

# **Review of the South African Coal Mining Industry**



October 2013

## INTRODUCTION

Coal was discovered in South Africa, in the KwaZulu-Natal and Eastern Cape Provinces, towards the middle of the 19<sup>th</sup> century. Mining, however, only began in 1870 when coal of the Molteno-Indwe Coalfield in the Eastern Cape was exploited to supply energy to the recently discovered Kimberley diamond fields. The Mpumalanga Province coalfields were discovered by the Voortrekkers, but only mined in the late 19<sup>th</sup> century after the development of the Witwatersrand gold deposits. Coal production rose from 500kt in 1890 to 2Mt in 1900. By 1920, with an output of 6.6Mtpa, the Central Basin coalfields were the country's leading producers with approximately one ton of coal first exported during that year. During most of the 1940s, production averaged about 20Mtpa, then rose to about 30Mtpa at the beginning of the 1950s with an increase of exports to 3Mtpa.

After the development of Eskom's "captive colliery" policy, coal demand and production grew rapidly. The onset of the world energy crisis in 1973 created further interest in South Africa's coal and rising demand saw output escalate to new heights. During the 1970s, production rose from 50Mtpa to 74Mtpa, most of the coal being consumed locally. Coal exports were seldom possible, due to the high ash content of the run-of-mine (ROM) coal. They became important as a consequence of the development of new beneficiated products and the brilliant ideas of David Horsfall. These coal products found a favourable market in Europe and Asia as steam and metallurgical coal. The South African infrastructure required for large-scale exports of unsized coal was created with the establishment of the Richards Bay Coal Terminal (RBCT) and its dedicated railway coal line (CoalLink).

The country has 18 principal coalfields, spread over an area of some 700km from north to south and 500km from east to west. The Molteno-Indwe coalfield in the Eastern Cape, some 300km south of the main coal-bearing region, is an isolated, younger deposit.

Generally, the rank or maturity of coal seams increases eastwards, with a concomitant decrease in the number of seams and their thickness. Thus, the Mpumalanga and Northern Province coals are usually bituminous in seams up to several metres thick, whilst KwaZulu-Natal coals are often anthracitic and deposited in relatively thinner seams.

Most of South Africa's coal production is bituminous steam, with only 1.2% anthracite. Some 0,8% of the bituminous coal is converted, through beneficiation, to a coking coal product, some semi-soft, some straight. Only a few small and uneconomic deposits of lignite have been recorded in the Eastern Cape and KwaZulu-Natal Provinces.

South Africa is now, according to the International Energy Agency (IEA), the 7<sup>th</sup> largest producer of hard coal (bituminous and anthracite) and the 6<sup>th</sup> largest exporter. It has 3.5% of the world coal reserves.

Coal in South Africa produces the highest foreign exchange earnings of the country, is the largest mining income-earning commodity, higher than platinum and gold. It is used to produce 95% of the country's energy, 90% of the reductants used by the metallurgical industry, more than 40% of the liquid fuels locally required and more than 200 major chemicals, used for 1 000 carbon-based products (SASOL's Synfuels).

*Table 1. Yearly production, local sales and exports*

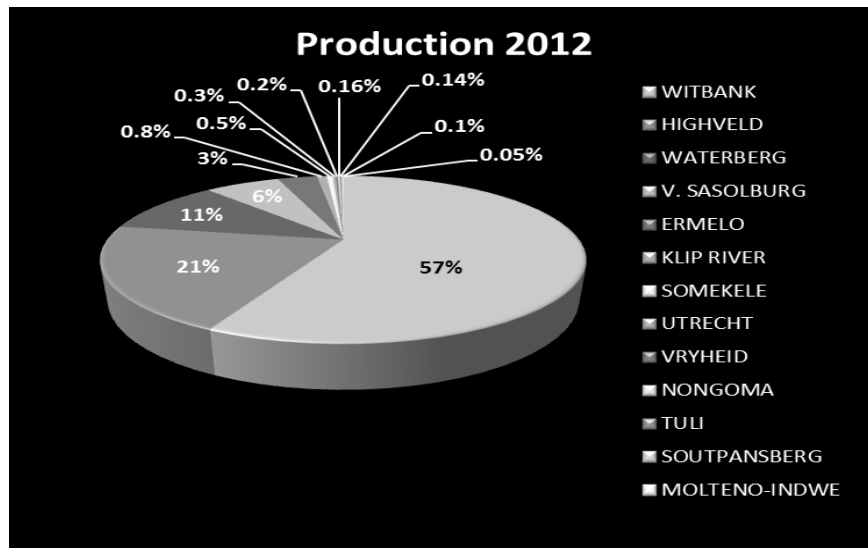
Year	Production		Local sales			Export sales		
	Mass (Mt)	Value (MR)	Mass (Mt)	Value (MR)	Price (R/t)	Mass (Mt)	Value (MR)	Price (R/t)
1980	115.0	82.0	783.2	10	31.1	713.9	23	
1981	130.3	98.1	1 138.7	12	31.8	1 007.7	32	
1982	142.9	110.3	1 414.1	13	30.0	1 239.0	41	
1983	145.6	113.0	1 461.1	13	31.6	1 190.4	38	
1984	162.8	121.4	1 720.8	14	39.9	1 753.0	44	
1985	175.7	125.2	1 954.4	16	46.7	3 148.1	67	
1986	176.8	127.4	2 228.8	17	46.9	3 203.8	68	
1987	176.1	128.9	2 533.5	20	43.6	2 312.0	53	
1988	181.6	139.4	3 112.8	22	44.2	2 839.2	64	
1989	177.8	131.2	3 691.0	28	48.9	3 883.2	79	
1990	175.0	134.9	4 146.3	31	49.6	4 018.6	81	
1991	178.5	132.6	4 505.9	34	49.3	4 279.4	87	
1992	177.4	129.6	5 066.7	39	49.6	4 357.1	88	
1993	184.0	131.8	5 193.1	39	52.2	4 520.9	87	
1994	196.4	138.8	5 520.3	40	54.8	4 832.3	88	
1995	205.6	146.1	6 342.3	43	59.7	6 478.8	109	
1996	205.0	146.3	6 798.4	46	60.2	8 104.4	135	
1997	219.3	159.7	7 810.7	49	57.6	8 468.5	147	
1998	223.8	156.8	8 217.9	52	66.1	9 699.1	147	
1999	222.3	155.3	8 307.6	53	64.9	9 181.8	141	
2000	224.9	155.5	8 835.3	57	68.1	10 914.0	160	
2001	223.5	152.2	9 564.5	63	66.6	16 278.3	244	
2002	220.2	157.6	11 773.1	75	69.2	19 367.0	280	
2003	239.3	168.0	13 212.8	79	71.5	13 490.6	189	
2004	242.8	178.4	13 606.1	76	67.9	14 472.9	213	
2005	245.0	173.4	14 878.1	86	71.4	21 155.2	296	
2006	244.7	177.0	16 238.9	92	68.8	21 497.2	312	
2007	247.7	182.8	19 718.6	108	67.7	24 447.6	361	
2008	252.7	197.0	30 104.2	153	61.2	46 903.3	766	
2009	250.6	184.7	34 463.0	187	61.1	31 301.8	512	
2010	254.7	171.5	33 044.7	193	66.4	36 413.7	548	
2011	257.7	177.8	38 053.8	214	69.4	49 498.8	713	
2012	258.6	184.1	43 696.4	237	76.0	52 226.9	687	
2013*	255.0	183.2	47 228.6	258	70.3	48 440.7	689	

\* Projected from figures Jan–June 2013

## MINING AND PROCESSING

About 64% of South Africa's coal is mined by opencast methods and 36% by underground methods, i.e. bord and pillar, 33.6% almost entirely mechanised, some 0.5% by longwalling and 1.9% by pillar recovery (stooping).

The principal coalfields currently being exploited, in order of importance, are: Witbank, Highveld, Waterberg, Vereeniging-Sasolburg, Ermelo, Kliprivier, Somekele, Utrecht, Vryheid, Nongoma, Tuli, Soutpansberg and Molteno-Indwe.



South Africa's coal mining occurs mainly within the Mpumalanga Province, which produces some 81% of the country's total output. Limpopo Province with 11%, Free State Province with 6%, and Kwazulu-Natal Province with 2% provide the rest. As anthracitic coal deposits in the east become depleted, bituminous coal from the central and northern coalfields, contributing 98.8% in 2012, make up most of South Africa's coal production.

Usually, coal exporters process their ROM production in order to reduce the ash content. In contrast, some bituminous coal, which constitutes the bulk of local sales, used in the domestic market mainly for electricity generation, is not beneficiated. Many large mines, including some of the steam coal producers, have become multi-product mines, processing their coal to obtain a light fraction, usually exported, and middlings, mainly used for local consumption. The standard coal processing operation involves crushing to attain liberation (separation of coal from rock

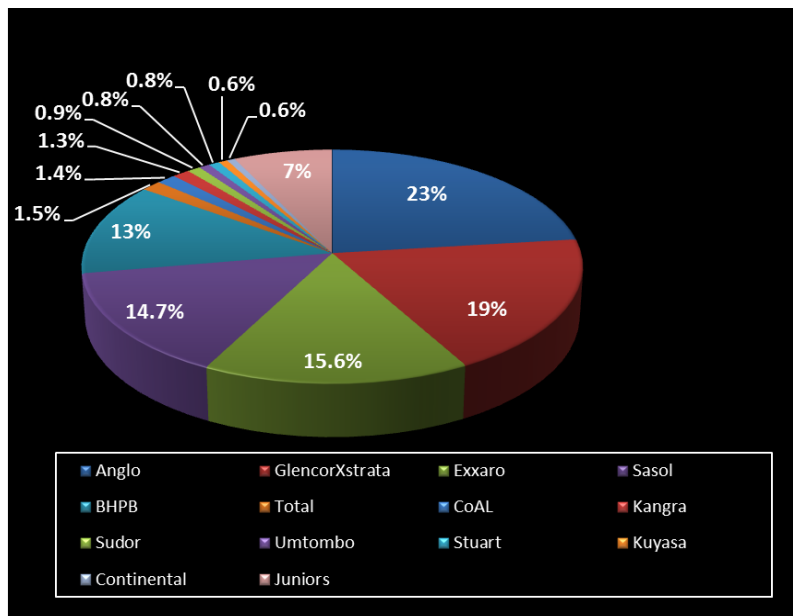
particles), followed by fine milling to obtain a product amenable to heavy media separation at densities between 1.4 and 1.5.

Grootegeluk, the only mine in the Waterberg coalfield, is the country's largest ROM coal producer, approximately 37.2Mtpa, but its saleable coal is only 17.9Mtpa, or 48.1% of the ROM. Some 19.3Mt are discarded after beneficiation due to the nature of the upper part of this coal deposit – 60m of intercalated mudstone, shale, carbonaceous shale and coal.

Sasol, producer of synthetic fuels, gas and some 120 by-products such as waxes, phenol, ammonia, explosives and sulphuric acid, also utilises low grade (high ash) bituminous coal. The Fischer-Tropsch process employed was originally developed in Germany but it was improved locally to the extent that South Africa is the first world producer of these products from coal.

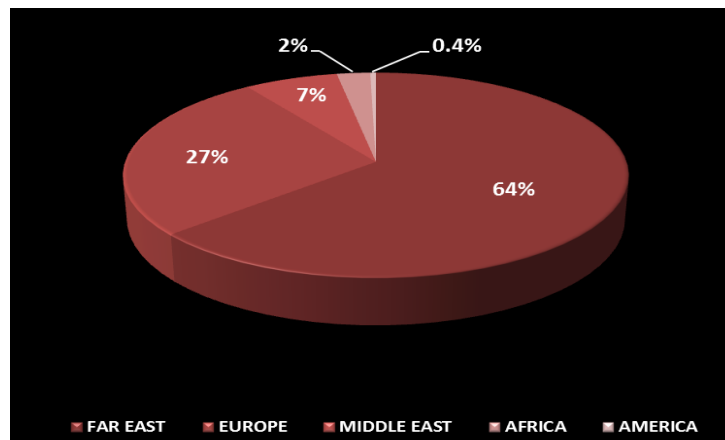
#### DEVELOPMENTS DURING 2011/2012

In 2012 South Africa's ROM coal production amounted to 330Mt. The 117 South African collieries produced 258.6Mt of saleable coal. It exported 76Mt valued at R52.227 billion at the average price of R687/t and used for the inland market, 184.1Mt valued at R43.921 billion at an average price of R238/t, ranging from R103/t (steam coal, mainly for Eskom) to R2 154/t (coking coal). 75.6Mt were discarded.



About 85.3% of saleable coal production was supplied by mines controlled by the five largest mining groups, i.e. Anglo 23%, Glencore Xstrata 19%, Exxaro 15.6%, Sasol 14.7% and BHP Billiton 13%. The other companies and mines produced the remaining 14.7%. The 36 Junior coal mines, mainly BEEs with an annual production ranging between 2Mt and 8kt, produced 7%.

The number of coal mines has increased to 117 in 2012. Of these, 7 are very large (more than 10Mtpa), responsible for 46% of the total output. As a result of the increase of the number of small (more labour intensive) operations, the coal mining industry's labour force has increased from 83 200 to 85 100 workers from 2011 to 2012.



### COAL EXPORTS 2012-2014

In 2012, South African coal was exported to 34 countries, of which India, China, Germany, Israel, Taiwan, Italy, Switzerland, Turkey, Malaysia, the Netherlands, Spain and the UK are, in order of importance, the largest importers. A total of 76Mt coal, valued at R52.2 billion, was exported, largely to consumers in the Far East (63.5%), EU (26.9%), Middle East (6.8%), Africa (2.4%) and America (0.4%).

The average price of South African export coal in 1998, in Rand terms, was R687/t (FOB).

**Coal Market Report**  
Your daily snapshot of international coal markets

12-Jan	12-Feb	12-Mar	12-Apr	12-May	12-Jun	12-Jul	12-Aug	12-Sep	12-Oct	12-Nov	12-Dec
105.93	105.62	103.86	101.53	95.36	86.38	87.03	89.09	85.93	83.01	84.95	89.44
13-Jan	13-Feb	13-Mar	13-Apr	13-May	13-Jun	13-Jul	13-Aug	13-Sep	13-Oct	13-Nov	13-Dec
86.67	85.82	83.06	82.02	81.99	77.53	72.82	72.74	73.5	81.09	83.5	89.38
14-Jan											
90.5											

The globalCOAL Market Report Fri 18.10.2013 (above) shows how prices dropped from Jan to Oct 2012, improved slightly in Nov and Dec, then continued declining during most of 2013 to reach, in Aug 2013 their lowest point (\$72.74/t). They slowly increased during the rest of the year, showing promise of further increases in the first quarter of 2014.

The recent price increase seems to not be supported by the market. Platts *Coal Trader International* reported: The Atlantic physical thermal coal market heated up considerably Thursday, with 800kt of higher fixed priced prompt SA RBCT FOB and European-delivered CIF ARA deals done via globalCOAL screen, the majority in a late afternoon spree. Including index-linked trades, 1.325Mt of coal was dealt in the physical market, making Thursday one of the busiest trading days of the year.

The SA RBCT FOB spot market rallied \$3 Thursday, with sources citing a stronger paper market, despite continually weak fundamentals. Platts assessed the price of physical RBCT thermal coal basis 6 000 kcal/kg NAR for loading within the next 7–45 day period at \$78/t, climbing \$3 on-day.

One trader noted that the strength was a “recurrent story” of a large trading house squashing the implied freight (CIF ARA–FOB RBCT) spreads in the financial market, with another large player bidding up API2 prices and South African swaps, and physical in turn following suit. He added that the trading house was buying cargoes at higher prices, particularly on the back of the 90-day window to justify their paper position, but that the physical values were “artificial”.

Trading sources continued to note that stocks at RBCT were high at around 5.5Mt and railing remained efficient, while the terminal was said to be shipping at under full capacity.

A second trader said that Indian demand was “nowhere to be seen” with prices at the current levels. “If you take freight rates into account, it just does not price in,”

he commented. A November-loading 50 000t cargo traded at \$78/t FOB, while three January-loading parcels also traded; 50 000t at \$83.50/t and two 25 000t transactions at \$83.50/t and \$83.70/t. The trader said that, with the \$5.50–5.70 difference between November and January cargoes, anyone who had the ability to stockpile would “buy November and stick it on the stockpile.” On the other hand, he said that if people had coal to sell, that they should sell it for January, as they would be getting a much better price, while those that “needed to sell to get rid of it” in November were having to do so at discounts of \$3–4/t below paper contracts.

Summing up, current (and future) relative higher prices, being artificial, cannot be supported by either the Atlantic or Pacific Rim markets. So, after this rally ends, prices will decrease again to their Sep 2013 levels, unless another unforeseen element affects the market and serves to maintain prices at their present levels.

### LOCAL MARKET 2013

South Africa's inland coal market recorded sales of 184.1Mt, valued at R43.9 billion. The electricity sector bought 120.3Mt, synthetic fuels 40.9Mt, the industrial sector 8.7Mt, merchants 8Mt, the metallurgical industry 5.8Mt and mining 0.4Mt.

The local market prices were mainly based on grade (Ash vs. CV). Eskom prices are calculated on GJ/t (*see table below*).

Coal specifications	Unit	Lower Ash A - grade	Lower Ash B - grade	Higher Ash C - grade	Higher Ash D - grade	Higher Ash < D - grade
Calorific Value	MJ/kg	27.5 - 28.5	26.5 - 27.5	25.5 - 26.5	< 24.5	< 22.5
Volatile Matter	%	>27	>25	>24	>20	>18
Ash content	%	7 - 15	12 - 17	17 - 22	18 - 30	18 - 35
Inherent Moisture	%	<4	<4	<6	<7	<7
Total Moisture	%	<10	<10	<10	<10	<10
Total Sulphur	%	<1	<1	<1	<1	<1
Fixed Carbon	%	By difference	By difference	By difference	By difference	By difference
Price/ton FOT	R	R640	R550 - R640	R450 - R500	R350 - R450	R9.50 - R11.50/GJ/t

Although local coal demand, especially that of Eskom, seems to grow unceasing and, as a result, prices will continue to rise, new Eskom regulations requesting suppliers a



51% BEE component is making it difficult (as in the case of New Largo/Kusile) for new non BEE mines to sell to Eskom.

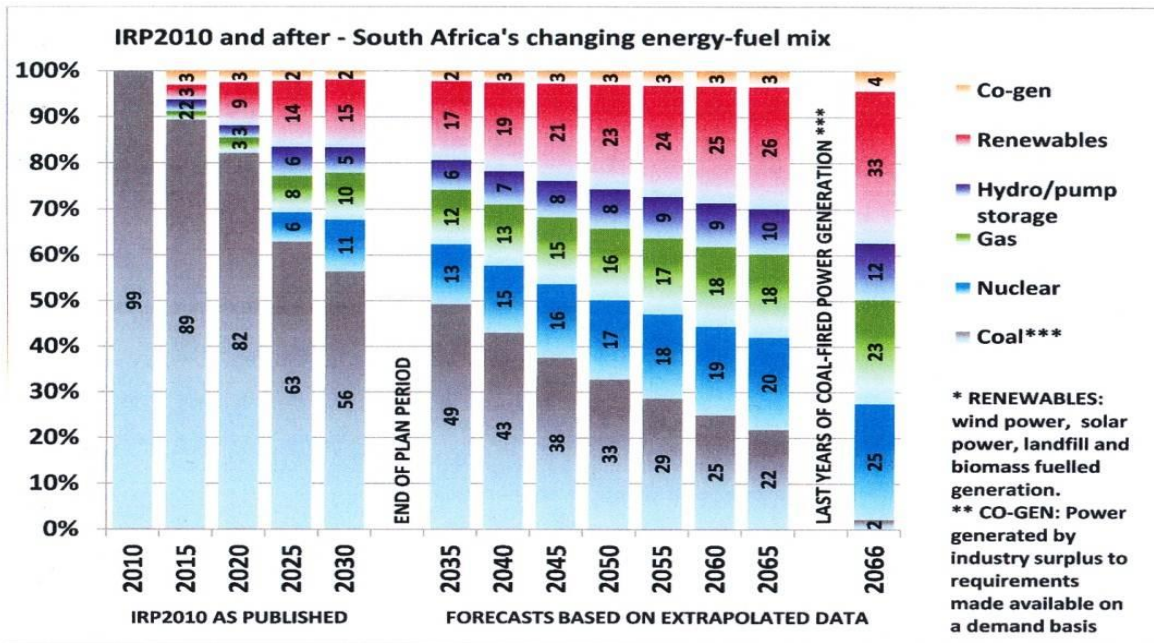
This and other cases of government and parastatals' effect on the industry will be discussed next.

### IMPACT OF SA GOVERNMENT – CURRENT AND FUTURE

1. At the 2009 UN climate change talks, South Africa undertook to reduce domestic greenhouse gas emissions by 34% by 2020, and by 42% by 2025, subject to adequate financial and technical support.
2. South Africa introduced the SA Renewables Initiative in October 2011, obtaining funds for climate change adaptation, energy-saving equipment, moderating the spike in the price of electricity generated from renewable sources.
3. South Africa introduced the Integrated Resource Plan in 2010 (IRP2010) i.e. mixed sources of energy.
4. The Minister of Finance announced the introduction of Carbon Taxes in 2015.
5. A new MPRDA (Mining Law) could be implemented by year-end or shortly after.

*Miningmx* Tue 01 Oct 2013: The CoM, and the companies themselves, including Anglo and BHP Billiton, launched impassioned pleas that amendments, including one that aims to provide the mines minister with discretionary powers over declaring certain minerals for export 'strategic', would only hurt investment. Giving unfettered and uncircumscribed power to the minister to determine the terms and conditions subject to which rights and permits may be granted is a significant disincentive to investment, said Khanyisile Kweyama, executive director of Anglo American SA. Anglo and BHP, two of South Africa's largest coal exporters, claim that restricting exports would stop investment in new mines.

Although points 1 and 2 have not affected coal mines – as yet – point 3 (IRP2010), if implemented, is a highly serious threat for the industry.



From the chart above, it can be seen that coal-fired energy, at 99% in 2010, should decrease to 63% in 2025, 56% in 2030 and ultimately to 2% in 2066.

To achieve these percentages, much of Eskom's power station fleet would have to close down. The results would be almost like shutting down most of the coal mines.

Point 4 could have a similar, but parallel result to the IRP2010. As government taxes CO<sub>2</sub> emitters, it will be automatically increasing the cost of electricity generation and making coal mines less profitable (and electricity more expensive).

The last item, point 5 is probably the most dangerous for the industry, as many articles published in the media have already pointed out.

### LABOUR UNREST

Since the beginning of last year, this has been one of the strongest deterrents for the industry attracting foreign capital. Although it seems like the coal mines did not receive the brunt of the strikes, the outcome of the platinum/gold mines' unrest have enhanced the perceived risk of similar occurrences in coal mines.

### REALITIES

Despite the rapid increase in renewable energy sources, "the reality is that fossil fuels will still provide the major share of power generation with coal alone accounting

for 40% of the world's electricity, a situation that will not change in the near term." (IEA CCC)

With a potential delay of two years or more in the South African nuclear programme, i.e. a loss of 3.6GW, what will fill the gap? Coal, on top of the 19GW in the current programme.

Renewables at present comprise approximately only 1% of the power generated in the country.

## SUMMARY

### RESERVES AND RESOURCES

<b>RESERVES 2012</b>		
COALFIELDS	RESERVES	
	2012 (Mt)	%
HIGHVELD	9 271.4	28.8
WITBANK	7 965.3	24.8
WATERBERG *	6 635.5	20.6
ERMELO	4 356.3	13.5
VRG.-SASOLBURG	1 647.0	5.1
SOUTH RAND	715.5	2.2
UTRECHT	539.7	1.7
KLIPRIVIER	521.3	1.6
SOUTPANSBERG	256.5	0.8
KANGWANE	145.6	0.5
VRYHEID	98.3	0.3
NONGOMA	3.7	0.01
<b>TOTAL</b>	<b>32 156.1</b>	<b>100</b>

The table above, showing an approximate figure of SA reserves (based on the 1983 de Jager Report), highlights that although coal reserves in SA are not in abundance, there is possibly enough coal to last for another 40 to 50 years. Most of this coal is in the Central Basin (Highveld, Witbank, Ermelo coalfields). The coalfields in the Limpopo Province (Waterberg, Soutpansberg, Springbok Flats and Tuli) only account for about 21% of the reserves, yet it is known that they contain large coal occurrences. Once the Central Basin coal is depleted, it is expected that the new coalfields should be mined, provided that by then, infrastructure and water resources can be boosted to make their coal mineable.

## PROJECT FINANCING

A serious question that arises is will SA be mining coal beyond 2020 or 2040? Presently many coal projects/mines are stranded because of the lack of sufficient capital to implement them.

While Botswana, Mozambique and many other African countries are attracting enough capital to open mines, it seems that South Africa has been singled out by the financiers as the only country (other than Zimbabwe) posing too high a risk for investment.

An Engineering News recent publication *Projects in Progress* – Sep 2013, spells out the dilemma. In the editorial entitled *Project economy disconnect*, Martin Cramer, Publishing Editor says that after interviewing numerous large contracting companies expressing their preference for working in SA, “international operations are likely to drive their earnings over the medium to long term”. He concludes: “there is currently a deep disconnect between the SA government’s rhetoric on infrastructure and the actual project-economic reality.”

What Cramer is saying is that the intentions of government to assist with the economic development of the nation contradict government implementation of legislation that is producing exactly the opposite consequences.

## FUTURE OF THE INDUSTRY

To accurately assess the future of the industry, we first need to know if all the big stumbling blocks to the development of new coal mines, listed above, are going to be implemented by government or not. I think that this is precisely the issue that prevents companies, local and international, from investing in new coal mines.

Xavier Prévost  
*Senior Coal Analyst*