a small base, figure 3. below shows that the country has quite a diversified export basket in manufactures. Manufactured goods, which currently constitute less than 20% of South Africa's exports, are showing significant growth, albeit from a small base (CSS, 1996, 1997). For the last five years manufactured exports have grown at an average of approximately 5% per annum in US dollar terms. The sectors that have accounted for this growth are as follows (average annual growth rates for the last five years shown in parentheses):

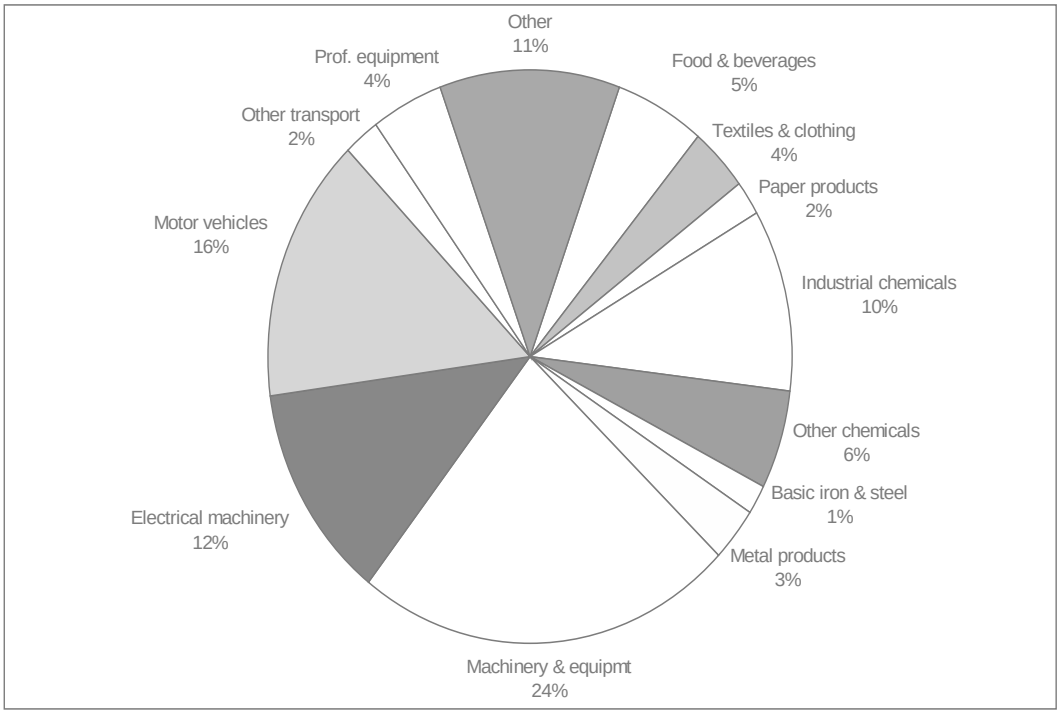
- iron and steel (20%)
- beverages (37%)
- electrical machinery (29%)
- metal products (19%)
- transport equipment (19%)
- industrial chemicals (9%)

Figure 3 SACU Manufacturing Exports: Share of Major Sectors Within Manufacturing Exports (IDC, 1997)



As far as imports are concerned, most of South Africa's imports consists of inter-mediate or capital goods. These are machinery and equipment, electrical machinery, industrial chemicals and motor vehicles (see figure 4. below).

Figure 4 SACU Manufacturing Imports: Share of Major Sectors (IDC, 1997)



2.4.1 Trade in Minerals

As mentioned previously a steady decline of the export contribution of minerals at a rate of 4.7 % (from 66% in 1987 to 40.9% in 1996) per annum is evident. If this decline continues, then it can be predicted that the impact of mineral exports in the total South African exports will be relatively minor with a decade or two. While gold still accounted for 22% for total South African exports in 1996, gold exports, as a percentage of total South African exports, have been declining in relative contribution suggesting that gold will be a far smaller contributor to mineral exports within a decade if the current trends are maintained. Coal, on the contrary, is growing, albeit at a very slow pace.

Gold and coal are the most important minerals contributing 41% and 12% respectively to the 1996 mineral exports. However, gold's contribution to the total mineral exports between 1987 and 1996 has declined from 73.1% to 51.6% this representing a decline rate of 3.4% per annum whereas coal increased from 9.5% to 15.8%, a growth rate of 5.9%. The decline in gold export revenue is not due solely to volatility in gold prices, volumes of gold exported have also declined over the period. On these figures coal's contribution to the total mineral exports will exceed that of gold by the year 2018 if their current trends continue. It must however be pointed out that natural commodity prices and volumes are subject to cyclical volatility and one can never be sure that such trends will continue. The growing contribution of coal underscores the need to thoroughly assess the externalities associated with coal production and processing.

An analysis of export/GDP ratios over the study period (1987 to 1996) show the following:

- An export/GDP ratio of all minerals declining from 17.1 to 10.6, a decline rate of 4.7% per year,
- An export/GDP ratio of gold declining from 10.4 to 5.5, an alarming decline rate of 6.2% per year
- An export/GDP ratio of coal increaseing from 1.5 to 1.7, this representing a rising rate of 1.3% per year

It is evident that coal, although not making a very remarkable impact in total mineral exports, has relatively very high growth potential. The export led nature of the coal sector and the rising share of coal within minerals exports provides one of the bases for using this commodity to examine trade and environment linkages. The environmental concerns of the sector are discussed in Part II of the paper.

2.4.2 Trade In Non -Traditional Exports

There are series of non-traditional exports that are not as important as minerals but are likely to become very important to the South African economy, such as the new manufacturing sectors discussed above. A particular new growth sector is the tourism industry. Tourism is a fast growing sector with large projected growth rates. Although part of the sector is based on domestic tourism, it is also a substantial export sector with many tourists coming from foreign destinations.

The nature of South African tourism, largely based on the country's wildlife, protected areas and scenic beauty, means that is dependent to a significant degree on natural resources. In this regard the industry has significant environmental linkages that are both positive and negative. A positive aspect of the industry is that it provides a means of securing income from conserved natural areas and pristine environments, thus enabling them to compete against alternative land uses. Large numbers of tourists however, can also have significant negative impacts on the areas which they visit and in which tourism facilities are sited. Although none of the case studies have looked at the tourism sector it is probably an economic and export growth sector that is worthy of further attention with respect to trade and environment linkages.

3 ENVIRONMENTAL IMPACTS OF SOUTH AFRICAN EXPORTING SECTORS

South Africa has environmental concerns related to the structure of production in the economy. Many of these environmental concerns are both export and import related. In the case of export related problems mining, given its nature and the fact that it is the largest segment of the economy, generates a host of environmental problems that are related to the mining activity itself. These include direct health problems, for instance occupational health issues in the coal mining sector, as well as pollution problems linked to gold, zinc, iron, and diamond mining. In the case of gold mining pollution of water resources is a common phenomena, as is the creation of waste dumps and sludge dams which pose a hazard as they contain toxic and radioactive waste. The problem of the growth in hazardous material is a particularly serious concern as South Africa does not have sufficient sites for waste disposal or incineration plants.

As the mineral industry is the main foreign exchange earner, contributing 40% to total South African exports in 1996 (SAMI, 1996), coupled with the fact that several environmental externalities are associated with the activities in the mineral industry, the environmental concerns in this sector need to be thoroughly addressed. This sector is probably among those sectors vulnerable to green trade restrictions in the event of such restrictions materialising.

To provide a background to the case-studies and the overview of trade and environment linkages in South Africa a brief environmental picture of the economy will be presented to complement the economic picture presented above. While it is impossible to provide an in-depth analysis of the environmental impacts of South African exporters a few general observations can be made which provide insight into the nature of South Africa's productive sectors. The main problem with such an environmental characterization is the lack of good environmental data and also the fact that national environmental data has not been collated to an adequate degree. Attempts are being made to improve this situation, such as a Natural Resource Accounting process underway, but these are far from complete (Blignaut, 1998). The presentation will therefore be a general overview and is largely provided in the form of two tables. The first (Table 4.) provides a breakdown of key export sectors and environmental issues flowing from them in a qualitative way. The second (Table 5.) provides a quantitative assessment of emissions from South Africa's productive sectors. While the data for this second table are old and of limited reliability the table nevertheless provides a sense of what pollutants arise from which sectors of the economy and in what proportions.

Table 4 Key export sectors - environmental issues and potential trade barriers

Sector	Percent of Total Exports (1993)	Export Value (000 Rand) (1993)	Environmental Impacts	Possible Green Trade Restrictions
Packaging	1.2	2,398	Waste disposal PPM's	Eco-labeling Domestic regulations
Gems & Precious Stones	14	46,699	Water pollution Biodiversity loss	Unlikely
Base Metals	2.85	3,245	Water pollution Air Pollution Solid waste	Unlikely in near future
Coal	6.72	11,659	As above Low sulphur content an advantage	Carbon tax in far future ISO14001
Mineral Products	10	5,389	Effluent production Atmospheric pollution High energy use	FCCC European recycling regulations ISO14001
Aluminium	0.72	3,998	As above	Packaging standards ISO14001
Steel	8.8	14,019	As above	ISO14001 Market based pressure
Chemicals	4	8,814	Atmospheric pollution Water pollution	Basel & Bamako Convention Montreal Protocol Safe packaging and Recycling pressures Specific chemical bans
Soaps & Detergents	0.13	255	As above	Market based pressure on packaging and biodegradability
Vegetable Products	3.5	3,042	Soil erosion/ mechanical damage Soil & water contamination	Importers domestic regulations Market based pressure
Fruit	2.26	2,743	Water & Soil Pollution Mechanical soil damage/erosion Occupational health hazards	Chemical residues - ecolaballing/importers domestic regulations/ market based pressure

Machinery & Appliances	4.14	8,310	Water Pollution Air Pollution Waste Disposal Occupational Hazards	ISO14001 Market based pressure Recyclability
Vehicles & Aircraft	3.84	6,762	Water Pollution Air Pollution Waste Disposal	ISO14001 Market based pressure Recyclability
Pulp & Paper Products	2.42	3,542	Organochloride effluent into waterways	Market based pressure to be chlorine free ISO14001 Ecolabelling to ensure not from old growth
Timber	0.8	1,091	Reduction of runoff Biodiversity loss	Ecolaballing to ensure not from old growth
Textiles	3.11	4,309	Effluent production Occupational hazards	Ecolabels
Foodstuffs/Beverages/ Tobacco	2.29	5,177	Varied	-
Animal Products	1.23	1,421	Varied	-

As the export figures in the table above show the economy is still primarily dependent on natural resource exports. In turn the South African industrial sector concentrates heavily on mineral beneficiation and chemical process, activities that have major environmental impacts. In addition South African industry is particularly energy intensive (Whyte, 1995). These contribute to an industry profile of significant environmental impact. The country's other exporting sectors, such as agriculture, pulp and paper and textiles, have their own set of impacts. For example, all are large water users and produce substantial effluent streams.

As the trade and environment debate has shown, the impact of environmental issues on the tradability of a country's good is not simply about domestic impacts. The trade-environment relationship depends on issues such as the relative environmental impact of a sector compared to the international average; the environmental impact of the consumption of traded good; and the impact on the global environment of a country's production. These issues cannot really be discerned at macro level and will be dealt with in greater depth in the case studies.

There has been much discussion (see GEM, 1998, van der Lugt, 1998, Bethlehem, 1997, Van Horen, 1997) on South Africa's potential vulnerability to trade barriers because the country's productive sectors are dependent on high levels of electricity use which has been generated through coal-based processes which emit large quantities of greenhouse gases. Whether this is a realistic and substantial threat to South Africa's exports is still uncertain. However what is clear is that the country is highly dependent on energy sources which have substantial negative global impacts. This issue will be returned to below.

4 HYPOTHESISED TRADE AND ENVIRONMENT LINKAGES IN SOUTH AFRICA

4.1 Indications of increasing linkages

Globalization and trade liberalization are currently dominant paradigms in the global economy. In general multilateral trade agreements are aimed at establishing a framework for an open, rule-based, non-discriminatory and predictable global trading system. However rule-based trade is not only about trade liberalisation, the development of multilateral trading rules also opens doors for constraining trade in favour of the environment, or other concerns. This has been demonstrated both through the use of trade restrictions in certain environmental agreements (such as the Montreal Protocol aimed at the protection of the ozone layer and the Basle Convention targeted at controlling international trade in hazardous wastes), and through the use of trade measures to secure political objectives (such as the international trade embargo against Iraq and indeed trade sanctions against South Africa during apartheid). These examples provide evidence that although trade liberalization has largely been accepted as a sound economic strategy the principle of free trade is by no means inviolate. On the other hand multilateral trade rules also provide an element of protection, particularly to developing countries, against the abuse of trade mechanisms in the pursuit of unilateral political or environmental goals.

The recognition that trade can be used as an instrument to secure other goals is one of the themes underlying the trade-environment debates. Other elements of the debate include the impact of the trade process itself on the environment, the use of environmental issues as trade barriers, and the role of trade measures to address global environmental concerns. Other aspects of this research programme are considering these relationships between trade and the environment in a thematic way. These research projects will provide a theoretical insight into the ways in which trade is affected by environmental concerns or contributes to environmental damage. This paper, however, is directly concerned with the impacts such relationships are having, or may have, on the South African economy and on the country's development path. In this light the experience of some major South African exporters is useful to determine what impact these issue are having on the country.

A survey conducted by Bethlehem (1998, 1997) assessed the experience of major exporting firms. Although this was not a comprehensive industrial survey the results provide a useful indication of the type and range of environmental issues faced by the exporting sector. Bethlehem (1997) conducted in-depth interviews with twenty exporting companies in twelve sectors. The companies were interviewed about the effects on their exports of any international environmental pressures they had either encountered or could potentially encounter. Table 6. summarizes the key results of the survey. Although few companies had experienced severe constraints due to environmentally related pressures there are clear indications from the survey that environmental issues are gradually being linked to export trade.

The trade-environment linkages are occurring in a number of ways. International agreements such as the Framework Convention on Climate Change are perceived as being increasingly important to the domestic economy, especially within the energy sector. South African exporters are having to meet domestic regulations imposed in the importing country, such as European Union control of products which may be environmentally damaging or European Union recycling regulations. On a less formal level eco-labels, which influence companies to modify their products by providing market incentives to meet certain environmental requirements, and general "market demand pressures" have led a number of companies in various sectors to modify their production process.

There is a clear indication of a growing acceptance that South African exporters need to adopt international management standards and accreditation, particularly the ISO 14000 series of environmental management standards. This is related to standards expected of suppliers in a number of industries and to general growth in environmental awareness in export markets. Specific issues, such as the need for specialised labeling and packaging procedures and pesticide residue requirements have also led to exporters having to modify aspects of the production and sales processes. The experience of South Africa exporters as revealed in the survey provided a basis for the selection of the case studies.

Table 5 Sectoral Experiences with Trade and Environment Issues: Environmental Pressures Reported by Exporters and Their Expectation of Possible Impacts of Future Measures (Bethlehem, 1997)

SECTOR	FIRM DETAILS	COMMENTS BY FIRMS ON THEIR TRADE AND ENVIRONMENT EXPERIENCES AND EXPECTATIONS
Coal	Produces and exports 30% to EU, East Asia, North America Latin America, Middle East and Asia.	• No direct pressure now but asked about environmental policy from time to time, and some customers started looking at trace elements in coal. • Receives mainly informal inquiries but has had a few formal inquiries about environmental impacts from customers. • Company is contemplating applying for ISO 14001 accreditation. • Internationally coal fired power has come under pressure with regard to its environmental impacts and will in the longer term be affected by international decisions on fossil fuels. • World market demands low-sulfur coal because of stringent environmental regulations abroad such as USA Clean Air Act. SA coal has low sulfur content giving South Africa a competitive edge and premium on such coal. • Company aware that coal sector potentially vulnerable to environmental trade measures, eg. those targeted at carbon reductions, but thinks this is unlikely in the foreseeable future and expects a rising demand of coal in the world market.
Electricity Generation (Eskom)	Supplying electricity mainly from coal-fired power stations.	• Trading partners are increasingly asking about South African products. Though Eskom has not been under any pressure from its electricity intensive export customers with regard to its environmental performance SA will come under pressure to limit greenhouse gas emissions since targets and other commitments may be set for middle-income developing countries. SA vulnerable to potential international action on CO_2 and other greenhouse emissions. This may even manifest as international development aid restriction.
Aluminum (2 firms)	Exports 50% of its aluminium production to East Asia, the Middle East and Africa Exports about 35% of production to North America and East Asia	• Both companies aware of a range of environmental pressures, including local regulation of emission and effluent. • Neither company has experienced significant pressures in the export market yet. • Both companies have experienced pressure from export customers to reduce and redesign their packaging. • Both have been asked to fulfill special protection and labeling requirements for the transport of their products, and this has required specialised packaging. • One company asked by its client to provide information on its EMS to apply for British environmental standard though this has not lead to market loss. • Both expect to apply for ISO 14000 series accreditation. • Both companies have received queries about potential hazards involved in the use and degradation of their products. • Both see environmental issues an increasing important to their ability to capture and maintain export markets in the longer term.
Chemicals (2 firms)	General chemical products. Exports 40% of production to EU, North and South America, and Australia. Producer of petro- and general chemicals. Exports as above	• Both companies see environmental issues as increasingly important in their ability to capture and maintain export markets in the long term. • Contend that South Africa chemical business follows international trends and will be able to meet changing global requirements. • Older capital stock is 'dirtier' and requires substantial investment to bring to world standards. New investments easier to make internationally environmentally comparable. • Both have had to fulfil special packaging and labeling requirements for export. • Both expect to apply for ISO 14001 accreditation. • The Montreal Protocol required a number of industry changes that were successfully made. • The industry is affected by a number of international conventions including Basle, Montreal and the FCCC.

SECTOR	FIRM DETAILS	COMMENTS BY FIRMS ON TRADE AND ENVIRONMENT EXPERIENCES AND EXPECTATIONS
Mineral Processing (2 companies)	Manganese producer. Exports 85% of its production to EU, North America and East Asia. Platinum producer. Exports 90% of its production to EU, North America and East Asia.	• Both received queries about their environmental performance of their products and processes. • One wants to apply for ISO 14001 accreditation in anticipation for international pressure. • One experienced a problem in exporting one of its concentrates which contained recycled materials. Difficulty in passing through EU boarder because of intricate regulations relating to this product and its environmental implications. • Both believe bureaucratic hurdles are just not for environmental reasons but that their competitors assisted in putting them in place as barriers to trade. • Large cost implications for investing in environmental protection technologies. • Environment has become a strategic issue for the next decade, especially with regard to exports. • The greenhouse gas issue was recognised but the industry did not see it as an immediate threat to exports.
Citrus Fruit (1 firm)	Export agent for South African citrus fruit to EU and N. America	• Environmental issues increasing strongly and they have identified environment as a major issue over the next five years • Specific regulations governing food impose stringent requirements on exporters, especially the regulation of chemicals used in fruit production and preservation. • Even if producers meet local standards this is insufficient to meet the export market requirements • Improvements in local environmental performance and in local standards because the export standards have become the de facto standards in the industry.
Packaging (2 firms)	Both service a wide range of exporters	• Both have been highly involved in meeting the packaging requirements of export markets, especially the EU packaging regulations and the German Packaging Ordinance • International requirements have driven significant changes in the local packaging market and has encouraged a trend towards lighter and more easily recycled materials. • The industry's experience indicates how environmental issues can be transferred down the product line to suppliers
Pulp and Paper	Two companies interviewed who export 35% of production to a wide range of markets	• Source of pulp wood from managed plantations is an advantage for SA producers as their wood is not unsustainably logged from old-growth forests • Strong moves towards elemental chlorine free pulp due to international market demands with large associated cost implications • Some suggestions that developed country producers are trying to raise environmental standards in the industry to gain a competitive advantage • Companies see the need to adopt international environmental management systems as a requirement for exports
Steel	Industry body – industry exports 30% of production to a wide range of markets	• The industry envisages growing environmental pressures and has already received some queries from customers about environmental performance. • New plant in the industry has good environmental performance while old stock lags seriously behind international norms • Industry is moving towards adopting ISO 14 000 • If the market for steel tightens then environmental factors may cause some export markets to be lost in the future.
Soaps and detergents	Two companies – both subsidiaries of foreign multinationals	• Both companies follow the standards set by their head office and their environmental performance must match that found in their other production locations. This has led to higher standards being adopted than required by local legislation. • Neither company identified any threats to exports based on their environmental performance.

5 CASE STUDY SELECTION

A number of sectors were chosen to investigate the possible linkages between trade and the environment in South Africa. Unlike many other developing countries the *prima facie* evidence in South Africa suggests that the main trade-environment issue are not those related to damage to the domestic environment caused by unsustainable production for international markets (such as unsustainable logging of primary forests). Rather, in the light of South Africa's post-apartheid emphasis on economic openness and the stress on export led growth, the major issues of concern are whether South Africa's exports are vulnerable to environmentally based trade barriers.

South Africa is in many respects a developing country but is also characterised by a high level of industrial development and a growing tertiary sector. At the same time, like many developing countries, the economy remains dependent on natural resource exports, in South Africa's case largely minerals, coal and metals, and on secondary beneficiation of these resources. Because the economy's exports depend heavily on resource extraction and beneficiation it was felt appropriate to examine both an extractive sector and a secondary sector using local natural resources. The sectors chosen were coal production and steel manufacturing. More detailed reasons for choosing these sectors are given below.

A third sector, citrus exports, was also chosen as a case study. Although agriculture as a whole makes up only a relatively small percentage of total exports it is an important sector in terms of employment and environmental impact. Citrus production is only a part of total agricultural production but the sector has had interesting experiences with environment related trade issues. It was felt that the sector was worthy of investigation because exporters were faced with specific environmental issues that affected their products. In addition foreign market pressures may have led to local environmental benefits.

5.1 Coal exports

Within the mineral sector exports gold and coal are the main players, accounting for 21% and 13% respectively of total South African exports and 41% and 23% of total minerals exports respectively. Although gold has traditionally been the driving force in mineral exports, it is declining at a fairly rapid rate of 1.1% per year whereas coal on the contrary is growing at a rate of about 0.5% per year. Rough projections indicate that coal could be the main foreign exchange earner in the mineral industry beyond the year 2020. Coal is worthy of attention from an environmental perspective because there are several externalities associated with its life cycle. In relation to trade issues greenhouse gas emissions from coal combustion are potentially the most important. Greenhouse gases are becoming increasingly tightly regulated internationally which makes coal exports potentially vulnerable to environmentally induced changes in global demand.

The market for coal is therefore one which may well be affected by global environmental concerns. Other factors also impact on the trade of South Africa's coal. These include the low sulphur composition of the coal which has environmentally based trade implications, and the local environmental impacts of coal production which may affect the country's competitiveness in the international coal market. For these reasons coal has been chosen as one of the case studies. A final issue that will be discussed in relation to South Africa's coal sector is the downstream dependence of the country's electricity generating industry on cheap coal.

With coal being the primary source of electricity generation in the country the very cheap electricity available to industry produces very large levels of greenhouse gases in its production cycle. Low cost electricity is in turn an input to many South African exports. While not an issue directly affecting the coal export sector this is of potential concern to exporters dependent on cheap energy. The implications of the dependence of South African exporters on energy intensive production processes will be raised in the coal case study and taken further when looking at the second sector, steel manufacturing, itself a high user of electricity.

The distinction between the two lines of investigation raised by the coal sector need to be kept clear. The first issue is whether South Africa's coal exports are vulnerable to any environmentally induced trade pressures. These could include such issues as changes in global coal demand due to international conventions on greenhouse gases, or pressure on local producers to meet international environmental standards. The second issue is whether the country's energy producing sector as a whole is vulnerable to trade related measures due to its dependence on coal as an input and the corresponding high levels of greenhouse gases emitted per unit of energy. This includes the concern that energy intensive industries 'downstream' are vulnerable to trade related measures due to South Africa's low electricity prices and high greenhouse gas production.

5.2 Basic Iron and Steel Manufacturing

The basic iron and steel manufacturing industry has been chosen for a number of reasons. It is an important exporting sector, with South Africa being the world's tenth largest steel exporter and with steel exports contributing between 10% and 20% of South Africa's total manufacturing exports. The industry as a whole has been shown to be vulnerable to trade related measures (such as anti-dumping measures and countervailing duties), although these have not been based on environmental criteria yet. Steel production is both energy intensive with global environmental impacts (relating to the previous discussion on possible threats due to cheap electricity) and has other significant local environmental impacts which also seem to make it worthy of attention. Finally, the previous survey outlined above (Bethlehem, 1997), suggested that the industry was concerned about environmentally based trade threats.

5.3 The Citrus Industry

The citrus export industry has been chosen as a case study because there is evidence that it has been affected by environmental concerns in export markets which have led to changes in production methods by the local industry. The case study is aimed at evaluating the trade pressures related to these changes and assessing the economic and environmental impacts of these measures. The industry has shown that it can respond to trade and environment challenges and this experience may be useful for other export sectors.

PART II: CASE STUDIES OF TRADE AND ENVIRONMENT LINKAGES

6 COAL PRODUCTION: FOSSIL FUEL EXPORTS IN THE GLOBAL GREENHOUSE

Coal's important role in the South African economy has already been noted, with coal being South Africa's second largest export after gold. Therefore any factors which will negatively impact on coal exports have important repercussions for the economy. As an extractive industry coal mining is by its nature environmentally damaging. Not only is the production of coal damaging, but the use of coal also has a range of environmental impacts associated with it. The major negative externality of global concern from coal use is the release of carbon dioxide, the major greenhouse gas, as a result of coal combustion. Coal is thus potentially vulnerable to trade impacts from two environmental perspectives, the *process* or production side (due to impacts of coal mining) and the *product* or consumption side (due to emissions of greenhouse gases).

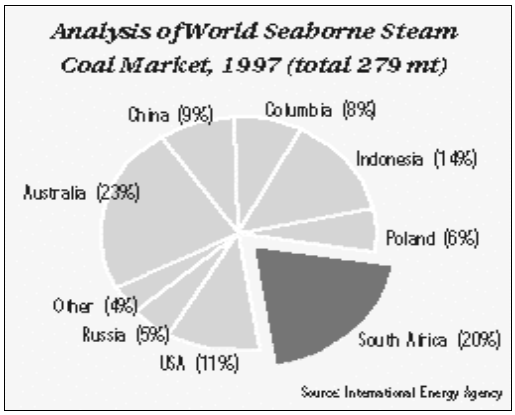
A further issue of concern to South Africa is that coal is the key primary input into the country's energy production. Coal is used for over 90% of electricity production and is also the major input into the SASOL oil-from-coal process which produces a large share of the country's liquid fuel needs. Because many of the externalities associated with coal's life cycle are global in nature, those industries that are downstream users of energy from coal may be vulnerable to the imposition of green environmental restraints on trade. There are particular fears in this regard because South Africa fails to internalise many of the costs of its environmental externalities into energy prices and hence may be seen as providing energy intensive domestic industries with an 'environmental subsidy'. Possibilities exist for countervailing actions against these industries. In addition, any action to reduce its greenhouse gas emissions, whether voluntary or otherwise, taken by South Africa in response to the global climate change negotiations will affect the coal industry and the industrial sector broadly.

The *first* aspect of the coal case-study will look at the process impacts of coal mining, in other words production externalities and will provide a brief assessment of whether exports may be vulnerable to trade restrictions aimed at leveling the playing field amongst coal producers. The *second* aspect will consider whether the world demand for coal will be affected by responses to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol under the Convention. The *third* part of the study will briefly look at the issue of whether the coal industry is responding to these future challenges by exploiting possible opportunities under the Kyoto Protocol and other international conventions. Finally, the *fourth* part will provide an overview of externalities from the country's electricity generation industry. This will give some insight into whether the country may be vulnerable to green trade restrictions on the basis of high greenhouse gas emissions and artificially cheap electricity. This last part will feed into concerns expressed in the steel industry study that the industry may be vulnerable to such restrictions.

6.1 South African Coal Export Data

South Africa is an important player in the world coal market. The country's share of the world export market for seaborne steamcoal was about 20% in 1997 (see Figure 3.).

Figure 5 South Africa's Share of the World Seaborne Coal Market (IEA, 1999)



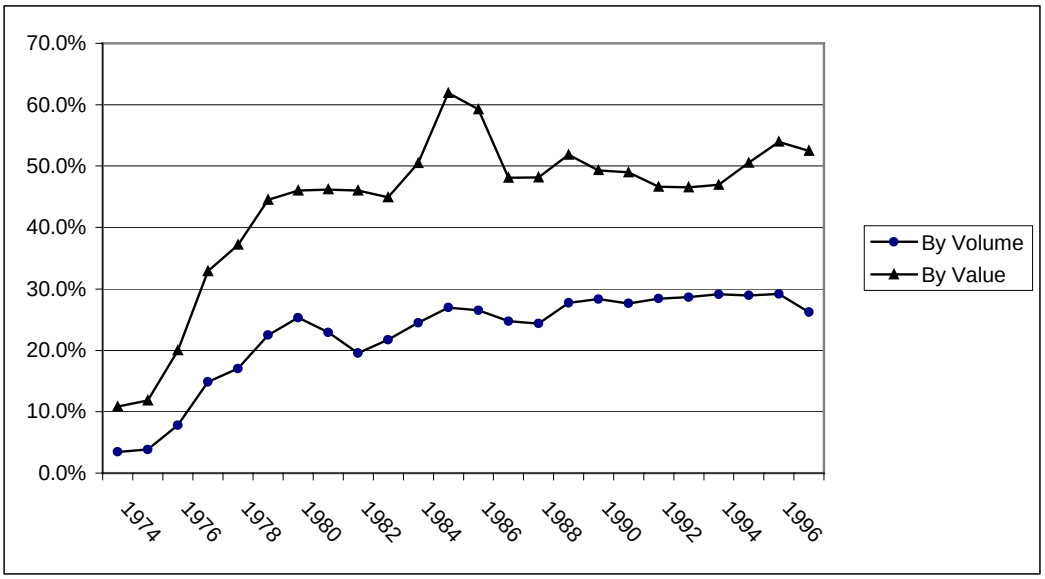
These substantial exports of coal are predominantly to Europe and the Far East, with smaller amounts exported to the Middle East and South America (see Table 7). As will be discussed later the customer profile of South Africa's coal has large implications with respect to future impacts of environmental issues.

Table 6 Percentages of South African coal exported to the regions of the world, 1993 (AES, 1995).

REGION	PERCENTAGE EXPORTED
European Union	52.5
Far East	36.4
USA	0.2
Middle East	7.1
South America	2.6
Rest of Europe	1.1

The final issue of importance is that a general rising trend in total coal production and exports has been evident over the last 25 years, with exports growing from about 11% to 52% of the total value of coal production over the period considered (see table 8. below).

Table 7 Annual Coal Sales from South Africa - Percentage of Coal Exported, 1974-1997 (based on data from the Chamber of Mines Online Database, 99)



6.2 Coal Production Externalities: Is the Industry Vulnerable to Trade Restrictions?

Is what appears to be such a dominant export sector vulnerable to environment related trade impacts? The first possible impact on coal exports is customer concern about the method of coal production. As reported in the industrial survey above (Bethlehem, 1997) there have been some informal enquiries to coal companies about their environmental performance. A brief assessment of the possible externalities from coal mining is presented below (Table 9.). If South African coal producers failed to internalise a large proportion of their externalities from coal production there would be some grounds for external pressure on the industry. This pressure could be on the basis of customer concerns about purchasing products that have caused environmental damage or on the basis of competitors attempting to 'level the playing fields' in terms of trying to force South African producers to meet higher environmental standards (such as those that may be found in developed countries).

Table 8 Externalities in the coal life cycle (indirect impacts italicised)

STAGE IN THE IMPACT PATHWAY	IDENTIFIABLE IMPACTS
Mining of coal	• Occupational health hazards e.g. respiratory diseases due to prolonged exposure – higher morbidity and mortality rates • Air pollution – dust, airborne particulate matter, methane • Water pollution – groundwater pollution and surface run-off • Loss of productive land above underground mines through surface subsidence • Land pollution , visual intrusions and landscape destruction • Seismic disturbance and potential surface subsidence
Transportation and processing of coal	• Transport accidents • Air pollution and visual intrusions – particulate and aerosol particles mainly sulphates in the size range 0.1 –1.0 um • Effluents and solid waste e.g. water contamination from coal beneficiating plants.
Power generation	• *Water consumption* • *Air pollution resulting in health impacts, impacts of acidic disposition through SO_2 release and visibility impacts.* • *Water quality impacts* • *Greenhouse gas emissions – $N0_x$ and $C0_2$* • *Aesthetic impacts of large power generation* • *Effluents and solid waste*
Coal dumps and waste	• Spontaneous combustion resulting in methane emissions that contributes to greenhouse effect. • Coal dust • Particulate emissions • Water pollution from leachate
Coal as source of fuel to industry and households	• *Greenhouse gas emissions, effluents and particulate, eg. steel industries* • *Coal combustion for steam generation and industrial energy requirements, coal gasification for the production of metallurgical coke and 'syn-gas', domestic coal combustion for space heating all result in gaseous emissions.*

An unpublished study which looked at the externalities from coal mining in South Africa concluded that under existing legislation, and due to market and peer pressures many potential externalities are already being responded to by the South African coal mining industry. While the study was cautious about placing a specific value on the cost of internalisation of environmental externalities it made some rough estimations. For example rehabilitation costs appeared to be in a range of R1 to R30 per ton of coal while the cost of cleaning polluted water seemed to vary from R0.28 to R2.80 per ton of coal. This represented a cost of 0.5 to 5.3 % of the selling price of coal. Most importantly the study concluded that to a large extent these local environmental costs were already internalised in the current mining operations.

The study also attempted to assess the reasons driving environmental performance in the coal industry and the improved environmental performance demonstrated by South African coal firms. The increasing strength of local legislative pressures was recognised as one of the forces behind improvements. It was suggested however that another important driving forces for the internalisation of externalities in the industry was international market forces and local peer pressure. This assessment was based on the observation that, "international pressures, local peer pressures and anticipated increasing pressures from the authorities have caused the mining houses to introduce Environmental Management Systems for their operations. These systems aim to ensure that corporate goals are being adhered to and that local legislation is being met. This trend is leading many companies to recognise the high risk to which they are exposed if they do not meet international norms." (AES, 1995). Thus based on this assessment international market pressures, alongside local legislation, play a clear role in improving local environmental performance.

Information from industry sources in general supported this assessment. However, industry representatives placed a greater stress on the domestic need to meet relevant laws rather than simply meeting such laws to avoid pressures from their international markets. They pointed to the increasing stringency of local environmental legislation and the need for large coal mining companies to meet this legislation in terms of their own environmental management system requirements. In the one case where a coal firm was audited for environmental compliance by a customer this was done by a local customer, Eskom, in order to satisfy the utility's environmental management system requirements. The companies did acknowledge that international exposure, such as foreign stock exchange listings, created additional pressures to ensure compliance with environmental legislation, although this was not necessarily trade related.

Some evidence for the contention that export market pressures are important in promoting environmental improvements

is that small coal mines tend to have worse environmental performance than the larger firms. These smaller mines are less exposed to international pressures and to global markets and the pressure to be internationally competitive. While this assessment is based on superficial evidence it appears to have some merit. At the same time these observations are based largely on outsider impressions of the industry, further research into the drivers of environmental performance in the coal industry will provide greater clarity on the role of international pressures for improved performance transmitted through South Africa's coal trade. From the opposite perspective there is also no clear evidence that inadequate environmental performance has led to loss of market share. Again, more detailed industry level research is required here.

There is one environmental issue that works in the favour of South African coal producers. This is the low level of sulphur found in much South African coal. This coal is particularly valuable for those importers, primarily in developed countries, who are required to meet sulphur emission standards. A lower sulphur content coal makes it easier and cheaper to achieve such standards and confers a premium on the price of such coal. Of course this is a natural advantage and does not depend on local producers environmental controls but it nevertheless demonstrates an interesting trade and environment linkage in the coal sector that has worked to the country's advantage. The advantage is a comparative one and difficult to quantify and the discovery of other low sulphur coal deposits elsewhere obviously undercuts it. For example certain coal deposits in Indonesia have a sulphur content of less than 0.1% by weight, significantly lower than the South African 'low-sulphur' coal. This is being marketed by Indonesia as 'Envirocoal' with the USA targeted as a likely destination due to stringent sulphur controls in that country (Goldstein, 1993, referenced in Lewis, 1993).

Although it appears that the need to conform to international standards does influence local coal producers' environmental management approaches to a certain degree there a no indications that this will be formalised into common global industry-wide environmental standards. While certain customers may request compliance with environmental management systems it seems unlikely that international market access could be limited through formal restrictions on South African coal due to inadequate domestic environmental performance. There are no strong indications that South African producers have greater environmental impacts than the international norm and in any event it is unlikely that under current World Trade Organisation rules restrictions due to domestic production methods would be allowed.

6.3 Coal Exports: Does the Kyoto Protocol Affect Demand for South African Coal?

While the impact of international market restrictions related to domestic environmental performance remains unclear, particularly formal trade restrictions given current WTO approaches, a less avoidable threat is the shrinking of the *entire* global market due to environmental concerns. Since coal combustion is one of the major contributors to greenhouse gases, global reductions in such gases, such as those committed to under the Kyoto Protocol, will have a potentially enormous impact on the coal industry and hence on South Africa's future trade in coal.

According to the USA Department of Energy (DoE, 1999) world coal trade is projected to increase from 530 million tons in 1997 to 659 million tons in 2020, accounting for approximately 9 to 10 percent of total world coal consumption over the period. Steam coal accounts for most of the projected increase in world coal trade. However in the industrialized countries, a major issue for the development of energy markets appears to be the possible impact of the Kyoto Protocol on Climate Change, which would require reductions or limits to the growth of carbon emissions within the Annex I countries (essentially the major industrialised countries) between 2008 and 2012, resulting in a combined 4-percent reduction in emissions relative to 1990 levels. By March 1999, 83 countries had signed the Kyoto Protocol; however, none of the Annex I countries had ratified it by the time the DoE's most recent International Energy Outlook (*IEO99*) was prepared. If the Kyoto Protocol enters into force, it could have profound effects on the use of energy in the industrialized world and it is likely that the coal outlook for the industrialized countries will differ substantially from the *IEO99* business-as-usual projections (DoE, 1999).

The difference between current trends in coal use and those envisaged under a new regime imposed by the need to reduce greenhouse gas emissions will present itself as reductions in coal consumption in Annex 1 countries. As Box 1. below indicates some South African analysts are already expecting reduced demand in some of South Africa's key export markets due to global warming concerns.

Box 1. Pressures on Coal Exports from South Africa

Coal Faces a Tough Year
(Article extract from *Mining News,* March 1999 edition.)

The South African coal mining industry faces difficult challenges in 1999, despite record coal export volumes in 1998..... Also, more stringent environmental legislation (eg. limits or proposed taxes on carbon dioxide emissions) within European Union countries has reduced the rate of increase in coal demand and usage as an energy source, which has increased consumer bargaining power, all of which, translates into downward pressure on the delivered steam coal export prices.....

The approximate volumes of coal imported by the top eight importers from South Africa are shown in Table 10. below. These eight purchasers consumed about 68% of South Africa's exported coal in 1993. As can be seen from the table a substantial proportion of the customers for South Africa's coal is made up of those countries who have committed themselves to greenhouse gas reductions under the Kyoto Protocol.

Table 9 Top eight importers of South African coal, Kyoto Protocol Annex 1 countries highlighted, 1993

IMPORTER (in descending order of volume)	AMOUNT IMPORTED (million metric tons)
1. Taiwan	5.8
2. Spain	5.3
3. Japan	4.9
4. Holland	4.6
5. South Korea	4.5
6. Hong Kong	4.2
7. Germany	4.1
8. Denmark	3.1

Based on an assessment of the destination of much of South Africa's coal the indications are that the Kyoto Protocol implementation could have serious impacts on the country's exports. While rigorous analysis will be necessary to quantify these impacts indications from modelling work done elsewhere give some idea of the possible effects on the industry. The Australian Bureau of Agricultural and Resource Economics (ABARE) have developed an economic model, the MEGABARE model which is a multi-commodity, multi-region, inter-temporal, computable general equilibrium model designed to conduct research on issues facing the global economy, including the impacts of climate change policies. This model has been used to run simulations of greenhouse gas reductions in the Pacific rim countries.

The simulation results from the ABARE model indicate that action to reduce carbon dioxide emissions in Annex I countries could have significant impacts on the consumption of coal and other fossil fuels in these economies. In order to meet the uniform emission abatement target of the simulation, carbon dioxide emissions in Annex I countries in 2010 must fall by 18 per cent relative to the reference case. Under the terms of the Kyoto Protocol, the required reductions in emissions would be even higher.

The emissions reduction has a large impact on the contribution made by coal to power generation in Annex I countries. As the cost of using coal increases under an emissions abatement strategy, Annex I countries substitute away from coal toward less emissions intensive fuels, especially gas and renewable energy. The extent of this substitution depends on the importance of coal in the baseline fuel structure and on the potential for other fuels, such as renewable energy, to cost effectively increase their share of total electricity generation. As a result of the changing structure of industrial production in Annex I countries and the shifts in electricity fuel shares, the demand for fossil fuels declines. As the most carbon intensive fossil fuel, coal experiences the largest fall in consumption by 2010 compared with the reference case scenario. Total demand for coal in the Annex I countries in 2010 is around half its level in the reference case. This amounts to a reduction in coal consumption of around 600 million tonnes. Under the actual Kyoto outcome, the decline in consumption might be even greater as emission reduction targets in Japan, the United States and Canada are more stringent than represented in the simulation.

The model indicates significant differences in the way in which countries' production and exports of coal respond to the Annex I stabilisation scenario. Coal production in some countries contracts as a result of declining demand from other Annex I countries and declines in own consumption. For example in the United States, most coal output is for domestic consumption and therefore suffers as a result of the contraction in domestic economic activity, especially the production of emissions intensive commodities. Canadian output also contracts because more than half of its exports are to the

United States and Japan where the demand for coal declines. However while Australian production also contracts, the country's output of coal is less sensitive to emission abatement policies because a high proportion of its production is for export to non-Annex I countries where less abatement action is undertaken.

Pertinent to South Africa are the results for Indonesia. Indonesia's coal production in 2010 is lower than in the reference case as export markets are a more important source of demand than domestic consumption and a significant proportion of exports are to Annex I countries where demand for coal declines. (Schneider *et al*, 1998). South Africa is in a similar export position (although a significant proportion of coal produced is used domestically) and may suffer the same fate under a post-Kyoto trading regime. This is an issue that may have major implications for the South African industry and deserves further attention.

Local coal producers are well aware of the negotiations underway under the UNFCCC. However they have not made any formal attempt as yet to assess the possible impact of these negotiations on the demand for coal from their major markets. Most projections of future coal sales are based on historical experience and assume a slowly increasing world market as seen over the recent past. It appears that this may be an overly sanguine view, especially given that the major markets for South Africa coal are those countries most likely to ratify the Kyoto Protocol. There is already experience of carbon taxes, and other less specific energy taxation, in Europe which will in all probability have an impact on the growth in coal demand.

6.4 Responses by the South Africa Coal Industry to Protect their Trading Position

The environmental management approaches with respect to local environmental performance by the coal sector have been discussed above. With respect to changes in global coal markets there seems to be limited coal industry response to the trade and environment issues potentially affecting the sector. In general it appears as if the major exporters, while aware of the threats to traditional export markets, are adopting a wait-and-see attitude. Their response is based partly on the view that there is often a significant lag between policy and action and the industry will assess direct actions, rather than policy discussions, before making major changes. In addition the coal industry may be more deeply affected in the short term by other changes in the industry such as the move to more flexible supply and pricing contracts driven partly by changes in the structure of power generation and deregulation of the energy industry in the main countries to which they export coal.

These changes in coal export markets may mean that the South Africa coal industry will increasingly have to look for non-traditional markets to export to. The changes in world market demand that adoption of the Kyoto Protocol will bring may simply add to this move to new markets, probably largely to developing and newly industrialised countries. The view was expressed by an industry representative that there may be advantages from the Kyoto Protocol in terms of expanding sales to less developed countries. This is because these countries may be able to expand capacity to a greater degree than developed countries since they are not faced with carbon emissions caps. Although there is some validity in this argument it is not certain that the Kyoto Protocol will lead to greater energy growth than without it in developing countries, especially if developed countries demand developing country carbon reduction commitments as a condition for ratification of the Protocol.

Some steps have been taken to address changes than may be brought about by current climate change negotiations. Avenues forward that have been considered include forward integration into the energy sector (such as working with electricity generators on more efficient coal use for power generation). There is also some ongoing research into coal-bed methane capture. However this is being looked at primarily for safety reasons and as a financially viable proposition in and of itself and not as a means to access international funding devoted to greenhouse gas abatement. For example it does not appear that the coal industry has rigorously considered their eventual participation in such international instruments as the Clean Development Mechanism under the Kyoto Protocol. This is a possible area for further research.

Finally the industry representatives suggested that there has been little support from government to address these issues. In comparison to other major coal exporting nations, such as Australia, there has been almost no research done by government to assess the impact of these environmental issues on the coal sector.

6.5 Can Energy Externalities be Viewed as Implicit Subsidies to Industry?

The final issue that will be briefly looked at under the coal sector is whether South Africa may be vulnerable to green trade restrictions on the basis of high greenhouse gas emissions and artificially cheap electricity. The electricity sector plays a central role in the South African economy as the supplier of a key input to the industrial, mining and commercial

sectors, as an employer and as a service provider for households. Eskom is one of the largest electricity utilities in the world. Of the South African domestically consumed coal, about 94% is used by three industries, Eskom (electricity generation), Iscor (steel production) and Sasol (synthetic fuels). Eskom's electricity generation accounts for nearly 85% of the total electricity generation in Southern Africa and roughly 50% of the total generated in Africa (Petrie, 1996).

Significant environmental impacts ranging from air to land pollution are generated from Eskom's power stations and also by the mines supplying coal to Eskom. The contention that South African industry has an unfair advantage due to artificially cheap electricity can rest on two arguments. The first is that *domestic* external costs are not internalised by the supplier and the second that *global* costs are not internalised. The first argument would suggest that low electricity prices are 'hidden subsidies' to local industry due to lax environmental legislation and the response could conceivably be in the form of countervailing duties. The second argument is one that is being dealt with under the global negotiations underway under the UNFCCC and one which will probably result in more wide-ranging responses, including possible trade related responses.

To assess the first argument one can consider the relative performance of local power generators compared to international levels. For example, a comparison of the emission levels from Eskom's power stations with levels which apply to similar facilities in other countries. Table 11 compares Eskom's environmental externalities in the Eastern Transvaal Highveld region (ETH) with other countries with similar plant facilities to Eskom (although it must be noted that these countries are high-income countries which may well have higher environmental standards than other middle-income developing countries like South Africa). From the table a number of observations can be made. Eskom's dust emission levels are twice that recorded by similar plants overseas in spite of its current dust removal system. The ETH's wet sulphate levels (an acidic pollutant) are twice that of Pennsylvania, USA, which has a similar power generation density and emissions of such pollutants as oxides of sulphur and nitrogen (S0x and N0x) far outweigh that of countries like Australia, Germany, Japan and USA who are South Africa trading partners. On the other hand, the South African dry sulphate and wet and dry nitrate (all of which result in acid rain) deposition levels are globally comparable.

Table 10 International comparison of South African emissions from electricity production (Petrie, 1996)

POLLUTANT	ESKOM EMISSIONS	OTHER COUNTRIES	COMMENT
Dust	100mg m^{-3}	50 mg m^{-3} (Europe, Japan & USA)	• Eskom dust removal efficiency range from 96% to 99.89%. • Despite this efficiency, best emission by Eskom almost twice that recorded by similar plant overseas. • Dust emission from other industrial processes which burn coal (petrochemical, steel making etc) likely to be considerably higher than Eskom.
Acidic Pollutants Wet Sulphate	-	-	• Acidic pollutants expressed in terms of bulk sulphate and nitrate deposition. • The highest Wet Sulphate levels in ETH nearly double those reported in Pennsylvania, USA where there is equivalent energy generation density.
Dry Sulphate	10$kgh^{-1}y^{-1}$	<1$kgh^{-1}y^{-1}$ to 20$kgh^{-1}y^{-1}$	
Wet and Dry Nitrate		25ugm^{-3} (California)	• ETH generally less than industrialized sites elsewhere in the world because of a general low contribution from the transport sector.
SO_x*	2000-2500 mg N m^{-3}	2000 (Australia) 400 (Germany) 223 (Japan) 1240 (USA)	• SA highest emitter of SO_2: 82%, 90%, 45% higher than Germany, Japan and USA respectively but comparable to Australian emissions.
NO_x*	600-700 mg N m^{-3}	500 (Australia) 200 (Germany) 411 (Japan) 475-620 (USA)	• SA highest emitter of SO_2: 23%, 69%, 37% and 16% higher than Australia, Germany, Japan and USA respectively but comparable to Australian emissions.

*Comparison of emission target for new power plants and current Eskom emission levels

From this very superficial comparison in some respects therefore it appears as if South African electricity is generated in a manner which produces greater environmental externalities than similar generation in developed countries. However a much more rigorous assessment of this statement needs to be made before definitive conclusions can be

drawn on this issue. Not only does more information need to be gathered but caution needs to be taken when translating emissions levels into environmental impact. In addition, even for the same *physical* impact the economic *value* of the impact may be different in different locales. This makes direct comparisons very difficult.

The primary study that has taken these above issues into account and considered the external costs of South African electricity generation is van Horen (1996). The results of his research are summarized in Table 12. below. This serves as the current reference point for external costs from the industry and provides a rough idea of environmental costs in the electricity cycle and whether they are internalised in the electricity price or not.

Table 11 Valuation of externalities from coal-based electricity generation in South Africa (Van Horen, 1996)

VALUATION CRITERIA	**AMOUNT (in millions of Rands)**			
	Low Estimate	**Medium Estimate**	**High Estimate**	**Comments**
Morbidity and mortality in coal mines	16.1	23	32.2	• Fatality rates for coal miners supplying coal to Eskom power stations was 0.156 per GWh produced, equivalent to 23 deaths in 1994.
Estimates for injuries in coal mines in 1994.	0.73	1.54	2.375	• Costs consists of medical costs, lost productivity and state compensation payments to injured workers.
Valuation estimates for water consumption externality effects.	120.8	185.8	250.7	• Cost attributable to nine coal mines. Based on economic cost of using water at R1.50 per m^3 (central estimate) with low and high estimates of R12 and R1.8 per m^3 respectively.
Valuation of morbidity and mortality from power stations emissions in 1994	582.7	804.9	991.6	• Based on nine coal mines supplying ESKOM • Valuation based on opportunity cost approach. Computer modeling tool EXMOD used. EXMOD originally used for New York State study but customized for SA. Used data of the main elements in the impact pathway: air emissions, wind patterns, demographics, dose-response functions and valuation data.
Valuation of damages from greenhouse gas emissions.	2 257.2	11 432	17 148	• Based on SA power stations emissions of greenhouse gases using low, central and high estimates of R18, R80 and R120 per ton of CO^2. Basis of the study is Working Group 3 of the Intergovernmental Panel on Climatic Change (IPCC).

It is evident from Table 12 that of the unit damage costs, global damage costs attributable to greenhouse gases emissions from South African power stations outweigh the other costs. For the central estimates, the external cost of greenhouse gas emissions is in the region of 7.7c/KWh. This is very significant in relation to the current electricity prices, making it difficult to internalize such costs into the price of coal-fired electricity, since there is no benefit for South Africa of doing so if other emitters of greenhouse gases do not follow suit (a typical 'free rider' problem).

The burden of chronic and acute illness amongst the general population which results from air pollution emissions from electricity generation was also estimated. This includes acute and chronic respiratory illness, lost productivity and other costs and can be seen to be the largest domestic externality from electricity generation, at a medium estimate of R805 million. The occupational health and safety impacts were also valued. However in economic terms it can be seen that the cost of morbidity and mortality in coal mines (R23 million) is insignificant relative to the damage resulting from greenhouse emissions (R11 billion) for the central estimate. This supports the viewpoint identified previously that secondary emissions including greenhouse gases emissions will probably have the most important impacts when considering trade and environmental linkages.

The key issue of whether South African electricity prices internalise the external costs was addressed by van Horen (1996). The results are summarised below in Table 13. which shows the impact on electricity prices if the external costs were to be incorporated into the electricity price. A large proportion of these costs are global costs, but even without these costs the central estimate suggests that a 7% increase in the current tariff would be required to internalise the costs of domestic externalities.

Table 12 Externalities as a percentage of Eskom's tariffs, 1994 (from van Horen, 1996)

	LOW ESTIMATE	CENTRAL ESTIMATE	HIGH ESTIMATE
Coal mining: injuries and mortalities	0.1%	0.1%	0.2%
Generation: water consumption	0.7%	1.0%	1.3%
Generation: air pollution and health impacts	3.1%	4.3%	5.3%
Generation: greenhouse gases	13.9%	61.6%	92.5%
Nuclear: fiscal subsidy	1.7%	1.8%	5.9%
Total	**19.5%**	**68.9%**	**105.3%**

The global externalities, however, are clearly the most important in economic terms. Whether they are as important in practical political and trade terms is unclear at present. Because it is regarded as a developing country under the Kyoto Protocol South Africa has been shielded thus far from making formal commitments to reducing greenhouse gas emissions. This space to continue with high emission levels may be reduced as developed countries increasingly demand evidence of progress from developing countries in combating global warming as a pre-requisite for their own climate change commitments. In addition international competitors in developed countries will probably strongly resist losing trade advantages to developing country competitors due to higher energy costs imposed by climate change mitigation actions. How this resistance will manifest itself is not yet apparent but certainly the energy intensity of production in developing countries, such as South Africa, will be a key area of scrutiny. If South Africa is forced, by political or economic pressure, to begin internalising some of the global energy externalities it may lead to higher energy costs, lower energy demand and hence lower demand for coal, the country's main primary source of energy.

South Africa may be especially vulnerable in this regard. South Africa was responsible for 1.2% of the world's greenhouse gas emissions in 1988, which made it the 18th largest emitter in the world and one of the largest sources on a per capita basis (Van Horen, 1995). The table shows the bulk of these emissions come from electricity generation and petrol and oil refining. The former from coal-fired electricity stations and the latter being largely from South Africa's coal-based oil production process carried out by SASOL. The country's dependence on coal as a primary energy source is thus very clear. The resulting greenhouse gas emissions are a source of one of the country's major global environmental externalities. The country has the 32nd highest carbon dioxide emissions per capita in the world, greater than such high-income industrialised countries as Italy, Austria and Sweden, and well above most countries of a similar development level such as Brazil or Chile (WWF, 1998). In 1994 it was estimated that South Africa used 5,5 times more energy per unit GDP than France, 3 times more than the USA, 4 times more than the UK, 7 times more than Japan and 5 times more than Germany, which are some of the country's major trading partners (World Development Report, 1994). South Africa may well have pressure brought to bear on it to make some commitments under the UNFCCC to stabilising greenhouse gas emissions, or at least reducing the rate of growth of emissions. This could affect one of the areas of comparative advantage available to local exporters, cheap electricity.

Due to a range of factors Eskom has been able to keep the cost of electricity very low and South Africa has very cheap electricity in world terms. There have therefore been few incentives to industry to minimise energy consumption and consequently South African industry remains highly energy intensive. In fact there are some industries where Eskom offers particularly low cost electricity for production purposes, such as aluminium production at the Richards Bay Alusaf smelter. There is also little scope for competition by cleaner energy sources, such as renewable energy.

While there is as yet no specific evidence of high energy intensity of production being used as a formal restriction on trade, for example as a rationale for countervailing tariffs, the issue is beginning to enter the world trading system. Certain eco-labels, such as those on cut flowers in Holland, already incorporate energy use as one of the criteria for evaluation (Verbruggen *et al*, 1995). In terms of 'voluntary' instruments like eco-labels therefore South Africa industry could find its access to foreign markets restricted, especially those in environmentally aware developed countries. These instruments may also act as a precedent for the extension of energy efficiency into more formal areas of trade restrictions. Therefore South Africa may be affected by the global warming in two ways. The first being a reduction in the cost advantage available to high energy use industries and the second being increasing barriers to trade, through legislated or informal means, for exports with a high energy component of production. This issue is taken further in the next case-study.

7.0 STEEL EXPORTS: COULD ENVIRONMENTAL ISSUES BE THE NEXT TRADE BARRIER?

7.1 Introduction

There is in principle no reason why the objectives of trade and sustainable development should be exclusive, and as Brack (1998) suggests, an inherent compatibility is in fact suggested by the theory of comparative advantage. Trade allows for specialisation in the production of goods and services in which countries are relatively most efficient. The optimisation of production by countries within a context of restricted inputs, the removal of distortionary subsidies and pricing policies and improvement of efficiency of resource allocation are advantages of trade that can hold benefits for the environment. Higher growth rates associated with trade help generate the resources needed for investment in environmental protection and cleaner technology (Brack 1998).

Trade however holds various negative implications if environmental regulations or management strategies are not in place. Negative social externalities associated with trade and growth include resource depletion and increased pollution which again has implications for public welfare.

The South African steel industry is used here to illustrate the importance that trade-related environmental measures may hold for developing economies in future. The steel industry is an important one for South Africa in terms of employment, GDP and foreign exchange. Local steel producers are currently under threat from restrictive trade practices and have been accused of dumping steel on the global market. Steel producers in importing countries assert that historical subsidisation in the steel industry is causing international trade distortions lending South African steel producers an unfair competitive advantage. There are some indications that environmental issues could be used in a similar fashion to erect protectionist barriers and this case study considers this issue.

Various calls have been made for countervailing and anti-dumping duties to be imposed against South African producers over the last few years. Environmental regulation, as an antidumping measure, has become a hotly debated topic in both trade and environmental circles. Counter-arguments have been made that the motivation for such actions is protectionist in nature. It is however crucial that South Africa's vulnerability to various trade measures be investigated. If there is a perception that South African producers are gaining a competitive advantage at the expense of stringent environmental policies of their international competitors, there is the likelihood that the injured parties may seek retribution from international trade or environmental forums. The impact that potential measures such as countervailing and anti-dumping duties may have for the economy as a whole therefore has to be considered.

South Africa is ranked the twenty-first largest steel-producing country in the world. In addition to this it is globally also the tenth largest net exporter of finished steel (Chatzitergou 1998). The steel industry is of considerable significance to the South African economy. It is a major contributor to the country's GDP and is important in terms of employment and foreign exchange earnings (Rosenthal 1998). The basic iron and steel industries contribute 16.9% to manufacturing exports in South Africa and within manufacturing production as a whole (which contributes 14.3% to GDP) the iron and steel industries contribute 7.2%. Table 1. below gives an indication of trends in Iron and Steel for the period 1997 to 1998.

***Table 13 Trend analysis - Semester 1 1998 compared to semester 1,1997 (*IDC, 1998)**

Production	Capacity Utilization	Employment	Exports	Imports
3.5%	1.2%	10.7%	⇑ 0.5%	⇑ 14.7%

Four steel companies dominate the South African industry: ISCOR, Highveld Steel, Scaw Metals and Davsteel. Of these the top two, ISCOR and Highveld Steel contribute almost 90% to total output. ISCOR is by far the largest producer with 75% of the South African market (Rosenthal 1998).

International growth in the steel sector is subject to strong competition for export markets. Growth in most markets has slowed down as a result of the spin-offs from the Asian currency crisis, which has led to reduction in output levels or price cuts. The contraction in demand ascribed to emerging market turmoil and increased external competition have dragged sectoral output to a level 0.3% lower than the year before (IDC 1998). The local basic iron and steel producers have further suffered due to high prime interest rates.

There has been a sharp increase in export earnings from Iron and Steel since April 1998. Local market consumption was 4-million tons of steel of which 0.3 million tons was imported while 2-million tons of local production was exported. In 1998 54% of steel produced in South Africa was exported (Chatzistergou 1998).

A combination of depressed international markets and insufficient domestic demand has had negative effects for South Africa's steel producers. Although exports were expected to benefit somewhat from the weak rand, the 23% decrease in net operating income for ISCOR for the six month period ending on December 31 1998 has been directly attributed to the collapse in international steel prices. Steel export prices have been at their lowest level in decades. Furthermore, domestic demand for steel products has been sluggish and is expected to decline (ISCOR 1999). South Africa produced 9.3 Million tones (Mt) in 1989 and ended 1997 on 8.0 Mt. This fourteen per cent reduction in domestic production relates to continuous rationalisation exercises that changed the production routes at the main producing steel works belonging to ISCOR's plants at Vanderbijlpark and Pretoria. The Pretoria plant has been mothballed; furnaces at VanderBijlpark have been closed down and significant retrenchment of labour continues.

The basic iron and steel industry is one of the main contributors to manufacturing production. It has however reported substantially lower average physical volumes of production over the last year, with physical volume of production for this industry dropping from 6.6% of total manufacturing production in 1997 to 5.8% in 1998 (IDC 1998). Although the proportion of total employment contribution to manufacturing has remained relatively stable at 4-5% of manufacturing employment, total employment in this sector has been declining (Rosenthal 1998). ISCOR's workforce has been reduced by some 30% during the last five years (ISCOR 1997). The decline in employment in the iron and steel industry has been attributed to automation, improved information and methodology, improved skill levels, and product rationalisation, indicating that adjustments by this industry to enhance competition play a prominent role in workforce reduction (Rosenthal 1998).

7.2 Environmental Impacts of the Steel Industry

Before turning to the trade, and trade and environment, aspect potentially affecting the industry an environmental profile of the industry will be presented. This will look at environmental impacts from the steel industry and also will consider whether South African steel production is significantly 'dirtier' than the norm in developed countries, South Africa's main export markets.

Steel has a positive environmental profile in many respects, particularly with regard to its recyclability, however the process of production itself can be highly polluting. Environmental issues facing the iron and steel industry may be national or transboundary and include air emissions, habitat protection, effluent discharges, safety incidents, and soil and groundwater contamination (UNEP&IISI 1997).

It should be noted that the environmental externalities associated with steel production are highly correlated with different steel products and more pertinently with the methods of production. Depending on the inputs used, technologies of production, and product types, the manufacture of steel products will have different environmental impacts on the environment. Factors that determine these impacts are the process stage, size and type of operation, the technology employed, and the nature and sensitivity of the surrounding environment. With regards to production processes, differing methods for producing a single product may not exhibit equal efficiency in waste reduction. Furthermore differing technologies of older and more recent plants often determine the degree to which companies have invested in capital equipment that prohibits environmental degradation.

Additional aspects that influence the quantities of waste produced, the level of environmental impacts and the abatement costs involved, are the effectiveness of the planning, pollution prevention, mitigation, and control techniques adopted (UNEP 1997). Formulating an environmental profile of the steel industry thus remains a complex task due to various contributing factors.

For simplicity environmental impacts of steel manufacture can be subdivided into three categories, namely atmospheric-, aquatic- and terrestrial impacts. Atmospheric impacts include particulate matter, ground-level ozone, nitrogen oxides, sulphur dioxide, heavy metals, organic emissions, radioactivity, carbon dioxide, CFCs, odour and noise. Effluent discharge may contain suspended solids, heavy metals, oils and greases, oxygen demand and organic compounds. Terrestrial externalities may be caused by disposal of refractories and sludge (UNEP&IISI 1997).

Raw material inputs for the process include iron ore, coal, limestone, recycled steel scrap, energy and a wide range of other materials in variable quantities such as oil, air, chemical refractories, alloys, refining materials, and water. Resource depletion in itself is one of the impacts generated in the iron and steel production process. In the table below,

pollutants associated with each process stage of steel manufacture and potential impacts of the release of these pollutants, as well as the problems associated with unsustainable consumption of resources, are discussed.

***Table 14 Pollutant releases and potential environmental impacts of steel manufacture (*UNEP&IISI, 1997)**

PROCESS STAGE	POTENTIAL POLLUTANT RELEASE	POTENTIAL ENVIRONMENTAL IMPACT
Raw Materials handling	Dust	Localized deposition
Sinter/Pellet Production	Dust (inc. PM_{10}) CO, CO_2, SO_2, NO_x, VOCs, methane, dioxins, metals, radioactive isotopes, HCL/HF, solid waste	Air and soil contamination, ground-level ozone, acid rain, global warming, noise
Coke Production	Dust (inc. PM_{10}) PAHs, benzene, NO_x, VOCs, methane, dioxins, metals, radioactive isotopes, HCL/HF, solid waste	Air, soil and water contamination, acid rain, ground-level ozone, global warming, odour
Scrap Processing	Oil, heavy metals	Soil and water contamination, noise
Blast Furnace	Dust (inc. PM_{10}), H_2S, CO, CO_2, SO_2, NO_x, radioactive isotopes, cyanide, solid waste	Air, soil and water contamination, acid rain, ground-level ozone, global warming, odour
Basic Oxygen Furnace	Dust (inc. PM_{10}), metals (e.g. zinc), CO, dioxins, VOCs, solid waste	Air, soil and water contamination, ground-level ozone
Electric Arc Furnace	Dust (inc. PM_{10}),metals (e.g. zinc, lead, mercury), dioxins, solid waste	Air and soil contamination, noise
Secondary Refining	Dust (inc. PM_{10}), metals, solid waste	Air and soil contamination, noise
Casting	Dust (inc. PM_{10}), metals oil, solid waste	Air and soil contamination, noise
Hot rolling	Dust (inc. PM_{10}), oil, CO, CO_2, SO_2, NO_x, VOCs, solid waste	Air, soil and water contamination, acid rain, ground-level ozone
Cold rolling	Oil mist, oil, CO, CO_2, SO_2, No_x, VOCs, acids, solid waste	Air, soil and water contamination, ground-level ozone
Coating	Dust(inc. PM_{10}), VOCs, metals (e.g. zinc, C(VI)), oil	Air, soil and water contamination, odour, ground-level ozone
Waste water treatment	Suspended solids, metals, pH, oil, ammonia, solid waste	Water/groundwater and sediment contamination
Gas Cleaning	Dust/sludge, metals	Soil and water contamination
Chemical Storage	Different chemicals	Water /ground contamination

Some of the impacts referred to in table 14 are primarily local. Soil and water contamination tends to be localized, except where rivers cross or form boundaries between countries. Externalities such as greenhouse gasses and ground level ozone, have implications for local environments and communities, but also cause transboundary pollution.

The coke-making process has been identified as one of the steel industry's greatest areas of concern. Major problems are air emissions and quench water. Atmospheric emissions from a coke plant works may be intermittent or continuous and are associated with the operations of under-firing, charging, pushing, quenching, conveying, and screening (EPA 1995).

The environmental impacts listed in Table 14 all result in some form of environmental degradation but often have additional health related implications. Emissions and effluent released and solid waste disposed of outside a plant have negative externalities. Besides posing health risks to employees working in a steel plant these externalities may effect the surrounding communities and may even contribute to transboundary greenhouse effects.

The exposure of steel-workers to pollutants generated within steel plants has been minimised due to development of processes and operating practices and training programs aimed at reducing these risks, over a long period of time. Although advances made in on-site risk reduction make it unlikely under present practices for employees to be exposed to levels of pollutants that will give rise to health problems, exposure to some pollutants still occurs (UNEP&IISI 1997).

7.3 Comparison Between Local and International Environmental Standards

7.3.1 Air Pollution

Emissions control requirements in developed countries, including most of Europe and Japan, stipulate the use of state-of-the-art technology, often with both emission standards and eventual ambient air quality standards. Stack height prescriptions (formula relating stack height to dispersion) are additionally used by some countries.

South African air pollution legislature is addressed partly in the Air Pollution Prevention Act, Act 45 of 1956 (as amended by Amendment Act 17 of 1973). According to this act any new proposal for a steel plant would be a "scheduled process" in terms of Part II of the Act (Process 30 - Iron and Steel works and Process 34 - Gas and Coke works) and will therefore fall under the direct control of the Chief Air Pollution Officer. A Provisional Registration Certificate for the operation and location of the steel plant has to be obtained [Section 9(1)(b)] from the Chief Air Pollution Officer (CAPO).

Permits issued by the CAPO may contain specifications (emission limits) as well as recommendations about processes used. Different criteria are used for old and new plants, the distinction being plants that were built before and after 1975. The Act (1989) requires that the "Best Practicable Means (BPM)" be used in the steel plant to reduce emissions. BPM involve the balancing of costs and benefits. It involves the assessments of industrial plant financial viability as well as environmental assimilative capacities and pollution abatement technological options (Pearce and Turner 1990). The terms for BPMs have to be negotiated with the CAPO [Section 10(2)] by each firm in order to obtain a permit. There is no standard BPMs prescribed for industry, and these negotiations are therefore largely determined by feasibility studies or cost estimates presented by each firm. The processes and cost estimates suggested by the firm are then subject to approval by the CAPO.

Terms of reference include setting minimum standards in order to ensure a safe environment, and negotiation of cost structure and technology purchases. Odour and visibility are also discussed within this framework (Pearce and Turner 1990). One of the difficulties with legislation using best practicable means is that there are no general standards for either emissions or ambient conditions. The implementation of BPM is entirely the responsibility of the CAPO. However there are guidelines for dust and selected other emissions, which are taken into account by the CAPO. These are compared to standards and guidelines used in other countries in Table 4 below (Boegman 1994).

***Table 15 A comparison of South African and international air pollution guidelines and standards (*UNEP, 1996)**

Country	Particulate/Dust (mg/Nm^3)	CO_2 (mg/Nm^3)	NO_x (mg/Nm^3)	SO_x (mg/Nm^3)
South Africa	50-120	-	-	-
Germany	50	-	-	500
Belgium	50 –100	250	200	50
Denmark	20-40	-	500	500 (SO2)
Pakistan	200-500	-	-	-
UK	25-140	-	400-3000	250-800 (SO2)
USA	12-50	-	-	-
Thailand	-	1000	1000-2000	400-700(SO2)

Note 1: concentration unit mg/Nm^3 [milligram per cubic meter at NORMAL temperature and pressure].
Note 2: These emission limits are averaged. In practice different limits are stipulated for different process stages/plants.

Table 4 above gives a reasonable indication of the range of standards adhered to internationally. Particulate emission standards in South Africa compare favourably with some countries, but are significantly higher than those of Germany and the USA. Although ambient limits for CO, NO_x and SO_x emissions are suggested by local legislation, no threshold levels are provided for end-of-pipe concentrations of these emissions. Table 4 nonetheless provides guidelines and standards set for iron end steel producers abroad, indicating the internationally acceptable concentrations for these emissions.

The most significant weakness present in the current structure is in the *execution* of air pollution control. Transparency on all aspects of pollution control, ranging from the extent of emissions through the width of implications of BPM to the control strategies, planning input and monitoring of implementation, is generally lacking (Cloete 1996).

Ambient environmental standards aim to maintain a level of environmental quality besides the regulation of actual discharges. Various countries impose ambient standards as a benchmark beyond which industrial discharges are not

allowed to diminish environmental quality. Formulas that account for atmospheric dispersion are used to determine the dilution that occurs at these discharge points, and hence the allowed concentration in the discharges (UNEP&IISI 1997).

In South Africa, the CAPO is also responsible for setting guidelines for ambient limits. As in the case with emission requirements, ambient limits have been developed as a guide to what is considered acceptable in South Africa, and in that sense may be compared to the standards for other countries. Table 5 shows ambient limits for South Africa in contrast with that of other in countries. These ambient concentrations are given for sulphur dioxide, nitrogen oxide and particulate.

Table 16 Comparison of ambient limits and standards (UNEP, 1996)

Pollutant	**Concentration (ηgram/m3)**	
	1 hour	**24 hour**
Sulfur Dioxide		
SA (corrected for site conditions)	730	365
Germany	400(1)	290
USA	--	365
Canada	900	300
Finland	500(1)	200
Italy	--	250
Netherlands	--	200
Switzerland	100(4)	--
Japan	300	120
WHO	750	100-150
Particulates		
SA	--	300
Germany	--	300
USA	--	150
Canada	--	120
Japan	200	100
Nitrogen Dioxide		
SA (total NOx of which 25% is NO_2)	600	300
Germany	--	200
WHO Guidelines for Europe (1987)	400	--

As can be seen in Table 5 above, South African SO_2 and NO_2 limits are generally much higher than these of international limits. Independent monitoring committees has been responsible for the gathering of data on industrial emission within respective areas. A source inventory (1993 results currently available) is available from the DEAT. At present there do not exist any stringent measures for immediately penalising companies that do not comply with permits. Yearly meetings are held between the CAPO and big firms, whereby the latter are notified if they do not comply with current technology and best available practices. If prescribed criteria are not met, a period of negotiation follows. If finally they still do not meet specific criteria, their certificate is cancelled, the consequences of which imply that such firms can then no longer operate (Loyd 1999).

7.3.2 Effluent standards

Regulatory authorities also control wastewater or effluent discharges. Both ambient quality and discharge standards are used. In South Africa effluent has been dealt with in two ways. Firstly, discharge to the sewer in which case the water quality is the responsibility of the local municipality. The latter will charge the specific company according to the treatment that the effluent requires (eg. for heavy metals). The Department of Water Affairs and Forestry's (DWAF) role is to see that the final level of water quality discharged into the watercourse complies with that stipulated by the permit.

Secondly direct discharge to a water source in which case firms need to comply with general and special standards as specified in the acts, Environmental Conservation Act of 1989 (Section 21 & 26) and the Water Act 54 of 1956. In terms of the Water Act of 1956 (Sections 12 and 21) and the Environmental Conservation Act of 1989 (Section 20), permits are required from the Department of Water Affairs and Forestry (DWAF) for the storage of raw materials. Section 12 of the Water Act of 1956 deals with use of water for industrial purposes.

The Minister may set conditions upon issuance of any permit, including issuance of permits for previous users. A permit may be revoked by the minister at any time if the conditions that apply to such a permit are not complied with. A requirement to implement pollution abatement measures proposed in the permit would probably be imposed by the DWAF as condition of the issue of the permits, for example, if the decision is taken to proceed with a steel plant on a proposed site.

South African effluent standards compare very favourably with that of international standards, as is evident in Table 6 below. It is however the enforcement of these standards that are a significant problem locally.

Table 17 Effluent standards for South Africa and selected other countries Source: UNEP, 1997

Characteristic (unit)	South Africa	Japan	Malaysia	Sweden
pH (pH unit)	6-9	5.8-8.6	6-9	-
Temp (°Celsius)	<30	-	40-45	-
Suspended Solids (mg/l)	10	200	50-100	5-10
Iron (mg/l)	0-0.3	-	1-5	0.5-1
Manganese (mg/l)	0-0.05	-	0.2-1	-
Lead (mg/l)	0.1	0.1	-	0.2-0.5
Mercury (mg/l)	0-0.02	-	-	0.005-0.05

The water act dealing with effluent will be replaced by the Act 36 of 1998 (The National Water Act). The new act is based on a Receiving Water Quality Approach (RWQA). In terms of the new act discharges into rivers will require environmental impact assessments. Rivers will be classified and standards will be determined by this classification (Einsted 1998).

The White Paper on a national water policy for South Africa outlines a program of resource monitoring, assessment and auditing. This includes the ongoing monitoring and investigation of resource use in different sectors, as well as, the auditing of sectoral resource use patterns and assessment of whether objectives are being reached. Further auditing areas that need to be covered are compliance with registration and permit conditions and achievement of objectives for resource protection and management.

7.3.3 Solid Waste Disposal

Land discharge conditions are applied to landfill facilities rather than the source of waste. Nevertheless, these conditions will be reflected in what the facilities will accept from their clients. Toxic slags, for example, must first be stabilised. Liquids are becoming less and less acceptable for land filling (UNEP&IISI 1997). Many governments are now requiring by law that companies clean up their sites that have been contaminated by seepage of chemicals and on-site disposals. This is often dealt with under specific “contaminated sites” legislation, or general environmental regulations. Although there has been no agreement or guidelines on “how clean is clean”, a number of countries have attempted to prepare guidelines for soil standards expected from successful clean-up operations (UNEP&IISI 1997). South African legislation requires that for the establishment or operation of any disposal site, a permit has to be issued by the Minister of Water Affairs and that the issuance of such a permit is subject to conditions as the Minister may deem fit [42].

7.3.4 Energy use

South Africa has a competitive advantage in terms of the cost of electricity. For example, electricity costs at ISCOR’s Vanderbijl plant are about 7.5% of input costs, compared with the norm of 14%-15%. Energy is provided relatively cheaply to local industry for various reasons, one being the result of a failure to internalise negative environmental externalities in the upstream production life cycle. The iron and steel industry further benefits from cheap abundant iron ore and coal. This enhances the industry’s competitive advantage in alloy and carbon steels, but not in stainless steel as it has to import nickel. Input costs for carbon steel are about 24% compared with overseas input costs of 30%. Input costs for local alloys are 45% of total input costs, compared to 52% internationally (Rosenthal 1998).

7.4 South African Industry Responses to Environmental Regulations

As a result of a lack of clear standards or specifications, as well as insufficient monitoring and control, there is little incentive for industry to upgrade production methods and invest in cleaner technologies. Local representatives of one of the major steel companies concluded that environmental performance of most South African steel plants are lagging

way behind that of international producers, with the exception of some local mills (Bethlehem 1997). The general range of estimates for environmental investment associated with iron and steel plants internationally are 8-20 per cent. Environmental expenditure on capital infrasructure in the EU is greater than 30 per cent (Malan 1999). In contrast environmental investments for local plant are between 2.5-5 per cent for older plants and 5-15 per cent for new plants with more recent technology in place (Iron and Steel Industry 1999). These estimates are based on information obtained from conversations with construction and production engineers. Insufficient estimates were however obtained to calculate reasonable uncertainties.

New plants generally employ more sophisticated and less-polluting technologies and are therefore more in line with international standards. Older plants are however lagging behind in international standards as they are very expensive to upgrade and environmental investments thus involve costly retrofits. Various companies in the steel industry have nonetheless made significant investments into end-of-pipe technologies and are further in the process of obtaining environmental accreditation in the form of ISO 140001 (Iron and Steel Industry 1999 & 1998).

At present ISCOR finds itself with very severe financial problems due to the slump in global steel prices. It has been involved in a major process of reshaping its steel making facilities and cost cutting. The urgent need to conform to international cost structures in order to remain competitive has been recognised internally and major efforts are being undertaken to adjust. According to a recent financial report ISCOR's Pretoria works has already scaled down, saving R170m per annum with cost reductions at the New Castle plant in the region of R430m. These and other large cost savings underway in the industry should enhance competitiveness significantly and propel ISCOR down the cost curve (Vermeulen 1998). Although the down-sizing of operations is not a result of environmental regulation, it can be expected that these changes will enable the steel industry to adapt more effectively to environmental regulation in the long run. However the immediate implication of this focus on cost reduction and the financial problems that ISCOR is currently experiencing is that direct environmental investments has almost come to a halt (Iron and Steel Industry 1999). ISCOR has however been involved with a joint venture project with Hoogovens, a large Netherlands steel producer, to increase overall efficiency in ISCOR's furnaces. In return ISCOR is under obligation to reduce its greenhouse emissions (ISCOR, 1999).

It appears that the steel industry locally may well be subject to less stringent environmental regulations and requirements than similar plants in developed countries. Many of the older industrial plants in South Africa utilise technologies that are inefficient in comparison with more recent technologies on the market. Upgrading older plants is however expensive and with the lack of regulation enforcing cleaner production, there is very little incentive for firms to upgrade these plants in the short term. The inefficient use of raw materials that generates excessive pollution during the production process are a further source to environmental damage that implies disparate process and production methods from the international average (Iron and Steel Industry 1999).

At the same time these differences are not necessarily dramatic and significant further research would be required to determine whether these differences could be construed as conferring an unfair competitive advantage to South Africa steel exporters. The implication is that cheap input cost structures may be construed as implicit subsidies to trade and subsequently be construed as providing an unfair comparative advantage in trade. It should be stressed that this argument is not yet well substantiated by empirical evidence of legal action taken against low cost producers. There are however numerous examples of anti-dumping and countervailing action that has been brought against local producers in cases where those industries have in the past been subsidized or partly state-owned (Financial Times 1999). This is looked at further below.

7.5 International Trade and the South African Steel Industry

There has been a sharp increase in export earnings from iron and steel since April 1998. The recent depreciation of the rand against the currencies of South Africa's major trading partners augers well for the trade balance in general. The rand-dollar exchange rate makes exports attractive to countries with strong currencies adding to the competitive advantage for domestic steel exports (Chatzitergou 1998). Marthinus Havenga (IDC downstream steel cluster manager) reported that international benchmarking has revealed several of the country's downstream carbon steel industries to be cost competitive largely because of the substantial depreciation of the rand and not as a result of inherent competitiveness (Chatzitergou 1998). The main exporting destinations are the USA, Japan and Taiwan, with Italy following closely.

The devaluation of the rand has however not boosted steel exports sufficiently and major setbacks have been endured due to the collapse in international steel prices. The industry has nevertheless maintained a positive trade balance. Local market consumption was 4-million tons of steel of which 0.3 million tons was imported while 2-million tons of local

production was exported. The industry is an important player on the African continent, accounting for about two-thirds of steel production and 80% of steel exports. South Africa also produces specialized steels that are rarely made in Africa (Rosenthal 1998)

The slump in international market prices is also leading to a major problem for local steel exports related to growing protectionist trends. As a result of increased competitiveness and decline in global demand due to the economic crises, various countries are attempting to protect their domestic markets against flooding from foreign imports by calling for countervailing and anti-dumping duties. Various countervailing suits have been lodged against South African producers over the last few years.

In the US, pressures is building in Congress for the introduction of trade measures aimed at restricting steel imports. Foreign imports are now estimated to account for roughly one-half of the US steel market. The further surge of foreign imports to the US due to the Asian financial crises is fuelling protectionist sentiment in the US. In North America, the anti-dumping cases filed by hot rolled plate producers were finalised this year and South Africa's attempts to be "decumulated" from other producers in China, Russia and the Ukraine failed. The dumping duties applied to South African producers are prohibitive and will effectively block the group's plate exports to North America (Financial Times 1999).

More pleas by steel communities for action against dumping of steel in UK markets are currently being made. A collapse in prices in the third quarter of last year is likely to cause demand and prices to fall across the European Union (EU). There is a general move for the EU to install tariffs against hot rolled coil products and other steel products that are flooding the market and threatening jobs. The charges are that various steel producers from emerging markets are exporting their steel at lower prices than what is being charged for these products in their own domestic markets. Eurofer, the European steel producer's association, has been making an inquiry into the alleged dumping on hot rolled coil, used to make industrial products, by Bulgaria, India, South Africa, Taiwan and Yugoslavia. Other countries are implementing or considering protectionist measures also as a result of the collapse in demand for steel in much of Asia, formerly one of the world's biggest importers of steel products (Financial Times 1999).

7.5.1 International Trade Agreements

Through the Uruguay Round extension of the General Agreement on Tariffs and Trade (GATT) and the creation of the World Trade Organisation (WTO) the international community has revealed a commitment to international trade liberalisation in theory. Prior to 1994 South-Africa's international isolation hindered the successful implementation of an outward-oriented growth policy. The free-trade school of thought that prevails globally has also inspired significant trade reforms (liberalisation) in South Africa. Steps have been taken to align South African export incentives with WTO acceptability. The rules that apply to countries in pursuit of industrial development have become a lot more stringent since the formation of the World Trade Organisation (WTO), limiting the degree to which governments can provide industrial development assistance (Steward 1998).

Tariffs and export subsidies that have previously served to protect local industries have been lifted or are in the process of being phased out. The move towards liberalised trade is aimed at increasing efficiency of national industries by exposure to international markets and is further the result of international trading requirements, demanding WTO members to abolish protective measures (DTI 1997). Current South African policy is structured around a supply-side approach, which seeks international competitiveness as its main goal. Firms are encouraged to invest in products and processes that are internationally competitive. Efforts to attain sustainable competitive manufacturing involve increasing general productivity and investing in enhanced capabilities of the factors of production (DTI 1995).

There is at present still a 5% tariff on all exports internationally, which is in the process of being phased out. Local government has created profit incentives (in terms of raw steel purchases) for secondary producers, whereas primary producers receive no form of incentive (DTI 1997).

Anti-dumping legislation remains an outstanding matter with regard to trade policy and the Department of Trade and Industry (DTI) is currently upgrading its institutional capacity to deal with such cases. South African producers have been accused by international competitors for dumping on international markets in recent years. Historical subsidies (such as starting-up capital) and low input cost structures are given as reasons for an unfair comparative advantage gained by South Africa, enabling local producers of providing steel on the international market at lower prices than average. Whether these claims are legitimate will have to be investigated and the accusation of dumping based on process and production methods will have to be further clarified within the international trade forum.

It is also becoming necessary for local producers to consider the possibility that negative externalities associated with "cheap" energy inputs (Van Horen 1997) as well as environmental aspects of production methods may in future become subject to unilateral action to enforce green trade barriers. There are fears that the current onslaught of countervailing and anti-dumping legal suits are motivated by protectionist agendas. The legal procedures involved can drag on for years causing the industries involved irreparable damage, irrespective of whether the original charge was substantiated.

7.5.2 Environmental Barriers to Trade

The impression obtained from conversations with various managing personnel within the iron and steel industry is that a logical progression from these dumping cases would be international targeting of differences in environmental investments between different countries. The incentive for implementation of ISO14001 is to a large extent based on an attempt to pre-empt such international action (Iron and Steel Industry 1999). It is however far more difficult to measure the extent of any "eco-dumping" than of standard economic dumping. This is amongst other things due to the fact that traditional dumping claims can be measured where exporting countries are selling below the private cost of production whereas in the case of "eco-dumping" the claim results from allegedly inadequate environmental standards by the exporting country (Drake-Brockman and Anderson 1994).

According to GATT, countervailing duties can be legally imposed if there is injury to a domestic industry and evidence of a subsidy. Provided that measures are in compliance with GATT principals of non-discrimination and national treatment, GATT also allows countries to impose product controls subject to environmental and health objectives of those countries. Unfortunately the provisions are not clearly defined have been open to abuse for protectionist purposes.

Environmental groups have suggested the use of countervailing duties to offset differences in environmental standards between countries (Charnovitz 1993). Drake-Brockman and Anderson (1998) remarks that there is a tendency for environmental groups to join forces with industries seeking compensation for declining competitiveness resulting from costs imposed by relative increases in domestic environmental standards. Since the loss of competitiveness can be offset by import restriction on products from lower-standards countries, such restrictions can at the same time remove opposition by local firms to higher standards at home and increase the incentive for foreign firms and their governments to adopt higher standards abroad. The use of trade policy in this context is inherently and sometimes deliberately protectionist.

Trade measures also hold potential as a measure to enforce international environmental agreements. For example, the Montreal Protocol, a multilateral environmental agreement (MEA) aimed at phasing out of substances which damage the ozone layer, uses trade provisions both to reward signatories and to penalise others. One of the features that make trade policy very attractive to environmentalists is the prospect that trade measures or even the threat of trade measures are relatively easy to use and are immediate in their impact (Drake-Brockman and Anderson 1994).

In an attempt to secure competitiveness between countries GATT sets limits to the use of subsidies towards environmental policies to secure competitiveness between countries. The agreement on Subsidies and Countervailing Measures makes provision for government assistance to industry in order to absorb the cost of adapting existing facilities to new environmental legislation. Governments have the option to provide non-actionable subsidies of up to 20% of the adaptation costs (ISCOR 1999).

7.6 South African Vulnerability to Trade-Environment Linkages

Some environmental issues, such as respiratory diseases caused by local emissions, have distinctly domestic implications (such as health costs, degradation of the environment and water pollution). Other issues may have local environmental impacts, but also have additional distinct transboundary effects, such as climate change due to greenhouse gas emissions. In the longer term it is especially these transboundary issues that become prone to MEAs. South Africa is a major emitter of CO_2 emissions and therefore contributes significantly to the global greenhouse effect. The Intergovernmental Panel on Climate Change (IPCC) has identified the production and consumption of energy from fossil fuels as the most important human activity contributing to increasing greenhouse gasses (Worrel 1994).

A future moratorium on carbon dioxide emitting processes or similar MEAs would put South African industries that are highly dependent on cheap sources of energy in a very vulnerable position. Reforms as a result of the Montreal

Protocol, mentioned in section 7.5.2 above, has had significant effects on local industries that has had to adjust their factors of production or install expensive equipment on plants to transform ozone-forming substances. (Iron and Steel Industry 1999).

The environmental trade linkage can be extrapolated even further. Firms in industrialised countries with high environmental standards and cost of compliance are concerned by the lack of global harmonisation with regards to standards (Canning et al 1998). Countries that do not impose environmental standards equivalent to those in developed countries may have lower relative costs, and hence gain an unjustified comparative advantage based on cost and pricing structures that do not reflect the costs of environmental externalities of production. In the event that countervailing action is taken to adjust for these differences in pricing, local industry may suffer severe damage (Jha 198).

There is growing discussion of the possibility of a change in the WTO rules on process and production methods to allow extra-territorial environmental issues to become a legitimate area of concern for importing countries. Those in favour of such changes argue that trade measures based on differing process and production methods should be accepted given that environmental effects caused by production processes are often more severe than those caused by the product (Brown-Weiss 1992). The growing recognition of the ecological interdependence of the world, reflected by International Agreements such as the Rio Declaration and Agenda 21, is indicative of increasing pressure on the sovereignty of countries where issues of global responsibility is concerned (Steward 1998).

At this stage it is seems as if trade measures taken in order to enforce domestic or international goals will not be legally binding under the WTO in future. It can be expected, however, that environmentally based international market pressure, whether formal or informal, will grow in the near future, given growing environmental awareness amongst the global market and increasingly stringent competitive trade measures. Recent studies have shown that the steel industry is experiencing increasing pressure from international and local sources (Bethlehem 1998). Although the WTO's stance on production and process methods (PPM) standards has not been resolved, it is unlikely that countervailing duties on the grounds of different PPMs will ever be a GATT-legal means of reprove. The possibility that countries might act unilaterally in this regard can however not be discounted.

The general feeling from the majority of local stakeholders is that the trading system should try to avoid such unilateral measures and that more flexible and creative options such as voluntary agreements, accreditation, and eco-labeling should be sought to align differences in environmental standards (UNEP&IISI 1997). Internationally legislation is coercing the steel industry into cleaner production and more efficient production processes. Concurrently competition from substitute materials is forcing the steel industry to invest in cost-saving and quality enhancing technologies. Simplified and continuous manufacturing technologies that reduce the capital costs and inventories and make provision for more efficient operation of smaller mills seem to be the way forward for those companies that will succeed in this industry in the long run (EPA 1995).

Local iron and steel industries do see trade and environmental linkages as a potential threat to the industry in the longer term. The South African Iron and Steel Institute (SAISI) has been instructed by its members to investigate these matters. A Committee on Environmental Affairs has been established in order to resolve queries surrounding trade-environmental issues. Although there are at present minimal evidence of trade-related environmental action (and vice versa) taken against the industry, some companies suspect that measures such as ISO 14001 accreditation will in future become a requirement for international markets.

The extensive environmental restructuring and implementation of ISO14001 at Columbus Stainless has been said to be a strategic move on behalf of the company to pre-empt international pressures, while incorporating more efficient and "cleaner" production methods are also increasing the global competitiveness of this firm (Iron and Steel Industry 1999). Some companies have reported problems with German wrapping and labelling requirements for imported goods. In other industries such as pulp and paper considerable adjustments has been made to conform with the expectations stipulated in the Montreal protocol (Iron and Steel Industry 1999). In general industry is very cautious to express opinions on this issue due to the unclear implications that this will have for policy decisions and the possible abuse of information by the competition. Responses varied from emphatic denials that the steel industry has or will experience any problems with regards to trade-related environmental pressure to clear indications that management is highly aware of the conflicts in the trade-environmental arena and its implications for industry in the future.

Various international reports of US adoption of strict environmental standards to exclude competitors that cannot meet stringent standards are being made. Similarly, environmental standards in the packaging and manufacturing industries in Germany were used to exclude competitors. It is therefore not unlikely that such measures will be introduced in the iron and steel industry which is already rife with dumping legal action (Financial Times 1999).

7.7 Conclusion

This report presented an overview of the major issues that concern the trade and environmental agenda for the iron and steel industry in South Africa at present. The advantages and disadvantages of trade for economic growth and the environment have been highlighted with sustainable development as objective. The objectives of domestic policy for industry have been discussed in terms of trade and environmental agendas respectively but also with respect to issues where trade and environmental policies have direct bearing on each other.

It is unlikely that the conflict arising between trade and the environment will lessen given an increasing commitment to global environmental imperatives. More countries are becoming signatories to multilateral agreements that aim to ensure compliance with global environmental imperatives such as global warming and ozone depletion. As international trade becomes more competitive, the differences in environmental approaches and standards between trading countries are increasingly sought and exploited in times of slumps in the market.

The behaviour of South African iron and steel and also other metals processing industries are increasingly being influenced by that of their competitors and also by driving international market pressures. In terms of actual international dumping and countervailing action, no specific action has been taken on environmental grounds locally. It is further unlikely that such action will be legal under the auspices of the WTO in future. Areas that have been affected by international pressures include eco-labelling, packaging and increasing international consumer awareness with regards to environmental quality.

Differences in environmental quality across countries, as well as, differences in awareness of environmental problems, differences in the structure of policies and costs of implementation all contribute to the complexity of the trade-environmental debate. International efforts to co-ordinate environmental policies may help, but many differences in the level of environmental action taken by countries will remain (Sorsa 1992). South Africa's position with respect to issues such as green trade barriers and carbon taxes is difficult to asses, given the uncertainty of global trade-environmental dispute handling and the approach that will be taken in MEAs in future. The possibility exist that local production will be slightly vulnerable to foreign environmental demands in future. It is likely that if international pressure is to be exerted on local producers to raise their environmental performance, this will be through MEAs and buyer specifications.

The cost of compliance with environmental measures due to higher standards and recycling requirements is likely to increase in future. Local industries are aware of the potential for international action based on environmental differences in process and production methods. The move towards ISO14001 is cited by various individuals in industry as an attempt to pre-empt such action (Iron and Steel Industry 1999). Incidences of market driven changes that are taking place in industry are mainly product related. It is however clear that there has been very little incentive for local industries to improve their environmental performance given the lack of clear specification with regards to pollution reduction and Best Practicable Means, by regulatory authorities. Another contributing factor has been the erratic enforcement and monitoring of the regulation that is in place.

The financial crises wherein the local steel industry finds itself as a result of the current low prices in the steel market creates a harsh atmosphere for environmental reform. Irrespective of the longer term benefits that accompanies cleaner production and waste minimisation there may not be the opportunity for local producers to embark on extensive environmental programs in the near future (Iron and Steel Industry 1999).

The benefits of cleaner production and increased efficiency with regards to resource use, is not fully comprehended by local producers at this point in time. This is in part a function of older technologies in place on many plants and also due to price distortions in the market for water and energy locally. However, the significant changes that have occurred within the industry should not be overlooked. Saldanha Steel is representative of the latest international technology, with its COREX and MIDREX plants and Columbus Stainless is one of two stainless steel manufacturers world-wide to have been awarded the ISO14001 Environmental Management System rating. Significant investments in environmental equipment were also made at Columbus during its Expansion Project in 1992 (Columbus Stainless 1998).

Within the context of globalisation South African industry and government is in a process of continual reform. Government reform in terms of trade liberalisation has required a South African move toward outward orientation and increased competitiveness. Import substitution and export subsidies are in the process of being phased out completely.

Economic reform is a slow and painful process and in the short term it can happen at the expense of other social priorities. There have already been major job losses in the iron and steel industry, with ISCOR shedding more than 30% of its workforce over the last few years. The moves towards integrated environmental management, cleaner production and ISO 14001 accreditation within the basic iron and steel industry is of future value to the industry, but unless regulation becomes more specific and transparent the impacts of increased compliance with international environmental approaches or regulation are unclear.

As a price-taker in the international steel market, South Africa needs to be aware of the consequences that future environmentally-motivated trade action may hold for the industry and the economy. Unless the responses of trade to environmental regulation and vice versa can be assessed more accurately, the success of current regulation in meeting environmental objectives are mostly speculative and the future trend for development of a regulatory framework with regard to trade and the environment will not be clear. Besides formulation of regulation and implementation of strategies, monitoring, updating regulation and creating formal structures for data gathering, are important portfolios for business as well as regulating bodies.

The following conclusion can be drawn from the work:

- There is a slight possibility of vulnerability to foreign environmental demands, mostly related to MEAs and buyer specifications.
- Local industry is not adequately aware of the situation and the implications of environmental trade barriers;
- Local industries are not willing to invest in environmental improvement, due to
    - Inadequate local regulation and enforcement
    - Current low steel prices and severe competition
    - No clear general paybacks identified for environmental investment;
- Data limitations were important and limited the research.

8 THE CITRUS EXPORTING INDUSTRY: AN INDUSTRY MEETING INTERNATIONAL MARKET DEMANDS

The South African citrus industry represents the third case study in the South African country study. The citrus industry was chosen because it shows an interesting reaction to environmental trade barriers and the impact of these trade barriers on exports. With the growing concern for the global environment, consumers overseas have begun to demand that citrus fruit grown in South Africa conform to certain environmental standards. Health and social demands have been added to the list of environmental requirements.

In order to remain competitive with international producers the South African citrus industry has had to change its production methods to comply with those demanded by export markets. Although the South African government has not aided the citrus industry to address these changes the industry has shown that it has the capacity to adapt to market demands by itself and that South African citrus exports can compete on an international level, even when environmental demands are made on the product.

The hypothesis underlying this case study is that the citrus industry has made changes to its production processes based on environmental demands from its export market. This hypothesis was investigated and found to be true. The second aim of the case study was an assessment of the changes in the production process of the citrus industry and the impacts thereof. The study assessed the impacts of changes in the citrus industry by taking an historical look at the industry, by reviewing relevant literature and by interviewing representatives from different facets of the industry. A limiting factor in the collection of information was the fragmentation of the industry as well as the competitiveness within the industry. Both of these factors have resulted from the deregulation of the citrus industry.

This case study will cover the following topics: the recent history of the South African citrus industry; the economic significance of the citrus industry in South Africa; the linkage between trade and sustainable development and how this linkage has developed; the impacts of environmental requirements and lastly, the role of pesticides.

Although this case study only focuses on the citrus industry, the South African deciduous fruit industry faces the same kinds of criteria as citrus fruit. In many cases deciduous fruit farmers are more prepared for the demands made on them than citrus farmers because of high pest resistance levels in that sector. This is observable in the way that pests are managed in the deciduous fruit industry, for example, integrated pest management (IPM) is at a much more advanced stage in deciduous fruit farming than in citrus farming. Hence, many of the conclusions and observations in the following paper are not restricted to the citrus industry and can be extended to the South African deciduous fruit industry and possibly other fruit industries.

8.1 History and Economics of the Citrus Industry

Prior to 1997, Outspan was the sole exporting agent of citrus fruit and had been for over 70 years. It was given this right by the Southern African Co-operative Citrus Exchange, which had the sole right to export citrus fruit. In 1992 Outspan International was established to serve as the export and marketing arm of the industry. In 1995 Outspan merged with Unifruco, the deciduous fruit-exporting agent, in order to utilise Unifruco's infrastructure all year round because citrus fruit was seen as an off-season winter fruit. This merger formed Capespan International and reflected a more market-oriented strategy, which was chosen over the former policies that emphasised production and technological advancements (IIED, South Africa).

The new Marketing of Agricultural Products Act, which came into operation in January 1998, dissolved the Citrus Board and ended Outspan/Capespan's monopoly on exporting fruit. Since the deregulation of the monopoly on fruit exports, about 40 new exporters have joined the trade. The old control board marketing agent, Capespan became an independent company and now has to compete for business as another export agent. In order for the former regulatory marketing agent to remain in business, it has had to become competitive. One of the ways Capespan ensures that it remains at the forefront of the industry is by being at the forefront of research on citrus fruit. Capespan retained about 70% of the 1998 citrus export crop due to its strong marketing network and facilities, well-developed infrastructure, strong extension support services, emphasis on research and development and focus on quality.

From the side of government the directorate of Plant and Quality Control of the Department of Agriculture is now responsible for setting the criterion standards for most agricultural products, including citrus fruit.

8.1.1 Economic Significance of the Citrus Industry

Agriculture contributes 4.5% to South Africa's GDP (SA Government Web) and over 13% to employment (the largest employing sector in the country). Although agriculture does not have major export significance, the sector has a profound impact on the entire economy because of its inputs, outputs and its function as an employer. An important backward and forward link of the citrus industry is the manufacturing sector. Inputs to citrus farming include fuel, fertiliser and pesticides.

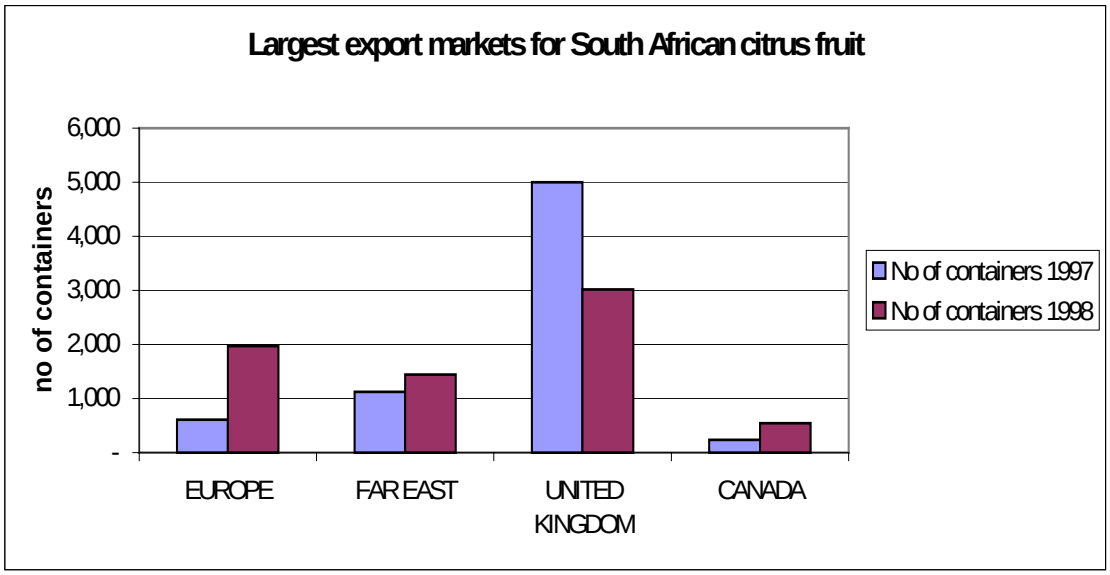
The citrus industry is seen as a growth industry. In 1996 the total volume of agricultural production in South Africa was 8.8% higher than for the previous year, with 17% more citrus fruit produced than in 1995 (IIED). The proportion of citrus exports as a percentage of agriculture is expected to continue growing. There are about 2000 entities that produce citrus fruit, of which about 1300 are commercial farmers and co-operatives that export citrus fruit. The citrus industry employs about 100 000 permanent workers and approximately 750 000 people are dependent on the industry (this includes seasonal workers and the dependants of workers) (Outspan Web Site).

8.1.2 Citrus Exports

South Africa is the fourth largest citrus exporter in the world. South Africa is the most important exporter in the Southern Hemisphere and is responsible for 7% of the world citrus export volume. Capespan exports 30 citrus fruit varieties to 56 different countries. Citrus fruit is South Africa's largest agricultural export to the EU, the largest fresh produce export, citrus fruit contributes 47.5% (Perishable products, 1999) of the volume of fresh produce exported, and it is the second biggest earner in the agricultural sector (after deciduous fruit). In 1998 the value of citrus exports to the European Union alone was R874 million.

In 1996, citrus fruit contributed 3.54% (CSS, 1999) to gross value of agricultural products, of which 69% (National Dept. of Agric. 1998) was exported. This shows the importance of exports to the citrus industry in the agricultural sector. This proportion remains relatively constant from year to year (IIED). The largest export markets for South African citrus fruit in 1998 in decreasing order of magnitude were UK, Europe, Far East and Canada. Figure 6 shows the relative quantities of exports in 1997 and 1998 to these countries.

Figure 6 Exports Markets of South African Citrus



Source: Perishable Products Exports Control Board Statistics, 1999

South Africa exported citrus fruit to the USA for the first time in 1997 (12 containers) (Perishable Products, 1999). This new market has a huge potential because it is a seasonally under-supplied market (but has very severe regulations on phytosanitary conditions and residue regulations). Other relatively new markets include Japan, Canada, Spain and Eastern Europe. The South African citrus industry has to seek out new markets because traditional markets like Western Europe and the UK have a limited ability to absorb increasing volumes of citrus produce. South African citrus exports

are facing increasing competition in these markets from South American citrus fruit, exports of which have grown substantially over the past few years (but are unable to meet rigorous phytosanitary and residue requirements, such as those demanded by the USA).

Before a consignment of fruit can be exported, samples from each consignment are checked in South Africa by the exporting agent and by the South African Perishable Products Exports Control Board (PPECB). The inspection covers fruit quality, pesticide residues and phytosanitary requirements. When the fruit reaches its final destination, the fruit undergoes another stringent quality check.

8.2 Trade and sustainable development linkages

Trade is linked to sustainable development in the production of citrus fruit through 'environmental requirements'. Included in this are social and health issues as well as environmental issues, but all are usually dealt under the label of environmental requirements (except phytosanitary issues, which are a separate requirement).

All countries to which South Africa exports citrus fruit have environmental requirements. Although some countries have less stringent environmental requirements the largest export markets have the strictest requirements (UK, Europe and potentially the USA), hence it is very important that the citrus industry is able to cope with the demands placed on it by buyers. The most demanding buyers within these markets are supermarkets (especially in the UK and Europe). Supermarkets require that all the fresh products that they sell have a fully transparent, traceable and sustainable production process. Fruit must be produced in a hygienic way where social and environmental responsibility are catered for. It is especially important that the demands of supermarkets can be met by South African citrus producers because it is thought that the role of supermarkets in the retailing of produce has potential for much growth.

Hidden within this host of 'environmental requirements' are two different classes of prerequisites necessary for exporting the fruit. The first prerequisite has to do with the physical state of the fruit when it arrives in the importing country and aspects that impact on the actual quality of the fruit. This involves phytosanitary aspects (such as whether there are certain insects or diseases present in the fruit that could contaminate it); chemical residue levels which are present on the fruit (due to pesticides - pesticides refer to insecticides, herbicides, fungicides, acaricides, nematicides and rodenticides); and the cleanliness of the fruit, which is influenced by the hygiene of workers who have come into contact with the fruit.

The second class of environmental requirements concern the production process used in the growing and packing of the fruit. This involves the environmental sustainability of the production methods used; the destruction of eco-systems due to the production process; labour issues and food safety.

The different requirements that make up environmental requirements can also be divided in the following three ways: true environmental requirements; social requirements; and health requirements. The requirements applicable depend on the country to which the fruit is to be exported. Some of these requirements are listed below in Table 2. and have been consolidated from different country's' requirements.

Table 18 Environmental Requirement of Importing Countries for Citrus Fruit

REQUIREMENT TYPE	DETAILS OF REQUIREMENTS
Environmental	• Type, strength and amount of pesticide that is used • Whether the pesticide contaminates run-off water and the soil • The destruction of sensitive eco-systems
Social	• No child labour • Fair remuneration • Health hygiene for workers in packhouses and in orchards • Supply of eating, drinking and recreation space • Day care provision in the packhouse and the orchard • Personal sanitation, such as toilet and washing basin facilities in the packhouse and the orchard
Health	• Pesticide residue levels • Low levels of chemical usage • Hazard Analysis and Critical Control Point – at the packing and transport levels • Personal sanitation • Food security (prevention of contamination)

Although the above requirements are quite different from one another, the environmental departments in fruit marketing companies generally take care of all of the requirements (why they are usually all labeled as environmental requirements). This is done because although there are a lot of clear-cut differences between different prequisites, there is a lot of overlap too. Phytosanitary requirements are generally dealt with totally separately.

The food safety issue is becoming more relevant because countries are demanding that food safety be considered at all times in the production process. Hazard Analysis and Critical Control Point (HACCP) is a new preventative system for all food supply that is becoming mandatory in many countries. There are seven steps involved in the HACCP management system. These steps ensure that throughout the production process the risk of contamination of products is minimised. In South Africa, the HACCP system is already being put into practise. The deciduous fruit industry is ahead of the citrus industry in this respect but there are measures being taken by some of the larger marketing agents for the citrus industry to catch up.

8.2.1 The development of trade and environment linkages

Consumers in importing countries are demanding higher levels of social responsibility from producers. The initial stimulus for many environmental regulations come from public pressure due to concerns about the environment. Consumer demands have since been extended to include health and social issues as important criteria for the fruit that they buy. This supports the contention that these concerns are genuine attempts to embody certain values in a product rather than simply barriers to trade created by producers to reduce competition.

On the supply side, farmers are willing to change their production methods because of the greater returns obtained for exports than for fruit sold domestically. In many cases (but not all) this is leading to the export market setting the minimum standards for the domestic fruit market. This stems from the fact that there has been improvements in local environmental performance and in local standards because the export standards have become the de facto standards in the industry. Thus far, the changes that farmers have had to make have been driven by consumers in importing countries. Sometimes these demands are supported by legislation in the importing country, but even then, legislation is driven by consumer concerns. Environmental requirements are one of the larger issues in the international citrus industry at present. They are becoming a minimum standard for entrance into the export market for larger producers. As yet many of the smaller citrus marketing agents have not encountered the need for environmental requirements, since supermarkets are the most demanding in terms of the higher standards and the smaller exporting agents on the whole do not sell to the supermarkets.

8.3 Changes in the Citrus Industry

As discussed in section 8.2, the structural changes in the citrus industry involved the introduction of the integrated pest management control sytem (an intensive monitoring system). This has obviously resulted in increased market share for South African citrus exports. These changes, however, have been consumer driven. Discussed below are the mechanisms put in place to monitor the changes as well as the impact of such changes.

8.3.1 The monitoring of changes

Marketing agents have intensive monitoring systems to check farms to ensure that the minimum requirements of buyers are met. Inspectors from large buyers monitor both orchards and pack-houses on an *ad hoc* basis. For example, Capespan works on a system of accreditations. Both orchards and pack-houses need to be accredited to be able to export through Capespan export. In order to be accredited, the supplier needs to comply with Capespan's protocols in the orchards and in the pack-houses. At present, about 20% of Capespan's growers are delivering about 80% of their export crop. At present only about 50% of their producers are complying. Capespan standards are viewed as being internationally competitive. The recent increase in the volumes of citrus exports from producers embracing the standards is an evidence of this.

8.3.2 Impacts of the Changes on the Citrus Industry

Economic Impacts

At this stage, it is impossible to measure what the impact of these requirements has been on the South African economy. From the research done, *prima facie* evidence suggests that environmental requirements have not yet had a negative effect on the South African citrus industry's international competitiveness. Other supply industries linked to the citrus industry, such as pesticide and fertiliser suppliers could however be negatively affected in the future.

Environmental Impacts

The environmental requirements in the citrus from the importing countries in one way or the other can have a positive effect on the domestic natural environment. This is evidenced by the fact that it can be said that most of the farmers who produce citrus fruit for exports and export through the larger marketing agents have higher levels of environmental performance than those required by local environmental standards.

Social and health impacts

There are certain regulatory requirements for producers wanting to export citrus fruit. In order to ensure that hygiene and working standards are met producers who comply with the requirements usually have to be accredited by exporting agents and sometimes also have to meet codes of practice (Capespan Web site). The following topics are covered in the code of practice: hygiene, integrated fruit production (IFP), integrated pest management (IPM), monitoring, worker welfare and worker safety. Included under these topics are things like lighting, personal sanitation, canteen and restroom facilities, and protective clothing and safety precautions.

The environmental requirements have probably not yet had any effect on domestic consumer health. This is because most farmers who produce for domestic markets have not yet felt the need to change their production methods. South African large supermarkets are the exception to this.

Impact on workers in the citrus industry

The effects of environmental requirements on workers in the citrus industry have been very positive. The increased training, which is necessary for complying with the higher standards, has lead to job creation, higher education levels in workers and greater awareness of personal hygiene. More, and better, facilities have been made available to workers. There is now regular scanning of workers for pesticide contamination. Workers are better protected against contamination and there are greater levels of compliance with pesticide regulations.

8.3.3 Impacts on the domestic citrus market

The larger South African supermarkets are moving in the same direction as supermarkets in the UK and Europe by making stricter demands on fruit growers. The rest of the South African citrus market has not made similar demands, in terms of environmental, social and health issues since their focus remains largely on the visual and physical quality of the fruit. The South African citrus industry has not been able to respond equally across the industry. At the moment, only the largest marketing export agents have been able to meet environmental requirements. The smaller marketing agents have not yet created the infrastructure to be able to ensure that their farmers meet all the requirements.

As an exporting country, South Africa has to comply with the import conditions of a specific country or group of countries by issuing phytosanitary certificates. Japan and the USA have the strictest phytosanitary requirements. These requirements are different from environmental requirements because they do not depend on how the fruit is produced but rather whether there are traces of specific insects or diseases that do not occur in the importing country. If one insect or one infected fruit is found, the whole container load is rejected and the 'contaminated' fruit is sold on domestic markets. When this occurs, environmental requirements have a definite positive effect on the quality of domestic fruit by increasing the standard of fruit sold domestically. Unfortunately this only occurs when export fruit is rejected. Since environmental requirements are not demanded, required or checked by local authorities, environmental requirements have not affected local fruit consumption unless it has been by default. Environmental issues in the citrus industry is not regulated at the local level but done through the national government agency. It should be pointed out that health standards are internationally competitive and continue to grow though not necessarily being rigourously enforced . The environmental standards are however weak.

8.3.4 Impacts on Domestic Pesticide Use

There is the perception that maximum residue levels of pesticides (the maximum amount of residue of a particular pesticide that may be present on the citrus fruit) in South Africa are not as low as those in industrialised countries. The higher the maximum residue levels , the lower the environmental standards. Contrary to this perception, regulations on maximum levels of pesticide residue in South Africa, on citrus fruits, are considered high by world standards. Citrus fruit that is produced for local consumption is not constantly tested for residue levels due to costs of establishing such a program. Instead, local governments may test food samples for pesticide residues depending on the particular health and environmental risks peculiar to their area.

Citrus fruit destined for export is tested meticulously in order to meet the standards discussed above. The Perishable Products Export Control Board provides a quality mark and a rigorous inspection service for fruit exports. On the other hand, the monitoring and enforcement of pesticide use at the farm level is less than adequate. There are only a few inspectors responsible for monitoring pesticide use in the whole country who do this by making spot-checks on farmers.

There is currently a slow shift in the paradigm of the use of pesticides in South Africa. The department of agriculture, through the directorate of Natural Agricultural Resource Conservation is doing research on more environmentally friendly methods to control pests to support farmers in changing the way that they use pesticides. From using pesticides to kill-off everything harmful even if beneficial organisms are harmed in the process, farmers are now being encouraged to use pesticides in a more balanced way and to consider a wider range of options to manage pest problems. IPM is growing in popularity as a way of controlling pests.

The main reasons for the change in the use of pesticides are firstly growing resistance in the pests and secondly international requirements in terms of pesticide residue levels. Although not a primary objective of the changes thiis movement away from the use of pesticides is also having many positive effects on the domestic environment and on worker health.

8.4 Conclusions

When the South African citrus industry was deregulated and fruit marketing companies began to compete for business, Capespan used the fact that their fruit was produced according to certain environmental requirements as part of their competitive edge. Buyers internationally that will accept citrus fruit that is not grown according to certain environmental standards are becoming fewer and fewer.

Although the largest South African exporter (Capespan) has recognised the importance of environmental requirements, most of the smaller exporting agents have not yet felt the need to change their production processes to include a minimum level of environmental requirements. In the not too distant future, these requirements are going to become a minimum standard for export quality citrus fruit. Smaller fruit marketing agents and farmers may both need some aid in changing their production methods in the orchards and in the pack-houses.

The government has not provided any support or assistance to the fruit industry in making the changes which have been necessary in remaining competitive internationally and in coping with adapting to environmental demands. Another way of helping the industry cope with changes necessary would be if the industry was organised to address these new challenges. This could be accomplished through the formation of a body representing the entire citrus industry, either by the industry itself or facilitated by government. The role of this body would be to disseminate information into the industry and provide a discussion forum for all industry stakeholders. Since there is no uniform set of standards, this body could assist the South African citrus industry by determining a set of minimum standards (comprising of the maximum requirements of all large export markets) that could be used across the board for all exports.

There has been almost no independent research conducted in the fruit industry about environmental requirements. Although this is a difficult area to research due to the great number of issues, and the secretiveness of the industry (which has come about since deregulation), research would be very helpful to the citrus industry. Aside from the above observations, it is still too soon after the deregulation of the industry to be able to generalise patterns of behaviour and draw clear lessons from the changes due to environmental requirements in the citrus industry. It is also too early to be able to measure the impacts that these requirements are having, or are going to have, on the South African citrus industry, industries linked to the citrus industry and on the South African environment in general.

9 SUMMARY OF ENVIRONMENT, TRADE AND ECONOMY LINKS: IDENTIFICATION OF POLICY ISSUES

The research presented here was not aimed at providing a comprehensive picture of trade and environment relationships in South Africa but rather focused on sectoral experiences. The results of the research therefore do not provide a comprehensive approach to policy but rather begin to throw up useful ideas which can inform the current policy debate in this area. The research results also give indications of further work required.

The three case-studies presented here covered a number of different issues. The coal study looked at possible changes in world market demand for coal, a key export, due to international action on climate change; possible threats to the industry due to domestic environmental performance; and industry responses to these issues. The study also examined the issue of the general energy intensity of the South African economy based on cheap coal combustion. The question was raised as to whether this current advantage of cheap energy to South African industry could become a disadvantage if it became the cause of international trade barriers.

The steel study considered whether current protectionist sentiment in the world steel market would spill over into the environmental arena. The essential question was whether lax local environmental performance, in terms of production and process method standards, could be construed as an unfair trading advantage and attract an anti-dumping response. The relatively low investment in environmental protection in the South African steel industry was presented as one indicator of lower local performance relative to world standards. A second indicator was the relatively low price of electricity used by the energy intensive steel industry. This is linked to issues raised in the first study and again raises the question of whether 'artificially' cheap energy can be seen as a subsidy to industry and hence as an unfair trading advantage.

The third study presented the experience of the citrus export sector and showed how the industry had managed to successfully respond to growing health, safety and environmental concerns in their export market. The industry had been forced, in order to maintain market share, to meet increasingly stringent end-consumer demands for better environmental standards. This required changes in the production processes of the industry and not only changes in the final product itself. The industry had managed to make these changes without losing market share and without government support. Indications were that the changes have resulted in improved local environmental performance, such as lower pesticide use, as well as improved worker health and safety.

9.1 Is the Trade-Environment Issue Significant for South Africa?

Given the nature of case studies the research does not provide a comprehensive set of answers to the question of how important these trade and environment linkages are for the South African economy and environment. What the studies do show is that there is an increasing set of connections between the world trading system and environmental issues in the three sectors studied, all important export sectors of the South African economy. These connections arise from disparate areas. In some cases, such as coal, environmental concerns have the potential to reduce the size of the export market as a whole. In others, such as citrus, environmental factors change the requirements for market entry and for the maintenance of market share. In the steel sector the suggestion was made that environmental issues may become simply another barrier to trade.

It thus appears that there are real indications of environmental issues affecting trade but that the scale and scope of these effects are unknown, even within the sectors selected for case studies. Further research and data gathering is required to make more definitive statements and to begin prioritising the areas of greatest threat or importance. What is interesting to note is that there was very little evidence forthcoming about the issue that has possibly been most discussed in the past, that of the energy intensity of South African industry and its consequent vulnerability to international actions. While there may be experience that has not been reflected in these studies it appears as if this issue may not be as immediate a direct threat as sometimes suggested. On the other hand the studies have also shown a lack of research on the implications of the current climate change negotiations for South Africa which may have less direct, but substantial, impacts on the South African economy and export profile.

The studies also showed that trade and environment linkages do not only arise from, and hence can be addressed within, the formal world trading system and the WTO. Some of the issues presented, such as eco-labels, are industry led initiatives and ostensibly voluntary. Others are based on real or perceived consumer demands or consumer risk aversions, such as the need for pesticide free produce. Therefore a policy response cannot be limited only to a better presentation of South Africa's position in world trade fora. A more nuanced and broader approach is required to meet

the challenges presented.

9.2 Conclusions And Recommendations

The case studies give rise to a number of policy suggestions with regard to addressing the threats and opportunities identified. When considering these suggestions it is important to remember that to be most effective they should be located within a broader well thought through strategy to approach trade and environment issues. Hopefully this project will assist in developing such a strategy. The suggestions for policy are divided up into a number of areas below.

9.2.1 Better Information Gathering and Provision

- As with many other environmental issues in South Africa the absence of good quality information collection and management is a stumbling block to a better understanding of the issues and to the development of appropriate responses. It is difficult to access information on trade and environment links and to identify sources of information. There is no repository of information on this issue and no coordinated process to identify the main trade and environmental trends, implications of international conventions (such as the UNFCCC), potential new developments, (such as eco-labels), and looming trade threats. The various stakeholders, such as the government through the Department of Trade and Industry and other departments; private sector firms and industry bodies; NGOs, and trade unions should establish a procedure to collect information and make it available in a coordinated manner

  The responsibility for building up a storehouse of information cannot depend on government or researchers alone. It is crucial that mechanisms be found to ensure that manufacturers and exporters report on environment and trade issues that they encounter in their normal transactions or negotiations. The governments' responsibility should be to collate such feedback from industry to assist the government and other stakeholders in formulating appropriate responses. For example, the citrus study identified the need for the supply of good information to industry on international standards which they need to comply with. A similar lack of research on possible impacts of environmental issues, such as the UNFCCC, was identified within the coal sector study. The problem of inadequate information sharing in highly competitive industrial sectors needs to be addressed to ensure that mutually beneficial information sharing occurs.

- To best use data collected there should be an institutional arrangement to provide trade and environment information, services and research to exporters. In particular mechanisms need to be made available to assist small and medium-sized exporters to meet new trading challenges posed by environmental issues.

9.2.2 Representation at the International Level

- Although many of the issues identified are ones which cannot be addressed within international fora the importance of appropriate and effective participation in such fora must be recognised. In particular the rules of the world trading system developed in the WTO have fundament affects on trade patterns and South Africa must ensure that her interests are represented in this organisation. To do this government negotiators require comprehensive consulted positions to take to these bodies. There should be a mechanism that allows consultation and interaction between the government and civil society before decisions are agreed to or MEAs are ratified.

- Aside from the WTO a key MEA is the UNFCCC. A comprehensive policy on global warming and on South Africa's response to the UNFCCC discussions needs to be developed. The potential vulnerability of energy intensive South African exports to trade barriers must be further investigated. In addition the general affect of greenhouse gas reductions on the economy and on international competitiveness are not well understood. More detailed assessment of the impacts of such reductions must be made so that South Africa can make informed decisions on responses to the climate change negotiations. In this regard there is the need to ensure coordination between Eskom, energy intensive exporters, the government and other stakeholders on this issue. Alongside this attention on possible negative impacts a greater understanding should be developed of possible benefits to be gained such as the use of flexibility mechanisms within the Kyoto Protocol.

9.2.3 Support By Government to Industry

- In addition to the gathering of information there are other mechanisms of government support to exporters that should be explored to assist them in meeting international environmental challenges. This includes investigations into the use of mechanisms available within current WTO rules, such as subsidies for environmental investment. This type of support may be required by industries like the steel industry where there are still some plants with old

stock requiring significant expenditure to meet new environmental requirements. Innovative mechanisms, such as making preferential finance available to exporters who are struggling to make the necessary environmental investments, should also be explored. As discussed in the citrus study, there may be the need for particular support for small business and small exporters.

- Government needs to carefully scrutinise anti-dumping or other protectionist actions by the country's trading partners to ensure that environmental issues are not being used as hidden trade barriers or protectionist measures. Industry and government should work together on this issue.

9.2.4 Proper Protection and Valuation of the Domestic Environment

- The case studies raise the interesting issue of the use of international environmental pressures on traded goods to improve local environmental performance. International trade pressures linked to the need for environmental management systems may be an effective way of ensuring that local legislation is adhered to. In many instances exporting firms are less concerned about the local effects of non-compliance with environmental legislation, which have been fairly minor until recently, than about the loss of market share if non-compliance effects their market access. Given real or perceived pressures in export markets many firms feel that they have to demonstrate compliance with an environmental management system, such as the ISO 14 000 system. The compliance with such a system includes compliance with local legislation. Therefore external trade pressures can lead to improved adherence to local environmental laws.

- While the exploitation of domestic natural resources, such as coal, may provide significant economic advantages to South Africa, through both natural resource based exports and cheap energy, the real costs of the use of these resources must also be accounted for when assessing the economic benefits of these sectors. Domestic environmental impacts impose real costs on the local (and global) population in terms of health and environmental damage. When developing economic development and trade strategies government should take into account associated environmental damages to avoid pursuing strategies that undermine their economic benefits by imposing substantial real environmental costs.

9.2.5 Identification and Exploitation of Opportunities

- Trade and environment relationships must not only be seen as a threat to South Africa's exports. A range of possible opportunities are also opened up by many of the new environmental issues on the global agenda. Ways of using environmental advantages to gain trade advantages should be considered. These include competitive advantages in environmental protection technologies that the country may have developed expertise in, such as water purification, or competitive advantages due to natural resources, such as the ability to successfully grow organic produce. For example, South African citrus industry, by the implementation and maintenance of high health, safety and environmental standards has preserved market share and probably increased it in some export markets. The state should support the opportunities created by new environmentally driven markets through similar mechanisms which it uses to support other strategic industries. Industry and government should also explore finance provision through concessionary global finance facilities 60such as the Global Environment Facility for the abatement of global environmental externalities.

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