

International competitiveness of Angolan diamond mines - THE CASE OF THE CATOCA Mine

Manuel Ndanji Borges dos Santos Bravo
Manuel.ndanji@gmail.com

Instituto Superior Técnico (Technical University of Lisbon, Portugal)

October 2017

Abstract

The study was carried out in the framework of the master's thesis focuses on an analysis of the international competitiveness of the Catoca mine kimberlite (Angola), through the comparison of its production costs (including the tax costs and marketing) with those of other mines also explored in kimberlites. Among them are the mines Diavik and Ekati (Canada), Aikhal and Lomonosov (Russia), Cullinan, Finsch and Koffiefontein (South Africa), Karowe (Botswana), Williamson (Tanzania) and Argyle (Australia). The factors that can contribute to an improvement of its competitiveness (decreasing the relative costs of production), and thus to increase the attractiveness of international investment in exploration, development and operation of mines in kimberlites (capital intensive) of diamonds in Angola, were also identified.

The results obtained show that the Catoca mine production costs are higher than the mines similar (open pit) with which it was compared (Williamson, Karowe and Lomonosov). The higher costs of production may be explained, in part, by the context of logistics, infrastructure and economic development of the country, which has certainly had a negative impact on the costs of operating the mine and that the Angolan Government must correct in order to increase the competitiveness and attract foreign investors. Among the factors that contribute to the increase in the cost of production of diamonds in Angola and that may explain the low competitiveness of the Catoca mine are: (i) the costs of stocks consumed (diesel fuel, parts), (ii) the high costs of context in Angola (roads in poor condition, several inefficiencies as bureaucracies, irregularity in the supply of fuel to the provinces, difficulty of import of parts), and (iii) personnel costs (productivity).

Key words: Diamonds, Mines, Angola, Kimberlitos, Competitiveness, Catoca.

1. Introduction

With the end of the civil war in 2002, the political and economic stability in the following years, transformed Angola in one of the countries with the highest growth at a global level. The biggest growth sector was the petroleum, which made the Angolan economy heavily dependent on this

resource. The problems posed to the country by the sharp decline in the price of oil, in 2015, came to corroborate this fact. Therefore, the government authorities initiated strategies with a view to combat this structural vulnerability, investing in other sectors, such as agriculture, industry, trade and services. In the first stage, the mineral sector, in particular the diamond subsector, constitutes the main bet as the second foundation of this economy. Note that, despite the oil and diamonds are at the base of the Angolan economy both have, however, very different contributions, the oil being clearly dominant. The bet in the subsector diamonds due to the fact that there is already an important base material and human with which the country can develop relatively quickly, an additional production capacity, in order to minimize the impact of the decrease of oil revenues. In this analysis, it is important to add that, according to the data of 2015 (Economic Report on Angola, 2015), Angola is the fifth largest producer of diamonds, both in value and in volume. However, in order to ensure the vitality and development of this subsector, it is necessary to discover and explore new mines on kimberlitos, since approximately 75 %, by volume, of current production is based in the Catoca mine, which is already in a mature phase. To achieve this purpose, it is necessary to obtain capital and international technology, which will depend, of course, an analysis of the international competitiveness of Angolan diamond mines. Thus, the main objectives of the dissertation are:

- i) Analyze the international competitiveness of exploration in Angola of kimberlíticas mines of diamonds, comparing their costs with those of other similar mines (Canada, Lesotho, Botswana, South Africa, Tanzania, Russia and Australia) and
- ii) Identify the factors that improve the competitiveness (decreasing the relative costs of production), and thus increase the attractiveness of international investment in the exploration, development and operation of mines kimberlíticas (capital intensive) of diamonds in Angola.

2. Materials and Methods

This thesis aims to analyze the international competitiveness of Angolan diamond mines based in the Catoca mine. To do this, used the data of minas Diavik and Ekati (Canada), Aikhal And Iomonosovsky (Russia), Cullinan, Finsch and Koffiefontein (South Africa), Karowe (Botswana), Williamson (Tanzania), Argyle (Australia). The likeness of the Catoca mine, also the mines used for analysis are mines in kimberlitos.

As regards the method of exploitation, in the Catoca mine as in mines Williamson, Argyle, Diavik, Ekati, Karowe and Iomonosovsky, exploitation is made to open sky; in mines Finsch, Koffiefontein, Cullinan And Aikhal, exploitation is underground.

The analysis of the international competitiveness of the Angolan mines was performed by comparing the costs of operating the Catoca mine with similar mines referred to above, including costs with salaries, goods and services and also tax costs of royalties and commercialisation of production.

To identify the factors that will improve the competitiveness of the Angolan mines:

- 1) production costs in USD/ton
- 2) annual accounts of each mine (obtained from annual reports of each mine)
- 3) Analysis of the demonstration of results
- 4) When available, classification of costs by nature (wages, goods and services, tax costs, royalties and marketing costs etc.).

3. Results and Discussion

In the case of the Angolan diamond industry, its international competitiveness is measured by the ability to produce diamonds at low cost, when compared with the costs of production in other countries. This general definition must, however, be precise.

Competitiveness must be measured by the cost of production per unit (extraction and concentration of diamonds from mineral reservoir). However, competitiveness measured by the cost of production of a carat incorporate (USD/CT), not only the costs of production of the company (or industry), but also the inherent characteristics of the reservoir (random, independent from the company or industry). It is, therefore, advisable to measure and compare the competitiveness of industry is not based on the cost of production per carat, but yes, the cost of production per unit volume of iron ore.

Finally, in the specific case of Angola, the public information available is very limited. Only some of the mines in activity publish information potentially useful for the analysis in question, those whose companies are listed on the Stock Exchange, i.e.:

- The Catoca mine - mine in reservoir kimberlítico, located to the north of Saurimo.
- The mine of SOMILUANA project (Luana river, a tributary of the right bank of the River Chiumbe).
- The mine of Lulo project - mine currently in alluvial deposits and Cacuílo Lulo (rivers).

These three mines, the catoca is one that has a temporal series of data over long; it is also the most important mine in Angola (producing approximately three quarters of the total production, measured in carats). Those are the reasons why if you chose the Catoca mine to assess the competitiveness of industry in Angola Diamonds, the object of this thesis.

Table 1 shows the balance of SMC, which contains economic and financial information of the company, that is, all assets and liabilities of the company that it is mandatory to submit when you close the annual accounts. When there is a difference between the value of assets and liabilities, we have the net situation of the company. In the tangible asset we have that gives us the information of goods that the company has that do not belong to its activity, i.e., goods that are not sold or processed. The current active refers to all goods that the company owns and which can be converted into cash in the near future, and includes categories such as stocks, the claims of third parties, the marketable securities and bank deposits.

Stocks are products that the company has in stock and not yet sold or not yet transformed for subsequent sales. With regard to the debts of third parties, are divided between the claims of

medium and long term and short term. Represent the values that other companies should, being that the difference is within the deadlines. In the medium and long term, enter the debts whose settlement is greater than one year, already in the short term are recorded the divided up to one year.

On the other side of the asset, we have the equity and liabilities. The capital is divided into several components, however, it should be noted that this item enter the values with which the partners or shareholders entered in the company and the changes that have occurred later. Within the own capital still find the reservations which include the values that are derived from the profits or capital and who do not enter in investments, and the net result of the exercise, in the case, including the profit or loss that the company generated during exercise. The liabilities shows which claims that the company holds, both in the medium and long and short term. The characteristics are identical with the asset, the only difference is that the liabilities are presented values that the company should the other.

Table 1 - balance sheets of SMC - Sociedade Mineira do catoca (2011 to 2016) - sources: annual reports and audit of the Sociedade Mineira do Catoca.

Balance sheet	1000 USD					
	2011	2012	2013	2014	2015	2016
ACTIVE	377 056	365 580	360 863	472 478	472 001	445 993
Non Current Assets	157 031	206 663	213 138	204 880	223 235	233 736
tangible fixed assets	155 073	201 614	207 656	199 103	217 108	224 564
intangible fixed assets	0	0	0	0	0	0
investments in subsidiaries	64	64	64	64	0	0
Bills to receive	1 894	4 985	5 418	5 713	6 127	9 172
Current Assets	220 025	158 917	147 725	267 598	248 766	212 257
stocks	65 313	74 906	71 299	70 618	64 689	72 295
Bills to receive	96 774	35 412	63 375	46 316	35 898	83 346
availability	57 525	46 274	10 638	149 100	145 603	53 392
other current assets	413	2 325	2 413	1 564	2 576	3 224
SHAREHOLDERS 'EQUITY AND LIABILITIES	235 475	233 849	260 859	346 002	355 712	311 424
Equity Capital	58 789					
share capital	29 268	29 268	29 268	29 268	29 268	29 268
capital reserve						
legal reserve	16 828	16 828	16 828	16 828	16 828	16 828
special purpose reservation	12 693	12 693	12 693	12 693	12 693	12 693
results of the year	0	0	0	0	0	0
Non-Current Liabilities	14 799	36 391	70 576	69 648	40 469	15 083
bills to pay	1 510					
medium and long-term loans	10 720	33 822	68 007	67 079	40 469	15 083
provisions for other risks	2 569	2 569	2 569	2 569		
Current Liabilities	161 887	138 669	131 494	217 565	256 454	237 552
bills to pay	140 888	126 275	115 933	194 237	220 104	203 594
short-term loans	1 693					
current portion of medium and long-term loans	15 162	8 184	10 700	18 782	30 970	28 214
other current liabilities	4 144	4 210	4 861	4 546	5 380	5 744

Table 2 shows the financial results of SMC, which contains the details of income and expenses during a given time period, usually a year.

Sales are recognized at the time that the transaction occurs, i.e., when the property of diamonds is transferred to the buyer. Because this is a specific product marketing, which normally occurs once per month, sales are valued on the basis of the value shown on the bill of sale, which corresponds to the price negotiated with the purchaser upon the evaluations carried out by independent experts hired by both the seller and the buyer. The costs that include works for the

company itself, is the income related to the generation or construction of tangible fixed assets by the company itself, deducted from their respective expenses inherent to production. As regards the staff costs, enter expenditures with salaries, expenses with meals of collaborators, premiums and other charges directly related to the work force.

Table 2 - statements of SMC - Sociedade Mineira do catoca (2011 to 2016) - sources: annual reports and audit of the Sociedade Mineira do Catoca.

Statement of financial results		1000 USD				
	2011	2012	2013	2014	2015	2016
SALES	622 016	584 920	602 460	608 131	594 191	616 012
product sales	611 306	579 354	594 353	602 940	582 016	593 617
provision of services						
other operating income	10 710	5 566	8 107	5 191	12 175	22 395
EXPENSES	379 335	398 871	443 788	419 087	401 727	421 094
variations in finished products	8 124	-6 064	-4 016	4 221	1 839	166
work for the company itself	-121	-102	-92		-1 072	-2 286
cost of stocks consumed	95 418	101 320	120 271	106 553	93 763	104 206
cost with staff	109 218	121 020	130 450	123 669	130 453	139 726
amortizations	53 440	62 154	70 534	61 443	62 006	60 783
other operating costs and losses	113 256	120 543	126 641	123 201	114 738	118 499
Operating results	242 681	186 049	158 672	189 044	192 464	194 918
financial results	598	3 660	-2 126	1 932	10 750	8 838
non-operating results	-6 931	-14 052	-23 196	-22 313	-26 275	-21 246
Net income from activities	236 348	175 657	133 350	168 663	176 939	182 510
Income tax	94 767	43 926	33 346	42 186	60 650	47 941
	40%	25%	25%	25%	34%	26%
Net income for the year	141 581	131 731	100 004	126 477	116 289	134 569

Each company makes your balance at the end of the year, this is what classifies assets that the company has and how funded the purchases of those goods. If it is equity, for example, Catoca in 2016, invested 193 million dollars in the beginning, this allows us to see how it is that the company has been evolving over time.

The assets have the value of money that the company spent for the purchase, it does not explain how the company operates in full, however, lack the financial result, which explains every year as is the business of the company, worked in this case, as it is that the company sold, what is sold and what were their expenses. If the company lends money receives interest and the financial result is positive, if the company borrows money paid interest and has a negative result in financial results, and then have other non-operating results where in extraordinary losses. Operating Results What is the difference between sales and opex, sum or decreases the financial results, adds or decreases the non-operating results and has the net results of their activities which is profit, that is, the income tax. For example in the Catoca tax is 25%.

Despite the limitations of the available data, the comparative analysis of the competitiveness of the mines in question, allows you to qualify, even if in a simplified manner, the international competitiveness of the Catoca mine and she assess the capacity of the Angolan economy in

attracting international investment for the prospection and exploitation of their great resources (potential or known) of diamonds in VAULTS kimberlíticos

In Figure 1 presenting a balance of costs of production of ore mined in tonnes of mines analyzed. The data available for the various mines are irregular in time: for some mines have relatively long series, as is the case in the Catoca; for others (as is the case of mines of ALROSA), has only data for one year.

Analyzing the cost of production of each mine, it was concluded that a reservoir that is exploitable in Botswana (for example the mine of Karowe), Russia (Aikhal mine) and other countries might not be exploitable in Angola.

In 2015 and 2016, the mine Williamson of Tanzania, for ore extracted in tonnes the mine spent 11 and 12 USD/ton, in this case one-fourth of the Catoca mine. The cost of production of other mines is half the cost of the Catoca, which, however, is not the producer of higher costs.

Angola has very high costs. It is important to note that we are not to compare the cost of production per carat, therefore be misleading, because this factor depends on the mine and the reservoir, is not dependent on the engineering or other items.

The unit cost of production analyzed in several mines have very different values: there is a clear trend for production costs are higher in underground mines that in open-pit mines and the mines with a larger scale of production have lower costs (which is natural, since they spread their fixed costs over a greater greater production base).

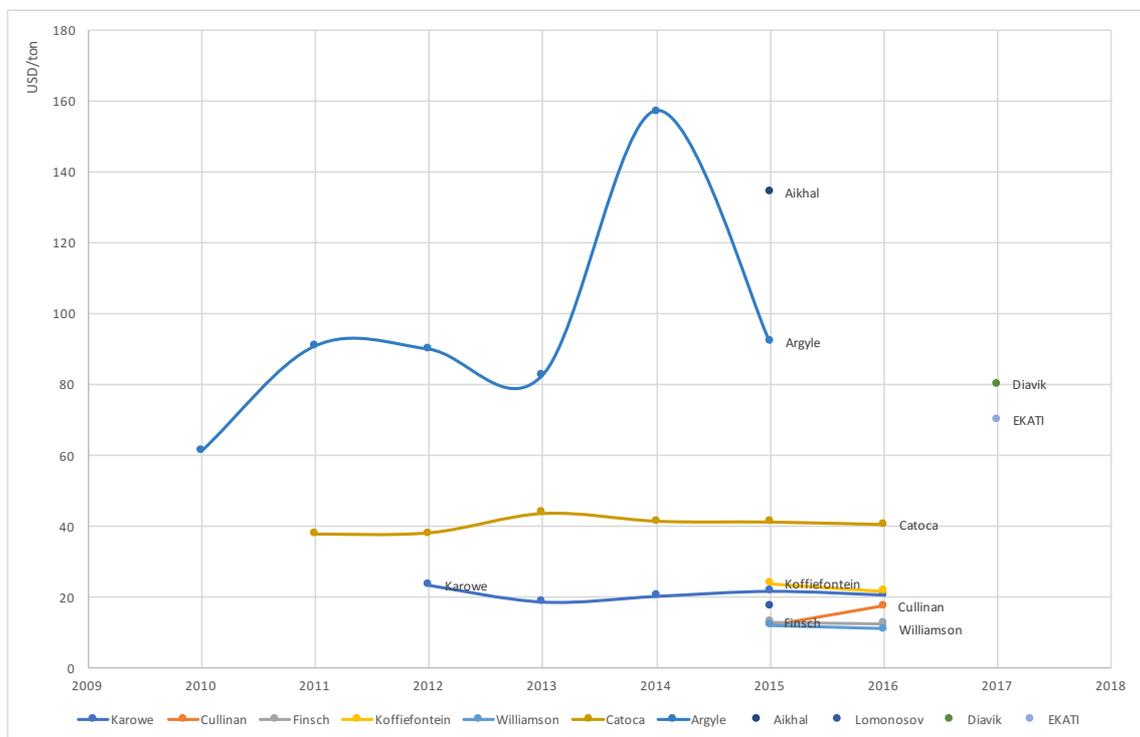


Figure 1 - Production costs of the mines analyzed (USD/ton).

It is also natural that the costs of production are influenced by the technology used and the culture of the company, by which it is to be expected that different companies have different production costs. For example, ALROSA seems to show a tendency to be a producer with higher costs, less

competitive. The confirmation of this possibility would require a more in-depth analysis, which goes beyond the scope of this study.

Finally, the social context, economic, legislative and fiscal environment and the quality of infrastructures in the country where the mine is located has an impact on the costs of operation. Angola has logistical challenges, fiscal and marketing policy of diamonds to face (some more obvious than others; some more important for international investors).

4. Conclusion

The results obtained, despite the limitations of the available data in Angola and some ambiguity and discretion in the adoption of accounting criteria of costs, indicate that the mine in the Catoca kimberlite production costs are very high (between 38 and 44 USD/t of ore mined and treated) in the face of a good part of their international competitors who practice holding the open sky. Between the mines analyzed, the Williamson (Tanzania), Karowe (Botswana) and Iomonosov (Russia) have lower unit costs or about half of the Catoca, as is the case of Karowe mine. Other mines with unit costs comparable to or higher than those of the Catoca, are the cases of underground mines and the Argyle mine (Australia), Diavik and Ekati (Canada) and Aikhal (Russia). In summary, the Catoca mine is between the open-pit mines in Kimberlite, a producer with high costs (as tends to be the mines of Alrosa).

In addition to the possibility of exploitation by Alrosa can explain part of the higher operating costs in the Catoca, Angola has a context of logistics, infrastructure and economic that certainly has a negative impact on the costs of operating the mine and that the Angolan Government must correct in order to be able to give the country a competitiveness that attract international investors.

From an international point of view, the Catoca mine could be substantially more profitable, if you had half the cost of production. This mine, the largest expense is the cost with the staff, whose importance in the total cost has been increasing over the years. Although there are, probably, problems of low productivity, mainly related to the inefficiency of human resources, the mine is profitable due to the high levels to explore. However, there is still much to be achieved, and other challenges to be faced. The diamond industry in the country and all the mineral sector will benefit if the geological information and basic metalorganics are publicly available in digital format. The United States and Canada are examples in which the policies of broad public availability of geological data produce results. The same principle should also be applied to the availability of public information on the exploration projects. It is important to know, especially, who produces what and where the volume, content, costs and revenues, so that these data can serve as a reference to other projects, enabling better management decisions and investment of public institutions and private companies.

The factors identified which increase the production of diamonds in Angola and that may explain the low competitiveness of the Catoca mine are: i) the cost of stocks consumed (diesel fuel, parts), (ii) the high costs of context in Angola (roads in poor condition, several inefficiencies as bureaucracies, irregularity in the supply of fuel to the provinces, difficulty of import of parts), and iii) personnel costs (productivity).

5. Bibliography

- Chambel, L. (1993). Estudo da Atractividade do Investimento na Produção de Diamantes de Origem Aluvionar. Tese de Mestrado em Gestão de Empresas, Faculdade de Economia, Universidade Nova de Lisboa, p. 14-85.
- Chambel, L.; Caetano, L.; Reis, M. (2013). One-century-of-angolan-diamonds. p. 18-98.
- Chaves M. & Chambel L. (2003). Diamante: a pedra, a gema, a lenda. Oficina de textos. São Paulo, Oficina de Textos, p. 231.
- Clement, C.; Skinner, E. (1985). A textural-genetic classification of kimberlites. Transactions of the Geological Society of South Africa, 38: 403-409.
- Clifford, T. (1966). Tectono-metallogenic units and metallogenic provinces of Africa. Earth Planet Sci. Lett, 1: 421-434.
- Coqueia, S. (2014). Metodologia para o controlo geoambiental da bacia de contenção de rejeitados da Sociedade Mineira de Catoca em Angola. Tese de Mestrado em Engenharia de Minas e Geoambiente, Faculdade de Engenharia, Universidade do Porto, p. 43-62.
- Monforte, A. (1988). O diamante em Angola nas rochas quimberlíticas e nos jazigos secundários. Geologia Geral. Lisboa: Sociedade Portuguesa de Empreendimentos, p. 101
- Monforte, A. (1993). Os jazigos de diamante em Angola, a problemática da sua prospecção: evolução e perspectivas. Sociedade Portuguesa de Empreendimentos (Policopiado), p. 30.
- Pereira, E. (1971). Nota sobre o Complexo ígneo ante-Apciano do Cuanza-Sul (Angola). Buletim Serviços de Geologia e Minas de Angola, p. 51-80.
- Pereira, E. (1995). Posição dos trabalhos de prospecção. Relatório Inédito da Endiama, Angola.
- Pereira, E.; Rodrigues, J.; Reis, B. (2003). Synopsis of Lunda geology, NE Angola: Implications for Diamond exploration. Comunicações do Instituto Geológico e Mineiro, p. 10-30.

Web Pages Consulted

- Alrosa (2014 – 2017). Annual and Auditor Reports. <http://eng.alrosa.ru/documents/annual-reports/>. Acedido em (22/06/2017).
- Dominion Diamond (2014 – 2017). Annual and Auditor Report. <http://phx.corporate-ir.net/phoenix.zhtml?c=65233&p=irol-reportsannual>. Acedido em (22/06/2017).
- De Beers (2016). Annual Report. <http://www.debeersgroup.com/en/reports.html>. Acedido em (22/06/2017).
- Lucara Diamonds (2015 e 2016). Annual and Auditor Report. <https://www.lucaradiamond.com/investor-info/financial/financial-reports-and-aif>. Acedido em (22/06/2017).
- Petra Diamonds (2014 – 2017). Annual and Auditor Report. <https://www.petradiamonds.com/investors/results-reports/>. Acedido em (22/06/2017).

Rio Tinto (2010 – 2017). Annual and Auditor Report. <http://www.riotinto.com/investors/results-and-reports-2146.aspx>. Acedido em (22/06/2017).

Catoca (2011 – 2016). Annual and Auditor Report. <http://www.catoca.com/>. Acedido em (22/06/2017).