Strategy4Good
Strategy and Sustainability

Lehating Mining Economic Impact Analysis, Alternative Land Use Analysis and Integrated Development Analysis

Author: Gerrie Muller, Strategy4Good

28 May 2013

www.strategy4good.co.za
Commissioned by SLR Consulting (Pty) Ltd

Content

FIGURES

TABLES

ACRONYMS

AHP

Analytical Hierarchical Process, 21

DCF

Discounted Cash Flow, 11

EIA

Environmental Impact Assessment, 9

EMP

Environmental Management Plan, 9

GDP

Gross Domestic Product, 13

SA

South Africa, 10

SLR

SLR Consulting, 21, 22

1 Introduction and background

The basic background to this project is outlined below.

ITEM	DETAILS
Type of Mineral	Manganese, Iron
Locality (Direction and distance from the nearest town)	Lehating is within 1km access of the R380 national road which connects the largest town in the area, Kuruman, to the Botswana border. The road is gravel from the farm Lehating for a distance of approximately 8km to the point of intersection where BHP Billiton Wessels Manganese Mine is located.
Extent of the area required for mining	Lehating will be an underground mining operating. The approximate extent of the underground mining area is 545 468m^2.
Extent of the area required for infrastructure, roads, servitudes etc	The approximate surface area required for surface infrastructure is 30ha. No servitudes currently exist over the project area, but a future servitude will be required for the ESKOM incoming HV line.

2 Baseline of the receptor communities

Given the wide geographical dispersion of the region, the low land density and the remote planned location of the mine, the Joe Morolong Local Municipality is deemed to be the economic base for the project.

As a first step, we therefore discuss a number of key economic baseline aspects below.

1. A critical measure of the improvement in quality of life of a local community is that of its GDP per capita. Based on S4G's information sources, the GDP per capita of Joe Morolong Local Municipality has increased robustly by 4.9% from 2006 to 2011, and this is set to continue to grow, despite a strong influx of people into the region. Its total GDP of R3.5 billion is relatively low and puts in in a low income town bracket.

   The local municipality's GDP per capita is estimated at 60% of that of the national statistic indicating both that the average price level in the area is much lower than the national, and that it is more impoverished than the average South African.

Table 1: GDP and population – Joe Morolong Local Municipality

Aspect	2006	2011	Growth
Population	65101	70592	1.6%
GDP Rm	1,825	3,529	7.1%
GDP per capita	39,315	49,987	4.9%

2. From the figure below, it can be gleaned that the mining industry is the major cornerstone of the local area's economy. It makes up over 50% of the private economy in the area and had shown steady growth. The catering and accommodation sector have in particular gained from this growth as it is the highest growth sector.

Figure 1: GDP per industry

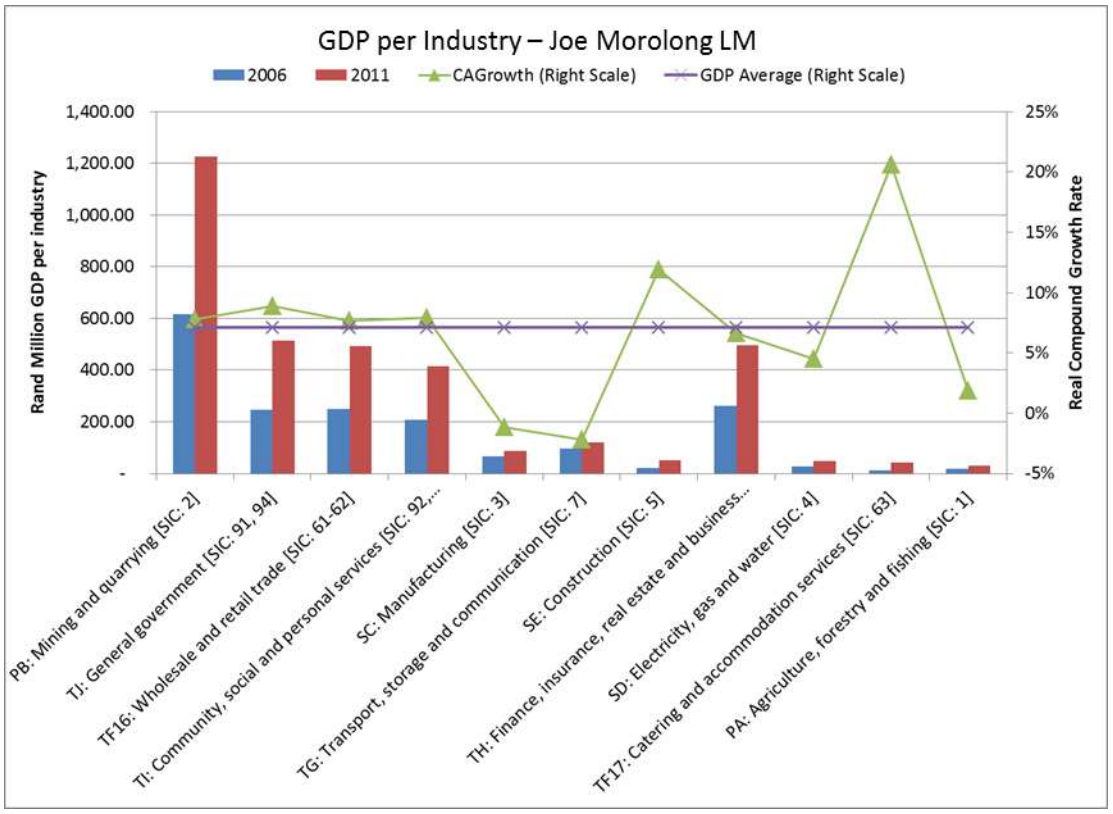
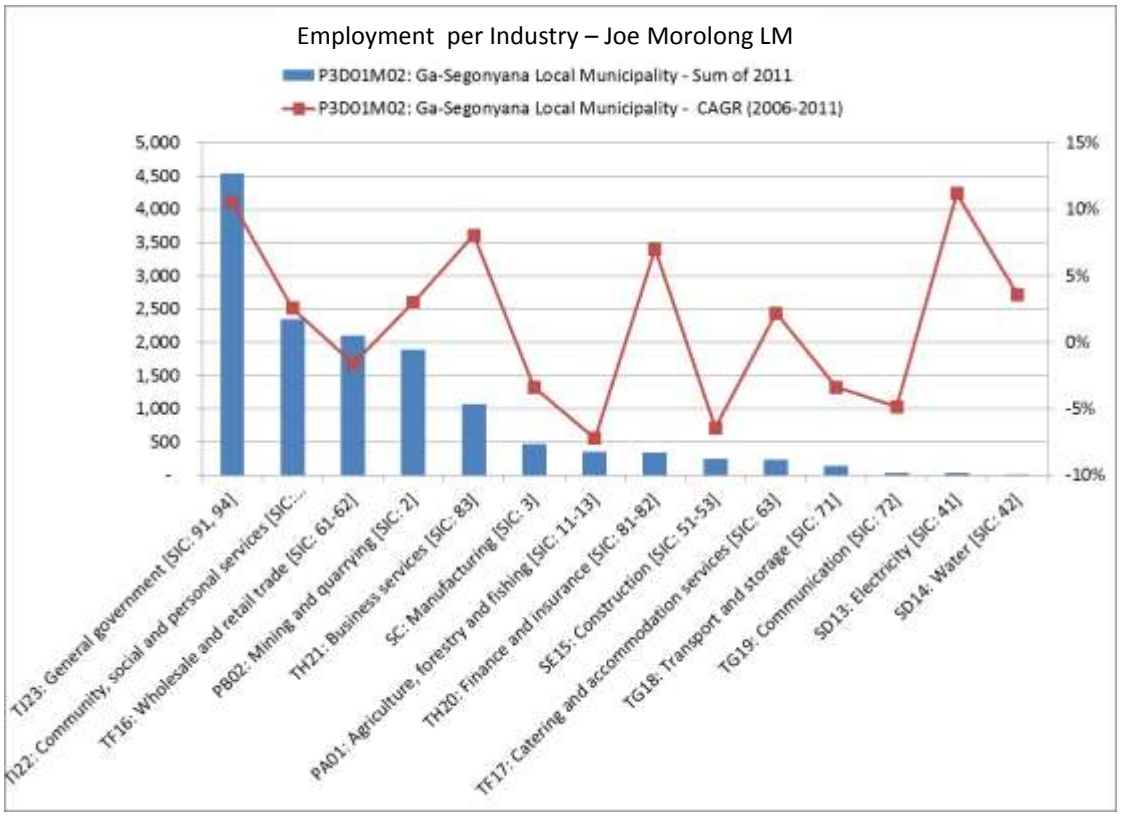


Figure 2: Employment by Industry



3. From the above figure it can be seen that the government sector is the biggest employer with the mining industry in the fourth place. The tertiary sectors had shown the highest employment growth rates. Unfortunately, the formal economy cannot absorb either the totally unemployed or new job seekers entering the market.

Table 2: Population, employment and unemployment

Concept	2001	2006	2011
PT000: Population - Total (Number)	60,001	65,101	70,592
PW000: Population - Working age (Number)	34,322	37,078	41,428
EA000: Economically active (Number)	12,772	18,421	22,696
IT000: Employed - Formal and informal - Total (Number)	9,219	12,811	16,138
IF000: Employed - Formal - Total (Number)	8,377	11,576	13,822
IS100: Employed - Formal - Highly skilled (Number)	1,436	2,035	2,877
IS200: Employed - Formal - Skilled (Number)	3,119	4,728	5,809
IS300: Employed - Formal - Semi- and unskilled (Number)	3,822	4,813	5,137
II000: Employed - Informal (Number)	843	1,235	2,316
UT000: Unemployed (Number)	3,553	5,610	6,558
NT000: Not economically active (Number)	21,550	18,657	18,732
UT001: Unemployment rate (Percentage)	28	30	29
PW001: Labour force participation rate (Percentage)	37	50	55
Gross Unemployment rate	63	50	45

2.1 Local Area SWOT analysis

Based on a SWOT developed in the 2013/14 IDP of this municipality, the forces for and against local economic development is outlined below.

2.1.1 STRENGTHS

- High potential for economic growth:
  - The municipality is at the centre of a strong manganese mining drive;
  - This may lead to promising industrial development;
  - Small businesses have the potential to grow and serve the improving commercial and mining economic industries.
- The local municipality has an approved SDF and it has identified several areas of development. These include expansion of the business industrial zone to the east on the N14 towards Kagung, the west towards Kathu, and to the northern side towards Hotazel.
- High tourism potential: Joe Morolong Local Municipality has a vast number of heritage sites that still needs to be exploited. These include religious monuments and heritage site, the oasis of the Kalahari, the caves, etc.
  - Political stability: According to the IDP co-operation between political parties in delivering services is adequate;
  - Ward Committees are functional and they are meeting their obligations as required;
  - There is strong political leadership and support to the municipal functioning.

2.1.2 WEAKNESSES

- Inadequate infrastructure to cater for the rapid development in the municipality
- Political interference:
  - Councillors tend to disregard protocol when issuing instructions to official;
  - Ineffective internal systems and controls:
  - Communicating available systems and controls to juniors;
  - The crucial tasks not being performed accordingly e.g. delegation of power.
- Culture of non-payment is prevalent in the municipality because credit control policy is not implemented and the continuous Audit Queries and Disclaimers are a concern.
- Retention of skilled personnel is non-existent because there is no policy on study loans and retention of trained personnel, especially those trained by the municipality.
- Urban sprawls due to erratic and indiscriminate land allocation despite Chiefs being part of the municipal council.
- Insufficient skilled personnel at the municipality to manage projects properly.

2.1.3 THREATS

- Social Economic Entitlement: Members of the community demand tenders and disrupt council operations
- Crime - the rate of crime has escalated since the development of mines around the region.
- Not sufficient beneficiation strategies levering the manganese mining developments.

2.1.4 OPPORTUNITIES

- There is a potential to acquire more land for development from the traditional leadership since they form part of council.
- Improve infrastructure and create jobs
- Internal systems could be improved
- Can improve on the credit control system to encourage culture of payment for services and increase municipal revenue.
- Enhance the LED and Tourism markets by disseminating the LED and Tourism strategy to members of the community using various methods of awareness.

3 Alternative land-use analysis

As part of the EIA/EMP process, an economic land use alternative analysis needs to be undertaken to determine whether the project's mining expansion is to the net benefit of the economy.

The requirements of this analysis is encapsulated in Regulation 50(c)[1], which has two distinct components - the first being a straight analysis of the economic value of land between a mining project and the predominant alternative land-use, and the second being an opinion on the sustainable development quality of the project relative to the alternative land-use.

The latter requires the integration of all the social, environmental and economic impacts on a cost-benefit basis. The wording of this requirement is ambiguous and we interpret this as an assessment of the better land-use alternative for this generation without compromising the needs of the next generation.[2]

Based on Regulation 50(c), the first task required in terms of this analysis is to report on the property values that would potentially be lost and gained in the continuation of the mining project.

The second task with respect to the alternative land use valuation is the calculation of the Net Present Value of future income streams to determine which alternative land-use yields the most positive economic results for this generation.

Although not stated in Regulation 50(c) as a requirement to analyse, we deem the net employment gained and lost as an important factor and added this component as well.

[1] Guideline For The Compilation Of An Environmental Impact Assessment And An Environmental Management Programme To Be Submitted With Applications For A Mining Right In Terms Of The Mineral And Petroleum Resources Development Act, 2002, (Act No. 28 Of 2002) (The Act)". Regulation 50.

[2] The most common definition of Sustainable Development is: 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

3.1 Assumptions, limitations and approach

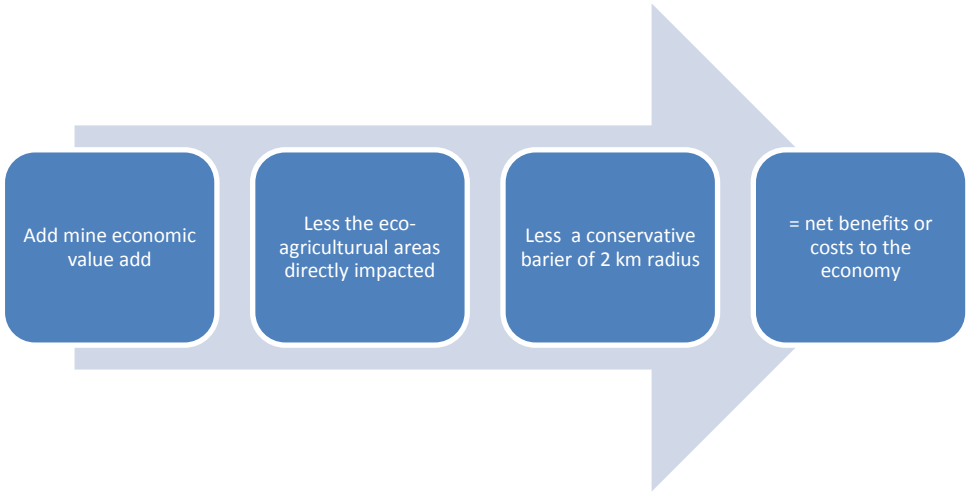
a) The first and probably most important assumption is that the proposed mining activities will be economically viable. Without economic viability (that is an acceptable risk-return rate is attained on investment), the probability of achieving the stated economic benefits are non-existent. This assessment accepts the rational investor concept, thus the investments to be committed are undertaken by a rational economic agent and the probability of achieving economic viability is high.

b) This study is limited in its scope as we worked mainly with "inferred economic data", thus we limited ourselves to, desktop research, telephonic interviews and relied on independent information from the project promoter and the environmental consultant.

c) This analysis works on the baseline intent – thus at the feasibility study phase what is economically evaluated, is intent. The actual project may well be different to what is being evaluated due to changes that it may require and all these permutations cannot be evaluated at this stage of the project.

d) The macro-economic data for this analysis was supplied by Quantec, a reliable regional economic data provider in SA.

Figure 3: General Approach



e) It is assumed that the land deemed to be potentially lost to agriculture and eco-tourism is utilised at the average productivity of the country's output for those sectors. The need to work on macro-averages is due to the fact that statistics supplied by individuals are regarded as private and is rarely shared in the public domain.

f) The receptor area is the immediate local area.

g) The project is evaluated over the period of an economic generation, even though the life of mine is slightly less than this. The valuations are done on a DCF basis, thus discounting all benefits over an economic generation. (In essence this reduces the economic value of the project relative to existing land-use.)

h) It is assumed that the land impacted by mining will be sterile and of no real use economically after mining. (Note, this is not always the case, but is done to be conservative and in the light of the many environmental legacy issues caused by mining.)

i) In this analysis it is assumed that mining and eco-agricultural is a zero-sum outcome, thus the benefit to the one is a loss to the other. (In reality the spirit of sustainable development is for economic agents to co-operate constructively in order for society to achieve a win-win, however, such an outcome is uncertain and naïve to assume.)

j) The economic analysis section of this study adopts a dispassionate compassionate stance, thus it concerns itself with the benefits or costs to the economy in a macro-economic and quantitative manner. The mathematical results, based on stated assumptions, therefore speak for themselves.

k) The evaluation of the total sustainability value to society is attempted in the integrated development trade-off analysis below, where the economy, society and the environment's costs and benefits are compared. In this analysis subjective ratings were used and the outcome could differ from stakeholder to stakeholder. These results are based on the environmental scientists' ratings and S4G calculated the averages and weighted averages. This was undertaken in an independent as possible basis.

l) This analysis should not be used for compensation negotiations between the mine and affected stakeholders simply because its intent is to compare a better alternative land use, using economic macro-variables and not micro-magnitudes. Micro-compensation negotiations are a matter of law and each stakeholder would have to present their own case and undertake their own negotiations. This report is not intended as a basis for negotiations.

3.2 Gain/Loss of property values

This section addresses the requirements of Regulation 50 (c) which states:

"*6.5.1 State the amount, of the quantified potential impact expressed in terms of the loss in value of property or infrastructural assets that will potentially be impacted upon as a result of the mining activity.*"

Based on internet research on many mining projects and this project in particular, an average of R7 000 is used per hectare as the market value of farm values. This is higher than the number indicated in the table below and is done to be conservative.

Figure 4: Estimated farm values per hectare

Row Labels	Count of Location	Average of Price ph
Kuruman	4	6,236
Tlakgameng	2	6,912
Molemole/Dendron	4	10,996
Koster	1	13,750
Rustenburg	1	14,332
Dullstroom	4	16,847
Brits	1	17,900
Nelspruit Game Farm	1	20,208
Bela Bela	3	23,473
Modimolle	7	25,024
Roossenekal	1	26,038
Groblersdal	2	27,864
Belfast	12	30,484
Lydenburg	9	34,638
Tzaneen	1	39,007
Nelspruiit	1	107,612
Grand Total	**54**	**25,331**

Table 3: Net property value analysis

Row #	Economic Aspects	Lehating	Agriculture - EcoTourism	Est cost/benefit economy
2	Potential Agricultural hectares directly displaced		(30)	
3	Precautionary approach (radius of 1 km around mine)		(314)	
4	Total Potential agricultural land lost		(344)	
5	Estimated market value for agricultural land ph (R'000)		7.0	
6	Estimated Investment by mine (2012 Rm)	241		
7	Time value depreciation of mine land (Rm)	(199)		
8	Net investment value of (Rm)	42	(2)	39

The above table indicates the following:

- The total economic addition to land value by the mine is calculated as R42m after amortisation over a 7 year period. The potential value loss of the eco-agricultural land is potentially R2m, thus giving a net positive R 39m to the economy. This equates to a benefit in land value to the local economy.
- The term eco-agriculture refers to eco-tourism and agricultural land combined. The hectares stated in the above table refer to the direct hectares on which the mine will be developed.
- Given that there may be many uncertainties with respect to land impacts of mines, a 1 kilometre radius (314 ha) has been added to the mine area. This is not based on actual scientific evidence that the said land will be impacted, it is merely to be conservative in favour of eco-agriculture.
- In conclusion more property value will be created over the duration of an economic generation due to the mine investment on this project.

3.3 Total operating GDP and employment net values

The section addresses the requirements of Regulation 50 (c) paragraph 6.5.2.

"6.5.2. State the amount, of the quantified potential impact expressed in terms of the loss in net present value of commercial, economic or business activity which will be impacted upon as a result of the mining activity."

AND

"6.5.3. State, the sum of the amounts, referred to in paragraphs 6.5.1 and 6.5.2 above."

Table 4: Total GDP and employment gained and lost

Row #	Economic Aspects	Lehating	Agriculture - EcoTourism	Est cost/benefit economy
9	Life of mine / economic generation (years)	7	32	
10	Initial construction employment (FTE)	40		
11	Adjust for 2 years construction	3		
12	Employees per 100 hectare		(2)	
13	Add new employment/jobs retained vs opportunity losses	140	(7)	133
14	FTE Total Jobs Created / Retained / (Lost)	31	(7)	24
15	FTE Jobs Created / Retained / (Lost) inc constrc'n	33	(7)	26
16	GDP pe (in respective industries) (2011) (R'000)	434	150	
17	GDP added/lost (Rm)	61	(1)	60
18	Discount Rate	20%	12%	
19	Present Value of EVA (GDP) (Rm)	219	(8)	211
20	Total Investment/(Property Value Lost)	42	(2)	39
21	Total Present Value of EVA + Property value(Rm)	261	(11)	250

1.1.1 GROSS DOMESTIC PRODUCT

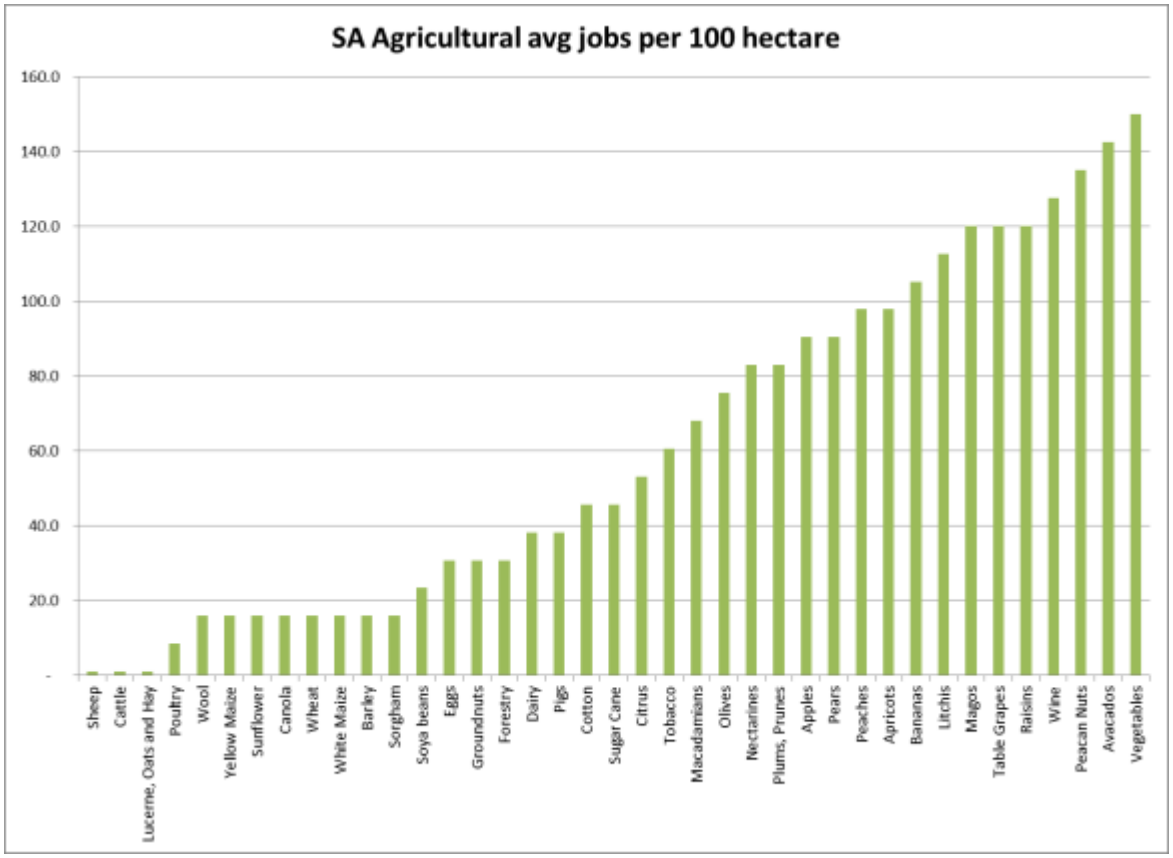
The table above shows that the net GDP gain to the economy as a result of the mine development is estimated as R 211m. Adding the property values gained, the net value to the economy amounts to R 250m. The total net employment added to the economy is potentially 26 jobs. This is the net difference between mining jobs created and potential eco-agricultural jobs lost.

The above results are arrived at using the following parameters:

- The life of mine is set at 7 years.
- The initial construction employment has been reduced to the FTE employees of 1/32 years.
- The weighted amount of employees per 100 hectare for agriculture is based on 2 jobs per 100 hectare in this sector. See chart below for employment per 100 hectare in the agricultural industry, used as a guide for this calculation.
- New jobs created were statistics supplied by the mines' MWP. The potential job losses in the eco-agricultural industry were derived at by the hectares lost/100*jobs per hectare.
- The FTE employees have been adjusted to accommodate the fact that the mine life is shorter than an economic generation.
- GDP per employee as estimated by Quantec data, a reputable economic data provider.
- A higher discount rate was used for the net present value of mining as it is inherently more risky than eco-agriculture.
- The present value is the discounting of the GDP per annum, over the life of mine or the economic generation, at the prescribed discount rate.

- The GDP's for the alternative land areas are calculated as the products of GDP per employee in the respective industries on a national level and the number of potential jobs lost.

Figure 5: No of employees per 100 hectares in farming



1.1.2 MULTIPLIERS

The GDP and employment multipliers on a national basis for the above land uses are very similar and therefore these multipliers will not make any difference in the outcome of this alternative land-use analysis on a national level.

Table 5: Multipliers

		National Multipliers	
No	**Industry**	**GDP**	**Empl x**
I01	Agriculture, forestry and fishing [1]	2.97	1.79
I04	Other mining [22/24/25/29]	2.31	3.15
I38	Catering and accommodation services [64]	2.80	2.40

Source 1: Quantec

4 Impact Assessment

4.1 Quantitative direct impacts

Figure 6: Quantitative direct impacts on factor conditions

Row ID	Category	Spatial Scale	Source of baseline	Baseline Year	Region	Estimated Baseline	Additionality (Annualised)	% Direct	EST. Multiplier	% after Multipliers
1	GDP	National	SA Resbank	2012	South Africa	R2,795,279 m	R37 m	0.00%	2.50	0.00%
2	GDP	Provincial	Quantec	2011	Northern Cape Province	R57,796 m	R37 m	0.06%	1.03	0.07%
3	GDP	District	Quantec	2011	Kgalagadi District	R11,944 m	R37 m	0.31%	1.01	0.31%
4	GDP	Local	Quantec	2011	Ga-Segonyana	R3,529 m	R37 m	1.06%	1.01	1.06%
5	Employment	National	Quantec	2011	South Africa	9,999,418	140	0.00%	3.50	0.00%
	Employment	Regional	Quantec	2011	Northern Cape Province	235,841	140	0.06%	2.00	0.12%
7	Employment	District	Quantec	2011	Kgalagadi District	28,204	140	0.50%	1.01	0.50%
8	Employment	Local	Quantec	2011	Ga-Segonyana	13,822	140	1.01%	1.00	1.02%

The table above shows the baseline data for a variety of economic aspects, and then compare the “Additionality” of the project to that baseline. A multiplier is added to the impacts and a final fraction indicating the increase in the baseline is added. The findings on this table are integrated into the discussion in the next section.

4.2 Qualitative impact assessment

The table below outlines the economic impact of the Lehating mine on the provincial, district and local economies. Many of the points discussed below are of a qualitative nature and where possible, quantitative data is supplied.

Factor (in alphabetical order)	Definition	Impact
Alternative land-use – employment	This aspect had been well defined above.	The mine is likely to create three times as many jobs as the amount it may potentially displace and this is very positive.
Alternative land-use - income	This aspect had been well defined above.	The mine is more positive to the economy than agriculture from an income generation perspective.
Alternative land-use - property	This aspect had been well defined above.	The property value of the mine exceeds that of agricultural properties lost by a healthy margin.
Corporate Social Responsibility	Investments in society for the betterment of its standard of living over and above expenditure in the normal course of business.	The mine is obligated to develop CSR projects and on a local level, and this is bound to be of a major benefit.
Employment	Employment refers to all direct full time employment in the development's industries.	The new jobs created through this project are relatively small. It is estimated that a 1% increase in formal jobs in the local economy can be expected. The regional and national impacts are miniscule.
Gross Domestic Product	GDP is the total goods and services produced by a country. From the demand side it consists of private consumption expenditure, government expenditure, investment and net exports (or imports). From a supply side it is the sum of EBITDA	The increase in GDP as a result of the project is very small on a national basis and somewhat significant on a local level. An increase in 1% of GDP can be expected as a result of the mining investment.

Factor (in alphabetical order)	Definition	Impact
	and salaries and wages.	
Mine Closure	The eventual decommissioning and closing of the mine.	In the same vain as a new mining investment has a strong positive impact on the economy, the reverse takes place when a mine closes. However, upon closure the local economy would have increased and a similar decrease (thus back to base zero, rarely occurs.)

4.3 Impact Rating table

The table below shows the fact that on all aspects the impacts are medium positive, except for mine closure where the impact is likely to be medium negative. It needs to be restated that this is a relatively small mine with a small footprint and it is the high probability of the economic outcomes that pushed it into M+ territory as opposed to L+.

Table 6: Summary Impacts

Aspect	Before or After Mitigation	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance	Significance =/-
Alternative land-use – employment	Before	L	L	L	L	M	M	+M
Alternative land-use - income	Before	L	L	L	L	M	M	+M
Alternative land-use - property	Before	L	L	L	L	M	M	+M
Corporate Social Responsibility	Before	L	L	L	L	M	M	+M
Employment	Before	L	L	L	L	M	M	+M
Gross Domestic Product	Before	L	L	L	L	M	M	+M
Alternative land-use – employment	After	L	L	L	L	M	M	+M
Alternative land-use - income	After	L	L	L	L	M	M	+M
Alternative land-use - property	After	L	L	L	L	M	M	+M
Corporate Social Responsibility	After	L	L	L	L	M	M	+M
Employment	After	L	L	L	L	M	M	+M
Gross Domestic Product	After	L	L	L	L	M	M	+M
Mine Closure	After	L	L	L	L	M	M	-M

5 Mitigation

There are no mitigation measures recommended given that this is a relatively small investment in a remote area where economic development could only benefit local inhabitants. It is assumed that the mine will comply with mine closure and social and labour plan provisions, as these cover the essential mitigation measures normally required.

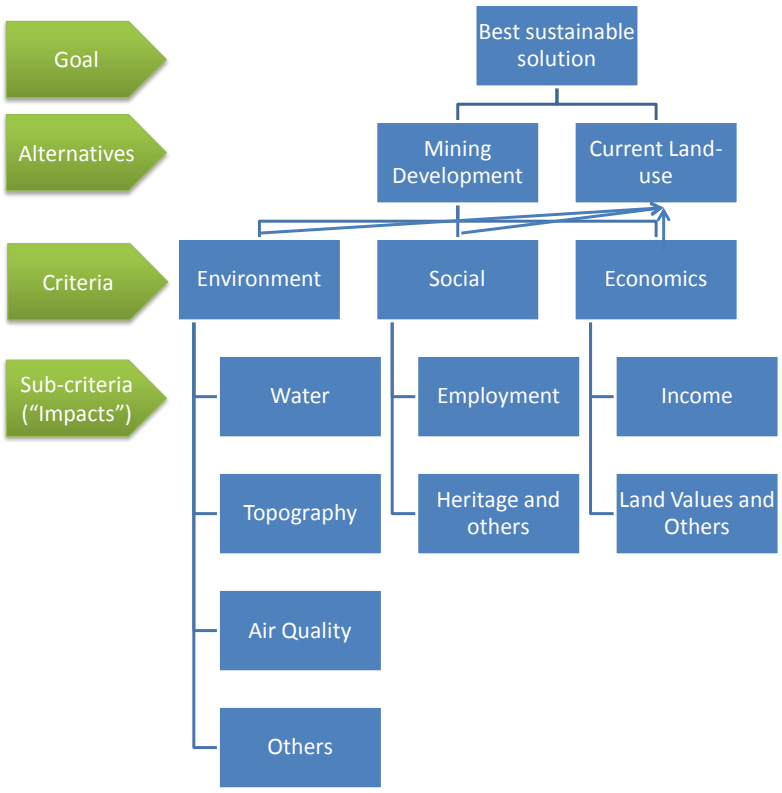
6 Integrated Development Analysis

Our approach to Regulation 50 (d) 9 is to evaluate all the sustainable development impacts (social, economic and environmental) to determine the best land-use for this and the next generation.

In arriving at the better sustainability option of land-use, we use the Analytical Hierarchical Process (AHP), which is a structured technique for organizing and analysing complex decisions. Based on mathematics and psychology, it was developed by Thomas L. Saaty in the 1970s and has been extensively studied and refined since then. It has particular application in group decision making and is used around the world in a wide variety of decision situations, in fields such as government, business, industry, healthcare, and education.

The figure below outlines this methodology.

Figure 7: AHP Decision Making Process



The first issue to establish in the Analytical Hierarchical Process is to define the decision-making goal. In this case, it is to decide the better land-use for this and the next generation between the mine development and existing land-use. The criteria used are the generally accepted sustainability categories, namely Environment, Social and Economics with each having their own sub-criteria (being the impacts as identified by SLR).

1.2 Approach

The Analytical Hierarchical Process was designed and executed by us in the following manner:

a. We used the SLR socio-economic and environment impact assessment as a basis for the significance of risks and opportunities. These impacts have been described in the main Environmental Impact Assessment document as undertaken by SLR Consulting.

b. The final results are mainly based on post-mitigated impact ratings as it is assumed that mitigation will take place. In this regard, the role of monitoring by the regulator is critical for the sustainable development success of this application.

c. We converted the above ratings into numerical scales. This is necessary in order to assign weightings for the purposes of weighted averages. The conversion was done on the basis outlined below.

Figure 8: Conversion of impact rating to Percentage Scale

Scale	%
(FF)	-100%
(H)	-90%
(H-M)	-66%
(M-H)	-66%
(M)	-50%
(M-L)	-22%
(L)	-10%
VL	0%
L	10%
M-L	22%
M	50%
H-M	66%
M-H	66%
H	90%
FF	100%

d. The next task was to assign weightings to different aspects in order to ensure that the most important ones have a higher impact on the overall rating. Each category is weighted equally, hence the aspects within each category is weighted relative to each other. Each category by definition has to add up to 100%. The findings are discussed below.

1.3 Environmental Ratings

The table below shows the negative impacts that can be attributed to environmental impacts. These are the impacts after mitigations measures had been factored in.

Figure 9[3]: Environmental before and after mitigation impact scales (non-weighted)

Aspect	Indicator	Operations	Operations2	Operations - BMU	Operations - AMU	Ranking	Weighting	Operations - BMW	Operations - AMW
Geology	Loss and sterilization of mineral re	(M)	(L)	-50%	-10%	9	9.4%	-4.7%	-0.9%
Topography	Hazardous excavations and infrast	(H)	(M)	-90%	-50%	9	9.4%	-8.5%	-4.7%
Soils and land capabi	Loss of soil resources and land cap	(M)	(M-L)	-50%	-22%	9	9.4%	-4.7%	-2.1%
Soils and land capabi	Loss of soil resources and land cap	(H)	(L)	-90%	-10%	9	9.4%	-8.5%	-0.9%
Biodiversity	General disturbance of biodiversit	(H)	(M)	-90%	-50%	9	9.4%	-8.5%	-4.7%
Biodiversity	Physical destruction of biodiversit	(H)	(H)	-90%	-90%	9	9.4%	-8.5%	-8.5%
Surface water	Alteration of natural drainage pat	(M)	(L)	-50%	-10%	9	9.4%	-4.7%	-0.9%
Surface water	Contamination of surface water	(H)	(L)	-90%	-10%	9	9.4%	-8.5%	-0.9%
Groundwater	Reduction of groundwater levels a	(H)	(L)	-90%	-10%	9	9.4%	-8.5%	-0.9%
Groundwater	Contamination of groundwater	(H)	(M)	-90%	-50%	9	9.4%	-8.5%	-4.7%
Air quality	Air pollution	(H)	(M)	-90%	-50%	3	3.1%	-2.8%	-1.6%
Noise	Noise pollution	(M)	(M-L)	-50%	-22%	1	1.0%	-0.5%	-0.2%
Blasting	Blasting impacts	(H)	(L)	-90%	-10%	1	1.0%	-0.9%	-0.1%
Traffic	Road disturbance and traffic safet	(H)	(M)	-90%	-50%	0	0.3%	-0.3%	-0.2%
Visual	Visual impacts	(H)	(M)	-90%	-50%	0	0.1%	-0.1%	-0.1%
Heritage, palaeontol	Loss of or damage to heritage, cul	(H)	(L)	-90%	-10%	0	0.1%	-0.1%	0.0%
				-80%	**-32%**	**95.56**	**100%**	**-78%**	**-32%**

1.4 Social ratings

Aspect	Indicator	Operations	Operations2	Operations - BMU	Operations - AMU	Ranking	Weighting	Operations - BMW	Operations - AMW
Socio-economic	Corporate Social Responsibility	M	M	50%	50%	0.33	3%	1%	1%
Socio-economic	Employment	M	M	50%	50%	9.00	73%	36%	36%
Socio-economic	Inward migration	(H)	(M)	-90%	-50%	3.00	24%	-22%	-12%
				3%	**17%**	**12.33**	**100%**	**16%**	**26%**

[3] BM – before mitigation, AM – after mitigation, U = un-weighted, W = weighted

1.5 Economic Ratings

Aspect	Indicator	Operations	Operations2	Operations - BMU	Operations - AMU	Ranking	Weighting	Operations - BMW	Operations - AMW
Land-use	Alternative land-use – employme	M	M	50%	50%	3	19%	9%	9%
Land-use	Alternative land-use - income	M	M	50%	50%	3	19%	9%	9%
Land-use	Alternative land-use - property	M	M	50%	50%	1	6%	3%	3%
Income	Gross Domestic Product	M	M	50%	50%	9	56%	28%	28%
				50%	**50%**	**16.00**	**100%**	**50%**	**50%**

7 Final Integrated Development Result

Figure 10: Final Weighted Results (after mitigation)

	Impacts before mitigation	Impacts after mitigation
Economic	50%	50%
Environment	-78%	-32%
Social	16%	26%
Average	-4%	15%

	Impacts before mitigation	Impacts after mitigation
Economic	M	M
Environment	(H)	(M)
Social	L	M-L
Average	(L)	L

The above figure shows that the project falls into the positive low integrated sustainable development category after mitigation. Before mitigation the project is low negative and this is relatively good compared to many others that had been evaluated by this author.

Most integrated development analyses of this nature on an after-mitigated basis fall into this category and it indicates that society is better of as a result of this project.