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THE ENVIRONMENTAL IMPACTS OF FOREIGN DIRECT INVESTMENT (FDI) IN THE MINING SECTOR. THE CASE OF SOUTH AFRICA.

Draft Paper

By MP de Wit[1]

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[1] The author can be contacted at CSIR, Environmentek, PO Box 395, Pretoria, 0001, South Africa. Tel: +27 (0) 12 841 3766, Fax: +27 (0) 12 841 2228 or email: mdewit@csir.co.za.

1 Introduction

The South African mineral industry plays an important role in the national economy and downstream beneficiation activities of other economies in the world. With the focus on the environmental impacts of mining, and the upcoming World Summit on Sustainable Development to be held in Johannesburg, South Africa, it is worthwhile to study the environmental impacts of FDI in this sector.

This paper highlights the contribution of mining to the South African economy, the environmental impacts associated with this mining and the environmental impacts of FDI. It concludes that first, a well-functioning institutional framework is needed wherein second that all costs and benefits of FDI investments are assessed.

2 An economic snapshot of the South African mining sector

Since the discovery of gold in the Witwatersrand at the end of the 19th century, the South African mining industry has made an important contribution to the national economy. Although its contribution in relative terms has declined over time (see Table I), the mining industry is still the basis of significant downstream secondary industries. According to Gaven, Sebothoma & Verster (no date), the associated multiplier effects of mining activities amounts to an estimated 14 percent of GDP.

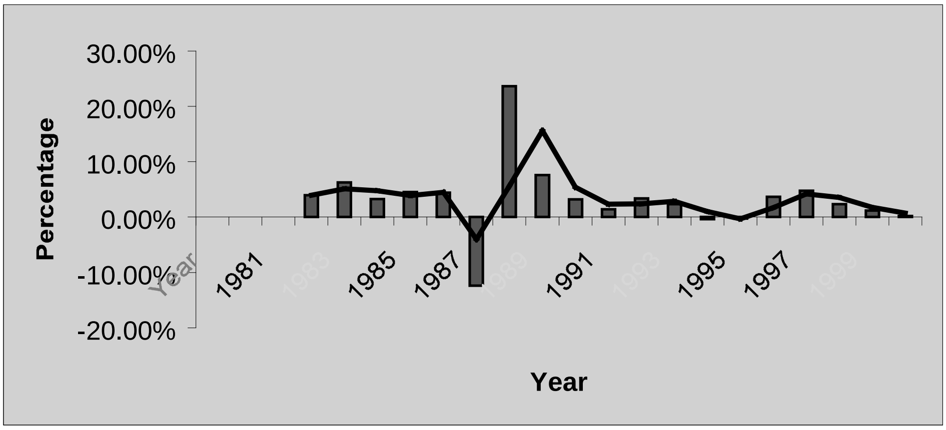
Table I: Contribution of mining sector to the South African economy

Year	Gross value added	Mining & Quarrying	Percentage
1993	471670	35782	8%
1994	485783	35946	7%
1995	500354	34830	7%
1996	521611	34542	7%
1997	535320	35120	7%
1998	539698	34840	6%
1999	551931	34472	6%
2000	570753	33821	6%
2001	581925	33919	6%

Notes: GVA at 1995 constant prices
Source: SARB (2001)

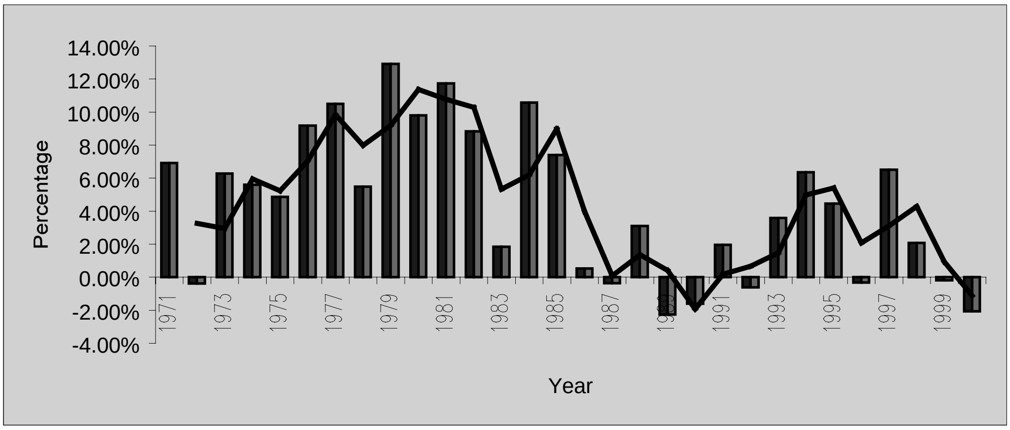
In the case of gold and the platinum group metals (PGM) (platinum, rhodium and palladium), year on year changes in production has shown an overall decreasing trend since the mid-eighties (Figure 1 and Figure 3 respectively). In the case of coal, following a slump from 1986-1992 this decreasing trend really started of again in 1998 and the latest figures available show that from 1999 onwards less coal than the previous year has been produced (Figure 2).

Figure 1 Year-on-year change in gold production



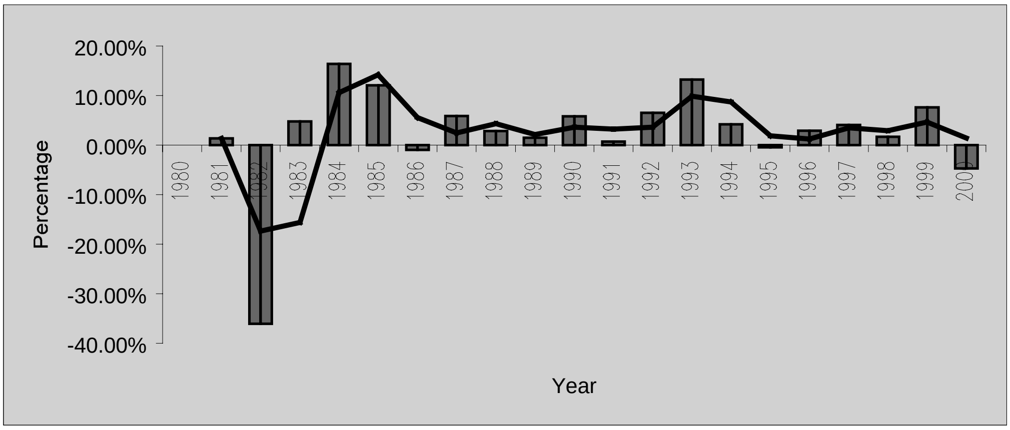
Source: Based on COM (2002)

Figure 2 Year-on-year change in coal production



Source: Based on COM (2002)

Figure 3 Year-on-year change in PGM production



Source: Based on COM (2002)

In 1999, the mining industry accounted for 33.5% of South Africa's total export revenue of which gold alone was responsible for 14.3%. The diversification of the South African

Table II: Total sales and exports from South African mineral sector

Commodity	Total sales R1000	% Exports to total sales
Gold, platinum & silver group	**R 54 999 971**	
Gold	R 25 272 141	99.7%
Platinum, Palladium, Rhodium	R 29 543 494	91.7%
Silver	R 184 336	92.2%
Base metals group	**R 43 317 003**	
Chrome	R 1 080 195	33.4%
Copper	R 1 573 603	38.0%
Iron core	R 3 064 750	80.6%
Lead concentrate	R 108 728	81.8%
Manganese	R 1 232 115	70.1%
Nickel	R 1 994 314	40.4%
Other metallic	R 386 291	17.9%
Asbestos fibre	R 33 352	91.7%
Coal	R 19 702 883	55.5%
Fluorspar	R 103 722	87.1%
Limestone & dolomite	R 792 445	1.7%
Other non-metallic	R 4 353 484	48.7%
Miscellaneous	R 8 891 121	61.7%
TOTAL	**R 98 316 974**	**77.6%**

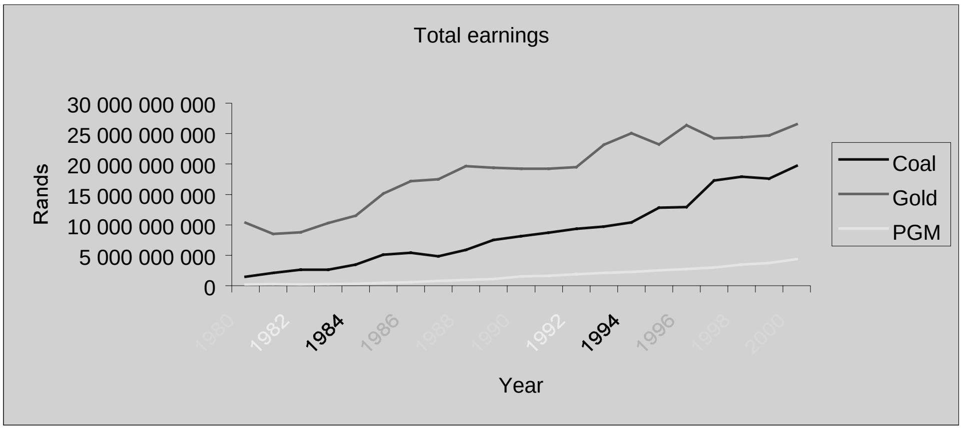
Source: Minerals Bureau, Department Minerals and Energy

economy and a policy of export-led growth is illustrated by the fact that in 1990 mining accounted for more than 50% of total export revenue to which gold contributed the lion's share of around 30% (see Gaven, Sebothoma & Verster, no date).

As illustrated in Table II, 77.6% of mineral commodities are still exported. Mineral beneficiation, in terms of exports, is particularly low in the gold, platinum and silver group and best for copper and chrome.

Total nominal earnings have increased steadily over the last two decades. In 2000 total gold earnings amounted to R26.5 billion, total coal earnings R19.7 billion and total earnings in PGM amounted to R4.26 billion (Figure 4).

Figure 4 Total earnings

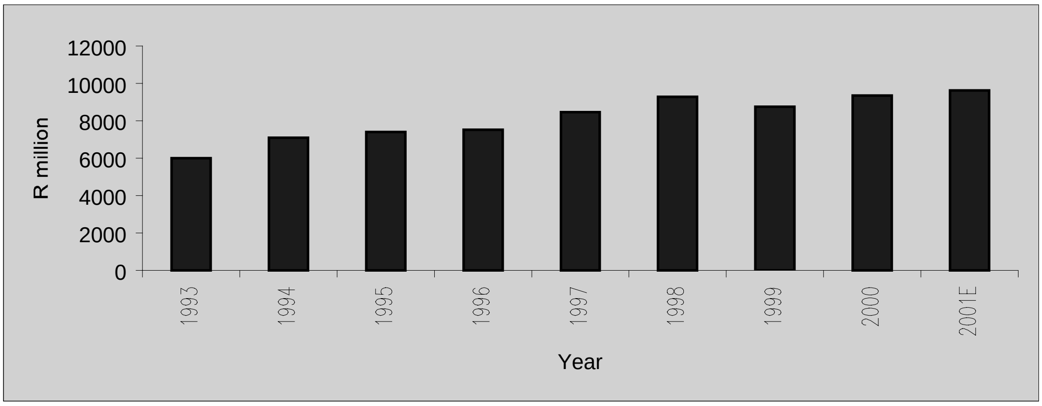


Note: At current prices

Source: Based on COM (2002)

The growing capital intensity of the mining sector is illustrated in Figures 5 and 6. The mining industry continues to invest between R6 billion in 1990 and R9.6 billion estimated for 2001. The mining industry is responsible for around 8-9% of gross domestic fixed investment in the country, which is higher than its 6.5% contribution to GDP.

Figure 5 Gross Fixed Capital Formation

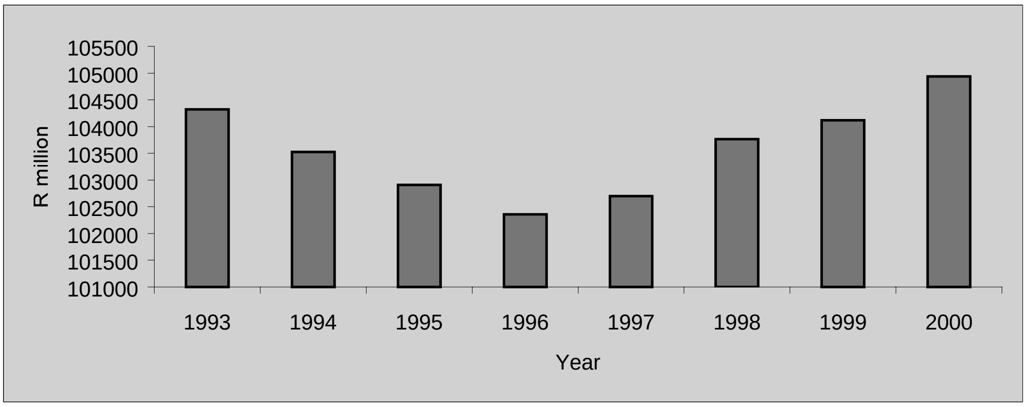


Note: At constant 1995 prices

Source: SARB (2001)

The fixed capital stock increased significantly over the last few years. It has grown from from a low base in 1996 of R102.4 billion to almost R105 billion in 2000.

Figure 6 Fixed capital stock



Note: At constant 1995 prices

Source: SARB (2001)

In summary the mining sector is:

- relatively small but dominant contributor to the South African economy

- experience declining rates in year on year production for major minerals such as gold, coal and PGM
- a decreasing, but still significant, foreign exchange earner
- growing in capital intensity with higher than average gross domestic fixed investment.

3 Foreign Direct Investment into South Africa

South Africa attracts around 0.6% of worldwide FDI. Between 1994 and 1998, 17.5% of FDI in South Africa has gone to telecommunications, 15.2% to other sectors, 11.4% to energy and oil, 10.7% to motor and components and 10.4% to food and beverages. Most FDI into South Africa is dominated by a relatively small number of large mergers & acquisitions on a national level, including privatizations. Portfolio investment dominated investments in SA up to the emerging market crises in 1999 (see Figure 6).

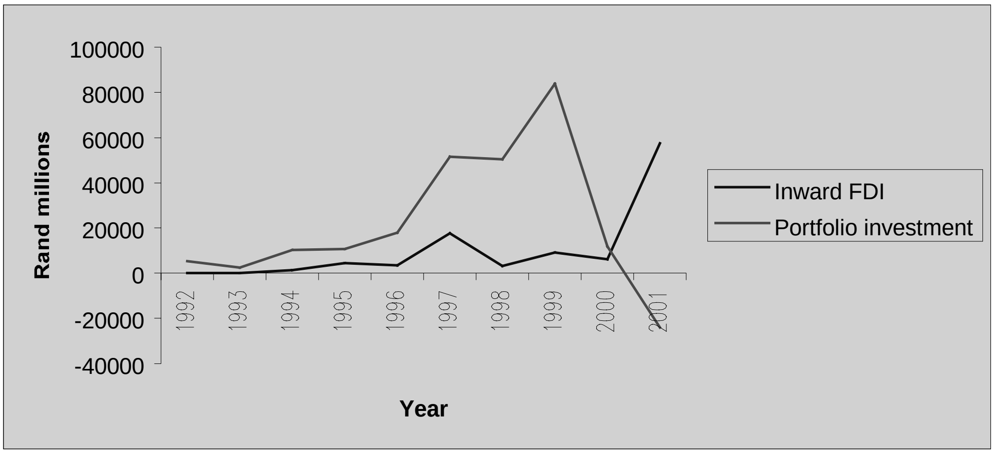
The nature of FDI flows suggest that South Africa offers better opportunities for joint ventures as investors appear less comfortable in entering new or expansion ventures in South Africa. Local know-how is a crucial factor in reaping the rewards the South Africa economy can provide, without falling in the adverse effects of African and even regional uncertainty.

The single FDI in the mining sector worth mentioning is the 50% stake of the Canadian Placer Dome Ltd into the South Deep Mine. More details on this project in Box I.

Box I: Placer Dome Ltd. investment in South Deep Mine.

"The development of the South Deep Mine (owned jointly by Western Areas and Placer Dome). This mine is a southerly extension to the Western Area Gold Mine, and contains measured and indicated reserves of 78.9 million ounces of gold in 541 million tonnes grading 4.5 g/t gold. Currently a 2.4 km shaft is being sunk to intersect haulage's developed from the Western Areas mine to the north. Avgold are currently developing the Target orebody (estimated total resource of 6.5 Moz), situated in the Free State. Similar to South Deep, the orebody is being accessed by haulages developed from Avgold's Lorraine Gold Mine. AngloGold are investigating using deep level mining technology to develop the Ultra Deeps orebody, situated at 5km depth. The orebody is currently down dip from AngloGold's Elandsrand mine."
Source: (www.mbendi.co.za)

Figure 6 FDI and portfolio investment into South Africa



Notes: Investment by foreigners in undertakings in South Africa in which they have been individually or collectively in the case of affiliated organizations or persons at least 10 per cent of the voting rights.

Source: SARB (2001)

4 An overview of the potential environmental impacts of mining

Table III provides an overview of poorly planned and managed mining activities. The impacts of these activities are often large enough to lead not only to on-site but also off-site environmental change. For full discussion of these potential impacts the reader is referred to Ashton et al. (2001) and Weaver & Caldwell (1999).

Table III: Overview of the potential environmental impacts associated with different phases of mining activities

Mining Phase	Activities	Potential Environmental Impacts
Exploration and Surveying	Geochemical, geophysical and airborne surveys Drilling and trenching Blasting of exploration adits Exploration camp housing Vehicle and machinery parks, fuel points and service bays Access road construction Waste disposal (garbage) Camp sanitation systems	Vegetation removal, damage and destruction Habitat disturbance due to noise / vibration Disturbance to wildlife and local residents Soil erosion along trenches and transects Dumping of drill cores and waste Demand on local water resources Discharge or spillage of contaminants Contamination of local ground waters by drilling muds and exposed ores Restricted public access
Mine development start-up; sourcing and stockpiling of raw materials Mine development start-up; sourcing and stockpiling of raw materials (Continued)	Mine construction Stripping / storing of soil “overburden” Installation of power lines Surveying and levelling of sites for buildings and plant Installation of mine and surface water treatment plants Construction of mine facilities, offices and roads Construction of processing plant, smelter and refinery Construction of storage facilities Landscaping of site	Fauna and flora habitat loss and disturbance Reduction in biodiversity on site Potential loss of heritage sites Decreased aesthetic appeal of site Altered landforms due to construction Altered drainage patterns and runoff flows Increased erosion of site area Increased siltation of surface waters Contamination of surface and ground waters by seepage and effluent discharges Discharge of contaminants via mine de-watering activities Methane emissions from mine contributes to

	Construction of staff housing, infrastructure and recreational facilities Construction of railway lines and sidings	greenhouse gases Increased demand on local water resources Seepage / discharge of acid rock drainage Ground and surface water contamination from seepage and radionuclides Contamination from fuel spills and leakages Increased demand for electrical power
Removal and storage of ores and waste materials	Stripping / storing of soil "overburden" Waste rock stockpiles Low grade ore stockpiles High grade ore stockpiles	Land alienation from waste rock stockpiles and disposal areas Disturbance from vehicle and machinery noise and site illumination Acceleration of acid rock drainage through exposure of ores to air and water Spontaneous combustion of coal fines Increased erosion and siltation of nearby surface waterbodies (rivers and lakes) Contamination of local ground waters
Blasting, milling and grinding	Blasting of rock to release ores Transport of ore to crusher Extraction and preliminary crushing of ore Milling and grinding of ore Flotation and chemical concentration / leaching of ore and final product Transport of ores to smelter	Ground surface disturbance Disturbance due to noise and vibrations Dust and fumes from explosives, mine vehicles and transportation systems Contamination from explosive residues Discharge of contaminated water Windborne dust and radionuclides Sulphur dioxide emissions from roasters and acid plants Metal vapour emissions from smelters
Smelting, refining and beneficiation	Mineral processing through smelting, roasting and other methods for refining ore Replenishment of refinery plant processes /solutions Stockpiling of final product	Discharge of contaminants to air, including heavy metals, organics and SO_2 Leakages from electrolytic plant leading to site contamination Spillage of corrosive liquids Requirement for electrical power
Transport of final product to markets	Packaging / loading of final product into transportation Transport of final product via rail link	Disturbance due to noise, vibration and site illumination Dust and fumes from exposed product stockpiles
Mine closure and post-operational	Decommissioning of roads	Subsidence, slumping and flooding of previously

waste management	Dismantling buildings Reseeding/planting of disturbed areas Re-contouring pit walls/waste dumps Water quality treatment Fencing dangerous areas Monitoring of seepage	mined areas Underground fires in abandoned coal mines Acid rock drainage from exposed ores Continuing discharge of contaminants to ground and surface water via seepage Fauna and flora habitat loss and disturbance Windborne dust, including radionuclides Dangerous areas that pose health risks and possible loss of life (e.g. shafts, pits, etc.)

Source: Ashton et al. (2001)

It is apparent that mining activities has a wide range of impacts on the environment. These range from the alteration of landscapes, to the pollution of the soil, groundwater (e.g. acid mine drainage) and the air (e.g. methane, sulphur dioxide and dust). Ecosystems also changes through the development of infrastructure and its' associated noise, vibration and surface disturbance impacts (Janse van Rensburg 2002).

An important question is how to compare these negative environmental impacts with the benefits of economic development on both the macroeconomic level (e.g. increase in economic welfare, foreign exchange earnings, taxes to government, job creation) and on the business level (e.g. profits, dividends). The actual damage costs of these impacts on the environment will vary with the response options used and the management of these responses. The focus is on two questions: first, whether the rate of exploitation of mineral resources and re-investment in alternative forms of sustainable capital is sustainable and second, whether the amount and concentrations of pollution and waste generated by this exploitation will cause no external costs to other agents.

4.1 The true costs of exploitation in the South African gold and coal mines

Any economic activity that exploits natural resources in a non-optimal way is not sustainable. To achieve optimality - in case of renewable natural resources the rate of extraction should at least be equal to the rate of regeneration (e.g. forests, fisheries). In the case of non-renewable natural resources, such as minerals, the rate of extraction should be matched with reinvestments to sustain a constant flow of income and employment from the feedstock. In other words, the project should sustain levels of consumption without diminishing the stock of assets. In the most simple way it would mean that somebody has just as much wealth at the end of a period than he had at the start of that period (Hicks 1946).

This does not mean that mineral assets cannot be exploited, but that a portion of the profits (or resource rent) is reinvested in alternative forms of sustainable capital. Future generations are therefore guaranteed to have the same amount of capital, although in different forms.

The amount reinvested should at least be equal to the user cost. User cost can best be thought of as the opportunity cost of current extraction on future profits. It is that part of the profits that need to put away to ensure that future generations will not be left worse of in terms of access to natural resources or alternatives to it.

User cost is usually paid through direct royalties, offset royalties and taxation streams. Direct royalties are defined here as direct payments to the owner of the resource for its exploitation. Offset royalties are investments in kind (e.g. free services) that also benefits the owner of the resource. A necessary condition for economic sustainability is that the amount of royalties and taxes paid over the lifespan of the project should at least be equal to the user cost.

Blignaut & Hassan (2002) made a first attempt to calculate the sustainability of resource extraction in the South African mining industry. They calculated that the capital depreciation factor, or level of user cost as a percentage of resource rent, was 15.5% for gold and 0.9% for coal in 1993 of which 4.2 % and 0.8% have been collected through royalties respectively. When taxes are added, 12.7% and 1.7% was actually recovered for potential re-investment to ensure non-declining levels of future profits (see Table IV).

Table IV: Capturing user costs in gold and coal mining in South Africa (R million current prices)

	Resource rent (RR)		User cost (UC)		UC/RR (%)		Royalties/RR (%)		Taxes & royalties/RR (%)	
	Gold	Coal	Gold	Coal	Gold	Coal	Gold	Coal	Gold	Coal
1966	299	0	48	0	16.1%	0.0%	3.3%	3.0%	35.0%	19.4%
1970	314	38	61	0	19.4%	0.0%	0.8%	4.9%	28.0%	19.1%
1975	1 422	95	173	0	12.2%	0.0%	0.7%	3.7%	0.7%	3.7%
1978	1 857	393	240	0	12.9%	0.0%	1.7%	2.3%	1.7%	2.3%
1981	4 705	1 065	585	0	12.4%	0.0%	4.5%	1.5%	52.1%	8.4%
1984	5 768	1 835	831	5	14.4%	0.3%	4.1%	0.4%	40.4%	3.5%
1987	7 841	1 940	971	10	12.4%	0.5%	6.3%	1.3%	41.8%	6.1%
1990	6 098	4 310	828	24	13.6%	0.6%	4.9%	0.6%	23.7%	3.4%
1993	7 713	4 319	1 196	37	15.5%	0.9%	4.2%	0.8%	12.7%	1.7%

Notes:
Data for 1975 and 1978 unreliable due to different methods of disclosures
Discount rate of 3% was used

Source: Blignaut & Hassan (2002:95)

This analysis indicates that user costs have been reasonably recovered by royalities and taxes. However, it is still an open question whether sustainability has been achieved through actual re-investment in sustainable capital. It is speculated that around 70% of land on which gold mines are operating and 80% of land used for coal mining, is privately held (Blignaut & Hassan 2002:96). As the South African government does not collect royalties from mining companies on private land and taxes on profits end up in the treasury, there appears to be little space for targeted re-investment in sustainable capital. This analysis need to be further refined because these results are sensitive to at least (i) the discount rate used and (ii) the broader debate on the definitions of sustainable investment in the context of developing countries such as South Africa.

4.2 The true costs of pollution and waste in South African gold and coal mines

As indicated in Table III (MMSD), mining activities can have widespread impacts on various aspects of the natural environment. These impacts could lead to external costs to agents other than the mining industry self[2]. These costs need to be added to the private costs of mining activities in order to reflect the costs of mining to society in general. With markets for environmental goods and services developing around the world, these 'new' liabilities will more easily find a way to the bottom line of mining (and other) economic activities negatively impacting on the production of these goods and services.

Preliminary calculations for the coal mining industry in South Africa indicate that such potential external costs are economically significant (Blignaut & King 2002). However, the risk to mining companies that these costs will be internalised need to assessed carefully before any meaningful conclusions can be made. It is not only the calculated costs per environmental impact that is important in decision making, but also the probability that mining companies will be held liable for these costs (polluter pays principle).

[2] A special case is where certain impacts on the environment has negative on-site costs, such as exploitative groundwater use or occupational health problems due to air pollution. The economic literature refers to this type of impacts as 'reciprocal externalities'.

4.3 Institutional and political setting

Whether and how a mining company will be held liable for the non-sustainable extraction of resources and the associated impacts on the environment is a function of institutional and political frameworks wherein these companies operate. In South Africa, development related to mining and quarrying would have to go through an environmental impact assessment process (see CSIR 1996, 1995). Although this process would assess for all environmental impacts considered to be an issue, express the significance of these impacts, and make recommendations on the best mitigation practices, it does not explicitly require economic efficiency in the allocation of resources to manage these impacts. In such processes, environmental impacts are therefore seldom calculated in terms of economic costs. South Africa’s National Environmental Management Act (NEMA) and the Treasury also have no working mechanisms in place to ensure that external costs are internalized in an economically efficient way. The approach is still regulatory with a major lack of capacity in the monitoring of actual environmental performance. Institutional capacity is also lacking, as is evident through significant backlogs in attending to all EIA applications.

The major drawback from EIAs are that they are project specific and do not adequately account for cumulative effects, both over time and spatially. Although strategic environmental assessments and the planning of spatial development initiatives (SDIs) do to some extent address this problem, they are not required by law and especially in the latter case do not explicitly include environmental effects. The Department of Environmental Affairs and Tourism is currently in a process to develop more comprehensive environmental assessment procedures inspired by the more holistic philosophy of integrated environmental management (IEM).

5 FDI and the environment

Given this overview of the environmental impacts and the costs of these impacts of mining activities, the next question is how foreign direct investment would impact on the environment. As all mining activities will have an impact on the environment (see Table III), the relevant FDI issue is what the additional environmental costs or benefits of FDI are.

5.1 Additional environmental impacts of FDI

Although FDI can bring economic benefits to a country and can even lead to overall economic welfare gain on both the micro and macro levels, the distribution of winners and losers is an issue worth considering. Tables V and VI provides a short overview of historical and ongoing projects (including mining activities) in South Africa that has had negative and positive impacts on certain segments of the population and the environment.

Table V: Examples of negative impacts of FDI in South Africa

Project	Investor	(Potential) impacts	Response options	Economic costs
Coega IDZ, Eastern Cape	Billiton, UK	Water & electricity use Loss in tourism to nearby Addo National Park Displacement of people Air pollution (sulphur dioxide, dust) Waste (heavy metals, liquid effluents)	Use of OECD guidelines for multinational enterprises Direct ministerial influence on Billiton	To be determined
Asbestos mining, Northern Cape	Cape Plc	Human health impacts (asbestosis, mesothelioma)	Rehabilitation actions Court action	Cost of court case: R120 million Cost of medical treatment: R350 million Loss of human capital: R467 million[3]
Cato Ridge plant, KZN	Thor Chemicals, Cyanamid (USA) partly supplies mercury waste	Human health (mercury poisoning)	Lobby group Pressure to ratify and implementation of Basel Convention	N/a
Uranium mine, Namibia	Rio Tinto	Human health (cancer)	Court action	N/a
Mozal/Hillside Aluminium smelter		Cheap electricity produced without accounting for external costs on the environment	Accession to Kyoto Protocol but no binding targets on greenhouse gas reduction	Costs not quantified Potential benefits through international offset projects (e.g. through Clean development mechanism)

Sources: Adapted from Martinez-Alier (2001) and Moodley, Blignaut & de Wit (submitted)

[3] These are conservative estimates. For further discussion see Moodley, Blignaut & de Wit (submitted).

Table VI: Examples of positive impacts of FDI in South Africa

Project	Investor	Positive Impacts	Economic value
Coca Cola plants	Coca Cola	Require all SA plants to do environmental audit of operations	Better management of external environmental costs
Mozal smelter, Mozambique		Environmental assessment using World Bank guidelines	N/a

Although far from exhaustive these tables make the point that FDI can have both negative and positive impacts on the environment. The important question when assessing the impacts of FDI on the environment would be whether FDI has any *additional* environmental impacts over and above the baseline of mining's impact on the environment. The economic assessment of environmental impacts, at least on a project level, need to be informed by the 'with FDI' and 'without FDI' scenario. Checks and balances on these 'additional' effects include environmentally sensitive project appraisal methodologies and best environmental practice guidelines.

The overall *scale* of mining's impacts on the environment might be increased by additional investments, but this question needs to dealt with on a macro level. Does South Africa have the right government policies to attract FDI into mining activities? And if this is the case, what checks and balances are in place to first, mitigate against the increased total amount of environment impacts and second, decrease the rate at which environmental impacts increase in relation to total production?

FDI could also have an effect on the relative size of the economic sectors, which, in turn, has an impact on the amount of goods and services produced that have an impact on the environment. For example, FDI can drive the production of relatively cleaner goods, if it results in sectoral shifts from primary and secondary industries to tertiary activities. This issue need also be dealt with on a macro-level.

6 Conclusions

South Africa attracts a tiny part of worldwide FDI (approx. 0.6%), mainly dominated through mergers & acquisitions in the telecommunication, energy & oil and automobile sectors. The growing capital formation in the mining sector is mainly financed out of other sources than FDI. A notable exception is the 50% stake by Placer Dome Ltd. in the

South Deep gold mine.

There is no evidence that FDI in itself is better or worse for then environment when compared to domestic investments. It was shown that some FDI projects had negative impacts on the environment and some had positive impacts on the environment when compared to other developments. The institutional context wherein FDI takes place is a more determining factor on its impacts on the environment. Although South Africa has an EIA process in place that is required by law, there are shortcomings in the institutional framework that can possibly be exploited by foreign (and domestic!) investors:

- A lack of capacity in government to deal with EIA applications.

- Project level EIAs do not take account of cumulative effects. One can have a series of projects that pass the test, but the overall impacts could lead to negative environmental change.

- An analysis of the effects of FDI on the overall scale and sectoral composition of economies and associated environmental impacts is not included in the current institutional framework.

- The true costs of the rate of resource extraction and the associated impacts on the environment need not be quantified within the current framework. A full picture of social welfare losses therefore is never brought to the decision makers' table.

- There is no mechanism to enforce the polluter-pays principle, other than the mitigation options suggested in the environmental management plan. The lack of enforcement produces incentives for non-compliance.

- Incentives for better environmental management, such as pollution taxes or tradable pollution permits are non-existent. The treasury does not have a fiscal policy that includes environmental aspects.

- Ignorance on the external costs of electricity production provides incentives for energy intensive developments (e.g. alluminium smelters, mining activities). The costs of cheap electricity to those dependent on a clean environment, is not calculated.

- Lax enforcement of international agreements such as the Basel Convention

- Developing country status under the Kyoto Protocol could provide incentives establishing greenhouse gas intensive operations. However, benefits can also be gained through the Clean Development Mechanism (CDM).

In summary, FDI towards the South African mining sector could have additional negative impacts if:

- weak spots in the current institutional framework is exploited

- full costs and benefits of investments are not brought to the decision maker's attention.

Response options would therefore need to focus on:

- use best international practices for project and strategic assessment of FDI projects

- these practices include all costs and benefits in a holistic framework.

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