Journal Comment

Black Swans versus White Swans

'Black Swans occur when there is a,
disjoint between what we
know and what we think we know'
J.C. Ngoma, Presidential Address SAIMM, September 2009

Those who attended the Presidential Address in 2009 did not suspect that the prophetic theme of 'Swinging with the Black Swans' would materialize within the next three years. 'These beasts could lie hidden, only to appear unexpectedly and cause much havoc.'

The Mining and Metallurgical industries are going through the most serious criticism that I have encountered in my 62 years' association with them. This is at a time when South Africans are looking at them to provide the key to the solution to an even bigger crisis facing the Nation: that of unemployment and poverty.

The 'Nationalization' debate, the topic of the papers in this issue, progressively came to a head in the few years after the 2009 address. It was, of course, a topic before that, but became heated, fanned by the global economic depression.

These papers have been submitted by the Mineral Economics Division, which is promoted by the Institute. They are sober analyses of a political/legal/economic situation that I found most interesting. The topic has given rise to some violent heated political rhetoric, which brought out the black swans to cause the havoc attributed to them. Job creation was assigned the highest national priority, and for obvious reasons attention was focussed on the mining industry that during the last century was second only to the agricultural industry as a major employer of disadvantaged communities. Increased mineral beneficiation became the battle cry.

I have neither attributes nor licence to comment on political and legal aspects. But on mineral beneficiation and job creation, I had this assignment in 1960 when I was designated to direct the National Institute for Metallurgy to make these the main focus of our work. The formula was simple - to indentify goods and/or services for sale to cover the (added value) salaries of the staff involved.

This still applies, and the latest calculations of the HSRC researchers indicate a target of 500 000 jobs, an increase of 5.5 per cent of GDP. Without having exact figures for GDP (*circa* R3.6 trillion) this amounts to R200 billion sales value per annum, well above the total value of gold production. To achieve such a target is impossible on any reasonable time scale unless desperate measures are taken to improve the range of skills for competitive global marketing.

There are many other black swans harassing the mining industry. Particularly worrying is the ever increasing cost of electrical power, which has already knocked out one aluminium plant and resulted in the closing down of ferro-alloy furnaces. It has a high impact on electric smelting, the current key to platinum metals processing.

There is the black swan-induced panic over Acid Mine Drainage (AMD), in which the latest strategy to prevent an environmental disaster is to use the disposal method used for decades, involving the addition of low-grade lime to dump a gypsum-loaded toxic slime that would continue to leak calcium sulphate and radioactive elements into the drinking water catchment areas. This requires vast quantities of pristine Lesotho water to flush these impurities down-river.

There is the black swan festering discontent among the contract mineworkers, resulting in the fiasco at Marikana and many other mining operations.

Worst of all are the difficulties of the government schooling system after the abandonment of the OBE policy. Even if it were possible to create the goods to generate employment, there exists no way that we would find the staff of material scientists, technicians, manufacturing, planning, marketing and business management to have the work ethic and linguistic skills to penetrate the global markets. This is the most fundamental of limitations and demands the highest of all priority in immediate action steps.

Fortunately there are many white swans, some only cygnets, which can provide some order to the havoc. I confine myself to only those that have been mentioned in this Journal and its Comments over the past years. In the space available, I can only touch on the outlines, but it is essential that they be specified and debated in detail soon by the professional collegiate of experts nationally and internationally.

For example, as mentioned in the December Comment, there are far more elegant ways of handling the AMD problem using ion exchange processes to provide quality water and impurities as saleable products to offset costs. There are options to overcome the electrical power cost, by use of hydrometallurgical methods, or co-generating of electrical power at low cost, as described in some detail in papers in this Journal.

There are potential options to prolong the life of the marginal gold mines using alternative rock- breaking methods and reducing gold losses, as suggested in the August issue on rock mechanics. These are based on selective blast mining. This could promote complete backfill, HPRC crushing underground, hydraulic hoisting by air lifts accompanied by pressure leaching and significantly increased precious metal recovery, extending and even re-opening gold mining operations could be the result.

In my view, by far the most dramatic of the white swans comes from the April issue, in which the Mining Engineering departments of the Universities of Pretoria and Witwatersrand describe their phenomenal success in bridging the gap between school leavers and properly matriculated first year acceptances. The result is the production, over the years, of top-quality mining engineering graduates at a high pass level. This was achieved by a quantum leap in IT-based methods of teaching and training.

This has persuaded me to pursue a vision initiated some two decades ago in observing 'Tavland', a subsidiary of JCI, making a fortune using treated mine water and drip irrigation on mine dumps at Western Areas mine for the growth of fruit orchards.

I can now put forward a suggestion of a mining cluster to provide a model for the rest of South Africa. The features are a completely integrated community of mineworker families, including wives and senior adults, all enjoying a reasonable income. The children will go to elite schools, offering a full curriculum including languages, arts, business management and, of course, mathematics and the range of sciences, well-

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paid specialized teachers using modern digital methods, integrating with parents and industrial employers and the mines. Every classroom and every farmer/family to have a computer or the latest smart phone. Incomes will be generated by small lot farming coupled to industrial manufacturing factories and service laboratories. The farming will be by automated hydroponic fertigation (sub-surface irrigation) using domestic effluent as the main water supply and fertilizer quantities, a small fraction (about1/5) of commercial irrigated farming. The agricultural products cover a wide range, but focus on food as well as biofuels and biomass for use for automated mining equipment and electrical power generation. Preliminary estimates of the income that can be generated are of the order of R300 000 per hectare per annum

The villagers and children will enjoy sport, entertainment, health clinics and academies for adult training and cultural activities. These and many more features will be self-sustaining, obviously with sponsorship where applicable but at little cost to the mine apart from the salaries of their employees - a Green car in the family, Green power, Green houses.

Are these concepts pipe dreams? Maybe not – as suggested by the following straws in the wind.

Malawi legislates for biofuel pumps in all filling stations to serve as a model for Africa.

Total power from waste dump biomass for the University of British Columbia.

I am looking for a champion community.

In the light of the origin of the contributors in this issue, maybe the Royal Bafokeng Nation and shareholders might be interested, possibly with Anglo American support, which has announced the building of houses for 20 000 mine workers.

It is a tortuous road from poverty to prosperity, needing many critical paths of portfolio planning.

These concepts could be achievable. To convert what we think we know to what we know demands detailed debate and demonstration. Herein lies the role of organizations and Institutes such as the SAIMM. ◆

R.E. Robinson