

MINISTRY OF MINES AND ENERGY
GEOLOGICAL SURVEY OF BRAZIL
PROMOTING THE BRAZILIAN MINERAL SECTOR



PRESENTATION OF THE RESULTS OF THE BRAZIL DIAMOND PROJECT
DIAMANTE BRASIL

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DIAMOND PROJECT BRAZIL

✓ SUMMARY

- Objective
- Study areas
- Methodology
- Obtained Results
- Generated Products
- Why invest in diamonds in Brazil?
- Acknowledgment



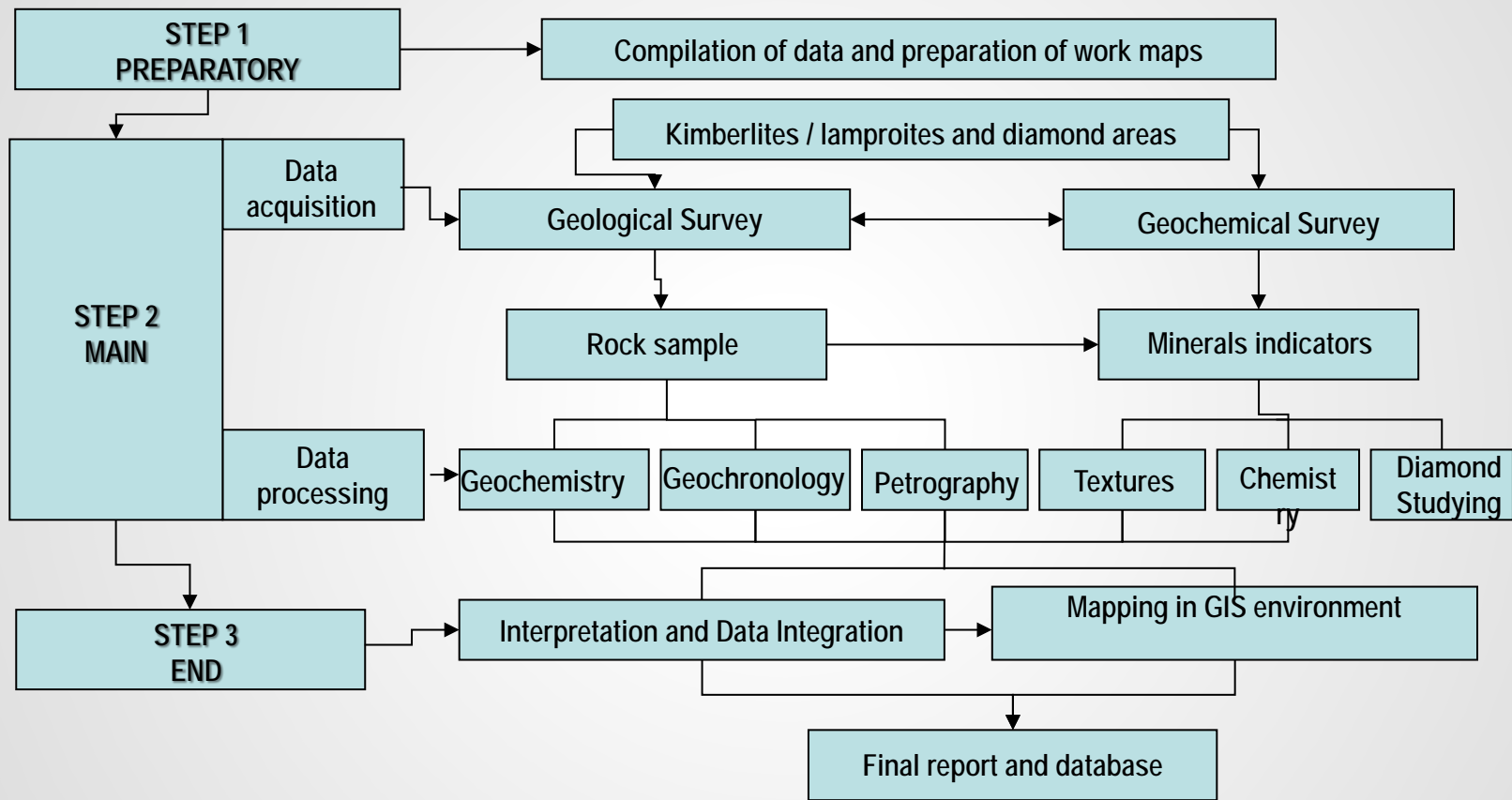
The Diamante Brasil Project is a national-wide program focused on the exploration and study of diamonds. Undertaken by the Geological Survey of Brazil (GSB / CPRM) through the Department of Mineral Resources - DEREM of the Geology and Mineral Resources Directory - DGM.

Objective

- **Evaluation and consistency of existing data from primary / secondary sources provided by companies and recorded in the GEOBANK.**
- **Provide information about geology, mineralogy, geochemistry, geophysics and geochronology of kimberlite / lamproite intrusions (Kimberlite Fields) and diamond areas of Brazil.**
- **Contribute with the improvement of knowledge and support future work in both scientific research and mineral exploration.**

Specific objectives

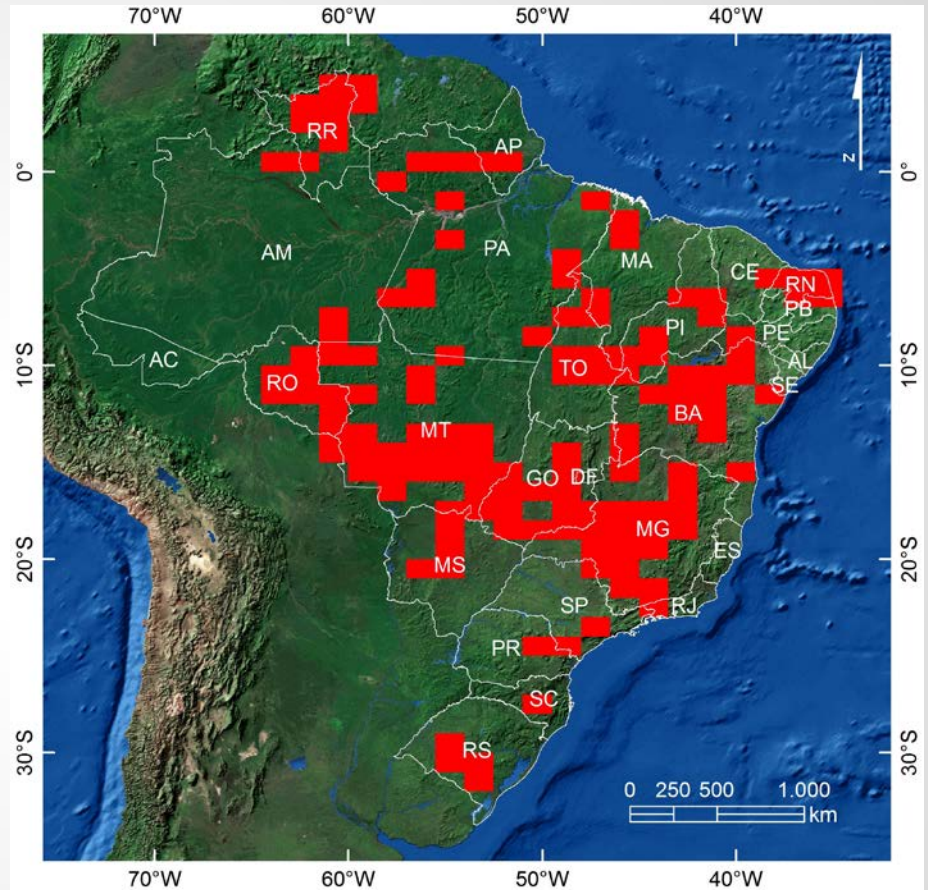
- **To present an integrated view of the main aspects of Diamond Geology in Brazil, including primary (kimberlite/lamproite), secondary sources (prospects, deposits in paleoplaceres) and economic aspects of diamond.**



Study areas

- **North** : RO, AM, RR, PA, AP e TO
- **Northeast** : MA, PI, CE, RN, PE e BA
- **Southeast** : SP e MG
- **Midwest** : MT, GO e MS
- **South** : RS, SC e PR

TOTAL: 20 States



Kimberlite Fields

42 campsites (24)

1,365 bodies (1,228)

Diamond Fields

20 known fields

804 occurrences

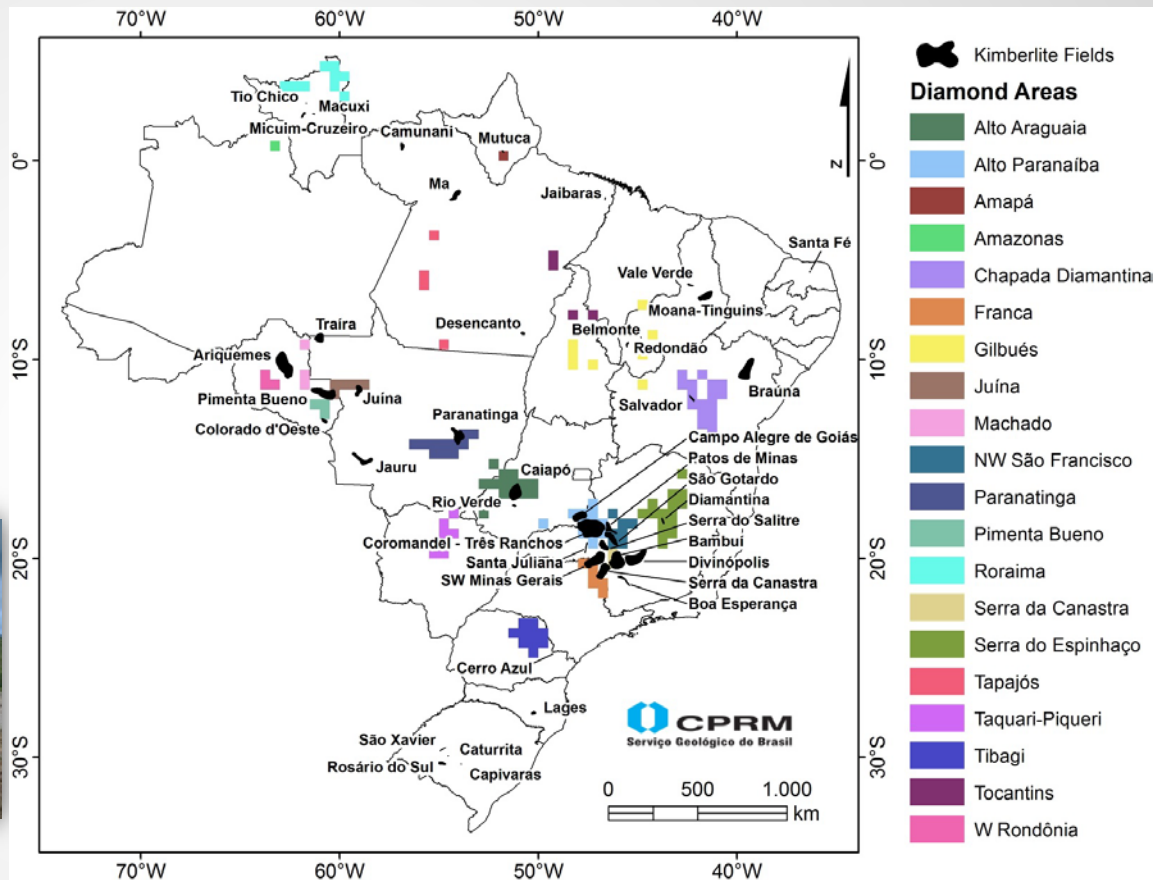
142 garimpos



Limpeza-17 (MG)



Garimpo Bendegó
(BA)



Methodology

Kimberlite - Related Rocks

Location

Intrusion Shape

Dimensions

Petrographic type

Mineralogy

Facies

Sampling (2)

Geochronology

Suitable for mineral chemistry
(diamond potential)

Presence of diamonds



Alto Paranaíba (MG)

Diamond Mining

Location

Status (active, inactive,
abandoned)

Deposit type

Average size of stones

Greatest stone recovered

Prevailing colors

Predominant morphology

Inclusions

Mining, concentration and
calculation systems

- Rock / Saprolite



- KIM's and diamonds



Braúna 8 (BA)



Diamonds recovered from the Braúna 8 kimberlite



Pirope

Araxá (MG)



Sampling

SAMPLES COLLECTED	PERIOD				TOTAL
	2011	2012	2013	2014	
Rock	758	96	212	0	1,094
Pan concentrate	2,407	281	222	410	3,320
Mineral (diamonds)	858	14	3	1.238	2,113
TOTAL	4,023	391	437	1.648	6,527

DIAMOND PROJECT BRAZIL		
TYPE OF DATA AND ANALYSIS	DESCRIPTION	QUANTITY
Mineralogical analysis - KIM	Recovery and classification of KIM	203,732 grains recovered
Mineralogical analysis - KIM	Magnetic mineral separation	3,404 samples analyzed
Mineral Chemistry Analysis	In situ electron microprobe analysis	1,453 spot analysis
Diamond Samples	Individual diamond grains	875 grains

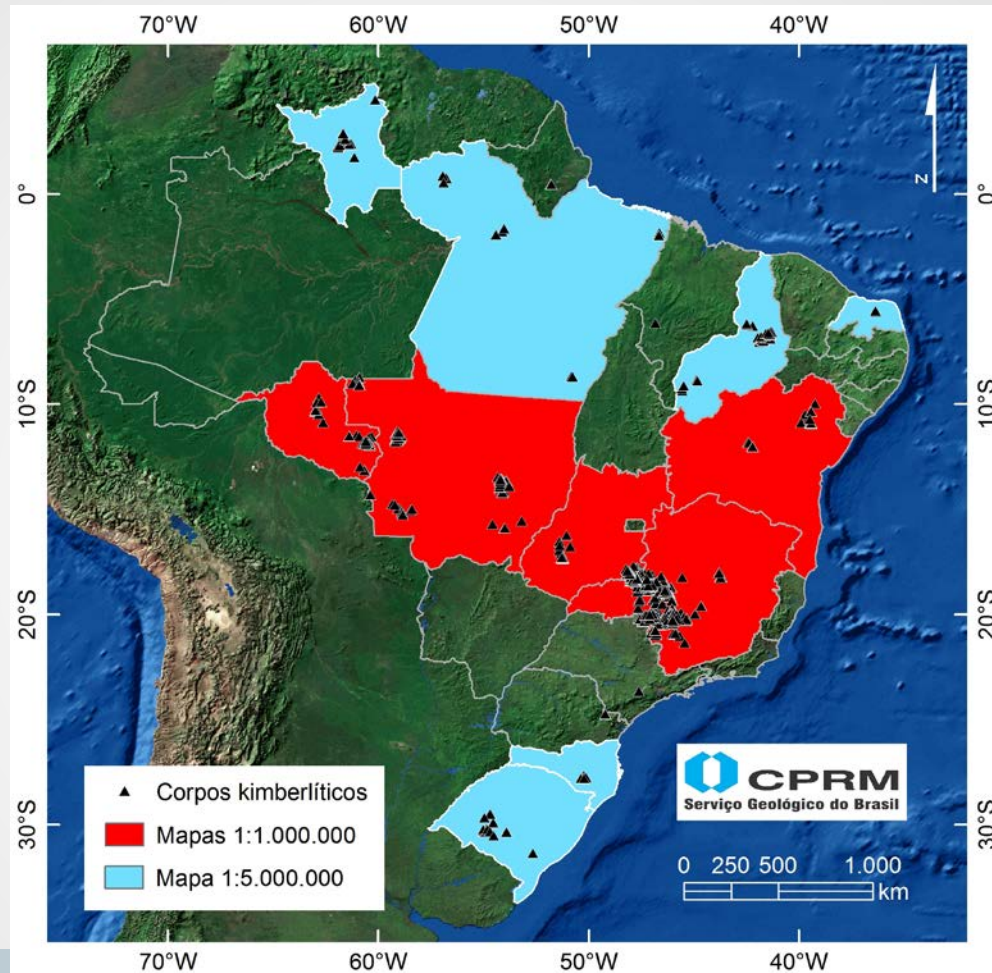
Results - Database

- **1,365 kimberlite bodies**
(surcharge of 138)
- **81 containing diamonds (6%)**

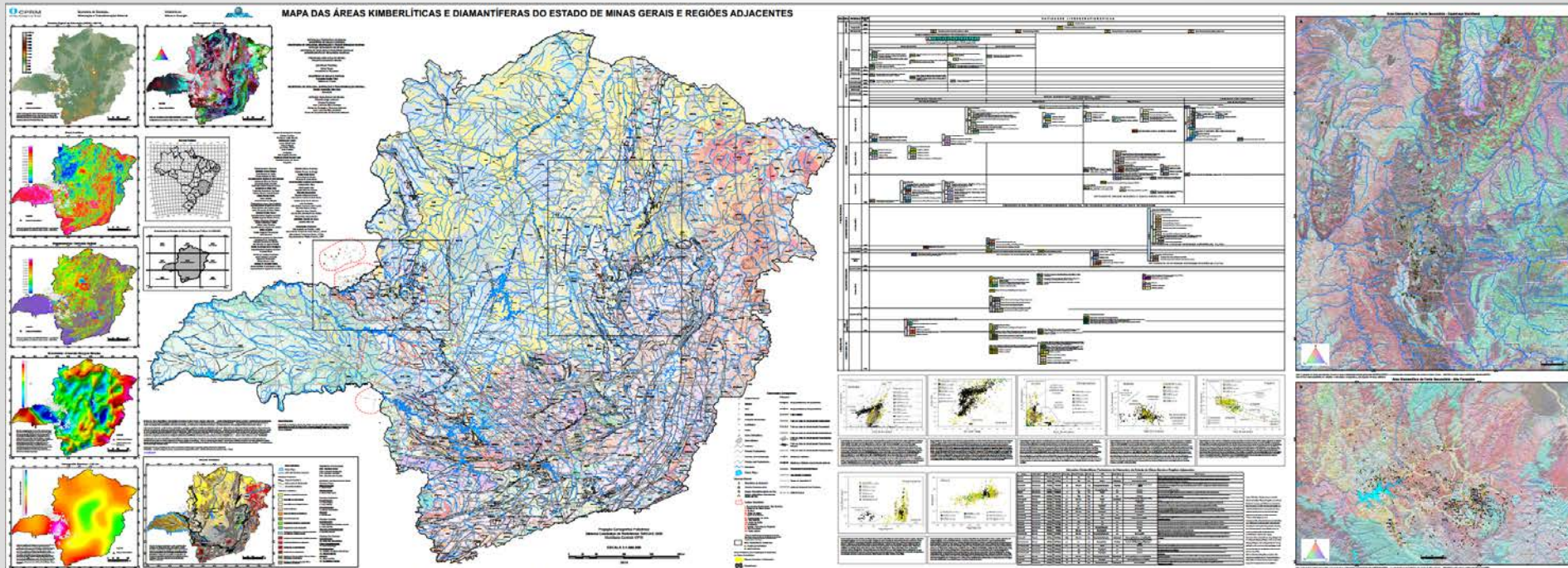
Corpo	Sigla	Alameda	UF	Coord. Folha	Nome, Folha	Datum	X UTM	Y UTM	Zona UTM	Long	Lat	Altitude	Area
Abel Regis_001	REG_001	Sim	MG	SE 23_Y_B_IV	Camão do Paraíba	WGS_84	349720,000	7901810,000	23S	-46,427472	-18,970581		
Alegria_001	ALE_001		MG	SE 23_Y_C_VI	Araxá	WGS_84	298989,357	7790184,784	23S	-46,921025	-19,974530		17,000
Alegria_002	ALE_002		MG	SF 23_V_A_III	Serra da Canastra	WGS_84	297788,309	7785895,796	23S	-46,932971	-20,003868		6,000
Alegria_003	ALE_003		MG	SF 23_V_A_III	Serra da Canastra	WGS_84	297484,362	7787030,786	23S	-46,935750	-20,002868		3,000
Alegria_004	ALE_004		MG	SF 23_V_A_III	Serra da Canastra	WGS_84	304159,371	7785506,750	23S	-46,872136	-20,017318		1,000
Alegria_005	ALE_005		MG	SE 23_Y_C_VI	Araxá	WGS_84	302623,366	7787703,767	23S	-46,886577	-19,997320		0,500
Alegria_006	ALE_006		MG	SE 23_Y_C_VI	Araxá	WGS_84	302218,361	7787453,766	23S	-46,890479	-19,999316		1,000
Alegria_007	ALE_007		MG	SF 23_V_A_III	Serra da Canastra	WGS_84	301648,364	7787323,763	23S	-46,895742	-20,006654		1,000
Alegria_008	ALE_008		MG	SE 23_Y_C_VI	Araxá	WGS_84	305527,365	7814370,749	23S	-46,856023	-19,756756		
Alegria_009	ALE_009	Sim	MG	SE 23_Y_C_VI	Araxá	WGS_84	315118,000	7799456,000	23S	-46,765031	-19,879403		
Alegria_010	ALE_010		MG	SE 23_Y_C_VI	Araxá	WGS_84	305766,358	7813810,742	23S	-46,853801	-19,761756		
Alegria_011	ALE_011		MG	SE 23_Y_C_VI	Araxá	WGS_84	305349,360	7814706,750	23S	-46,857688	-19,753703		
Alegria_012	ALE_012		MG	SE 23_Y_C_III	Iba	WGS_84	306924,344	7868819,758	23S	-46,837131	-19,265083		
Alegria_013	ALE_013		MG	SE 23_Y_C_VI	Araxá	WGS_84	306761,354	7816044,745	23S	-46,844077	-19,741757		
Alegria_014	ALE_014		MG	SE 23_Y_C_VI	Araxá	WGS_84	306183,356	7812962,745	23S	-46,849912	-19,769558		
Alegria_015	ALE_015		MG	SE 23_Y_C_VI	Araxá	WGS_84	309220,365	7817547,729	23S	-46,820466	-19,728422		
Alegria_016	ALE_016		MG	SE 23_Y_C_VI	Araxá	WGS_84	301244,354	7817217,774	23S	-46,896580	-19,770649		
Alegria_017	ALE_017		MG	SE 23_Y_C_VI	Araxá	WGS_84	298839,363	7818724,796	23S	-46,919356	-19,776757		
Alegria_018	ALE_018		MG	SE 23_Y_C_VI	Araxá	WGS_84	298895,358	7819124,780	23S	-46,919638	-19,773141		
Alegria_019	ALE_019		MG	SE 23_Y_C_VI	Araxá	WGS_84	315267,363	7807400,699	23S	-46,763793	-19,820653		3,000
Alegria_020	ALE_020		MG	SE 23_Y_C_VI	Araxá	WGS_84	317657,000	7806767,000	23S	-46,741995	-19,826600		2,300
Alegria_021	ALE_021	Sim	MG	SE 23_Y_C_VI	Araxá	WGS_84	318790,364	7807252,679	23S	-46,730182	-19,822319		
Alegria_022	ALE_022		MG	SE 23_Y_C_VI	Araxá	WGS_84	320493,363	7808623,674	23S	-46,713795	-19,810092		
Alegria_023	ALE_023		MG	SE 23_Y_C_VI	Araxá	WGS_84	320591,369	7810408,671	23S	-46,712687	-19,791977		
Alegria_024	ALE_024		MG	SE 23_Y_C_VI	Araxá	WGS_84	319953,377	7790258,671	23S	-46,720740	-19,975928		
Alegria_025	ALE_025		MG	SE 23_Y_C_VI	Araxá	WGS_84	320154,366	7790537,668	23S	-46,718792	-19,973427		
Alegria_026	ALE_026		MG	SE 23_Y_C_VI	Araxá	WGS_84	319891,372	7790626,672	23S	-46,721596	-19,972598		
Alegria_027	ALE_027		MG	SE 23_Y_C_VI	Araxá	WGS_84	319944,373	7790934,673	23S	-46,720741	-19,968921		
Alegria_028	ALE_028		MG	SE 23_Y_C_VI	Araxá	WGS_84	316747,374	7793792,690	23S	-46,751017	-19,943707		1,000

- Samples Database : **1,094** rock samples
2,181 of sieve and pan concentrates
- Analytical results database : **3,404** samples of MIK's
27,585 of mineral chemistry
875 Diamonds described.

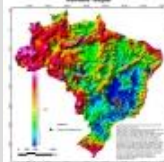
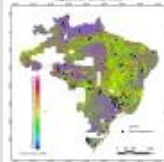
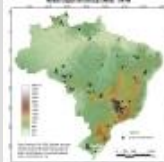
Generated Products



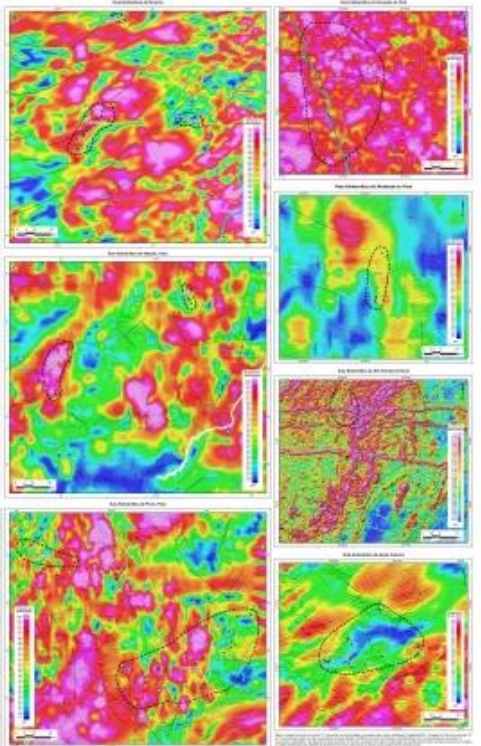
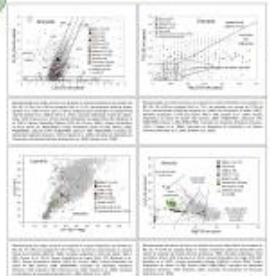
Generated Products



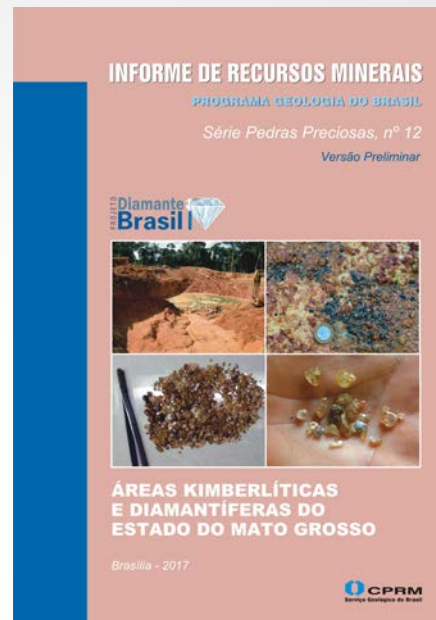
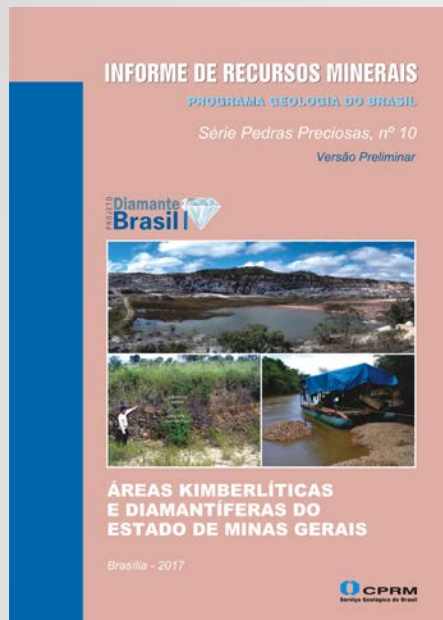
MAPA DAS ÁREAS KIMBERLÍTICAS E DIAMANTÍFERAS DOS ESTADOS DE RORAIMA, PARAÍ, PIAUÍ, RIO GRANDE DO NORTE, SANTA CATARINA E RIO GRANDE DO SUL



Identificação	Descrição	Observações
1	Área Kimberlítica	
2	Área Diamantífera	
3	Área de Interação	
4	Área de Invasão	
5	Área de Alteração	
6	Área de Deposição	
7	Área de Erosão	
8	Área de Sedimentação	
9	Área de Metamorfismo	
10	Área de Deformação	
11	Área de Migração	
12	Área de Transporte	
13	Área de Armazenamento	
14	Área de Reciclagem	
15	Área de Reabsorção	
16	Área de Recristalização	
17	Área de Recombinação	
18	Área de Recombinação	
19	Área de Recombinação	
20	Área de Recombinação	



Generated Products



- **Technical Procedures Guides:**
- - **Sampling of Heavy Minerals indicators of Kimberlite and Diamond**
- - **KIM, Distribution and Populations of Diamonds**
- - **Chemical studies and gemological characterization of Diamond**



Projeto Diamante Brasil



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1- Mapa das áreas kimberlíticas e diamantíferas do estado da Bahia

2- Mapa das áreas kimberlíticas e diamantíferas do estado de Minas Gerais e regiões adjacentes

3- Mapa das áreas kimberlíticas e diamantíferas dos Estados de Roraima, Pará, Piauí, Rio Grande do Norte, Santa Catarina e Rio Grande do Sul

4- Mapa das áreas kimberlíticas e diamantíferas do Estado de Goiás e do Distrito Federal

5- Mapa das áreas kimberlíticas e diamantíferas do Estado de Mato Grosso

6- Mapa das áreas kimberlíticas e diamantíferas do Estado de Rondônia

7- Informe de Recursos Minerais - Áreas kimberlíticas e diamantíferas do Estado do Mato Grosso

8- Informe de Recursos Minerais - Áreas kimberlíticas e diamantíferas do Estado de Rondônia

9- Informe de Recursos Minerais - Áreas kimberlíticas e diamantíferas do Estado da Bahia

400mi

CHILE

Santiago

ARGENTINA

Montevideo



Caracas

VENEZUELA

Bogotá
COLOMBIA

Paramaribo

Manaus

Belém

Fortaleza

Recife

Salvador

BOLIVIA

B R A Z I L

Brasília

Belo Horizonte

PARAGUAY

Asunción

São Paulo

URUGUAY

Porto Alegre

Atlantic Ocean

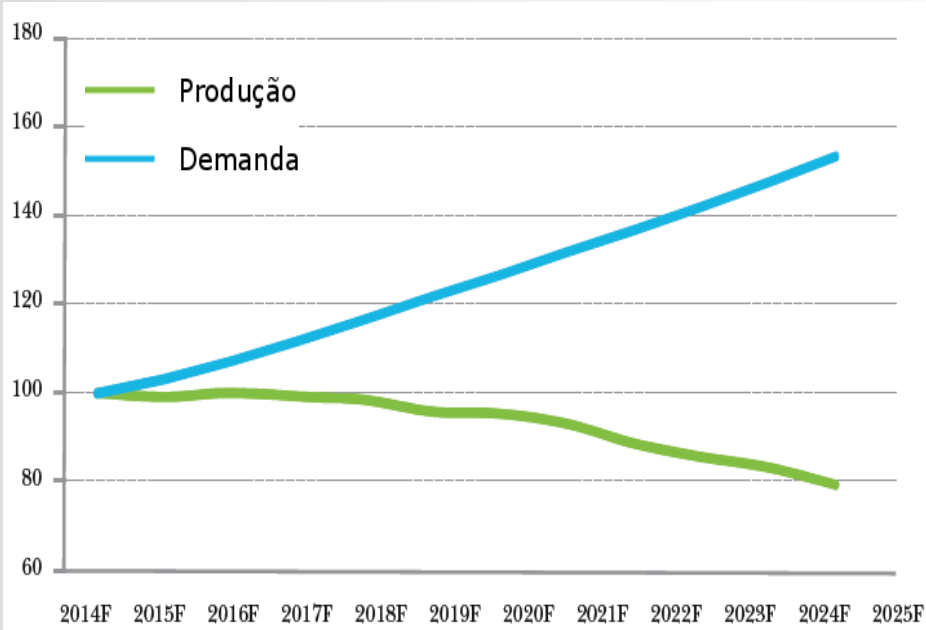
WHY INVEST IN DIAMONDS IN BRAZIL?

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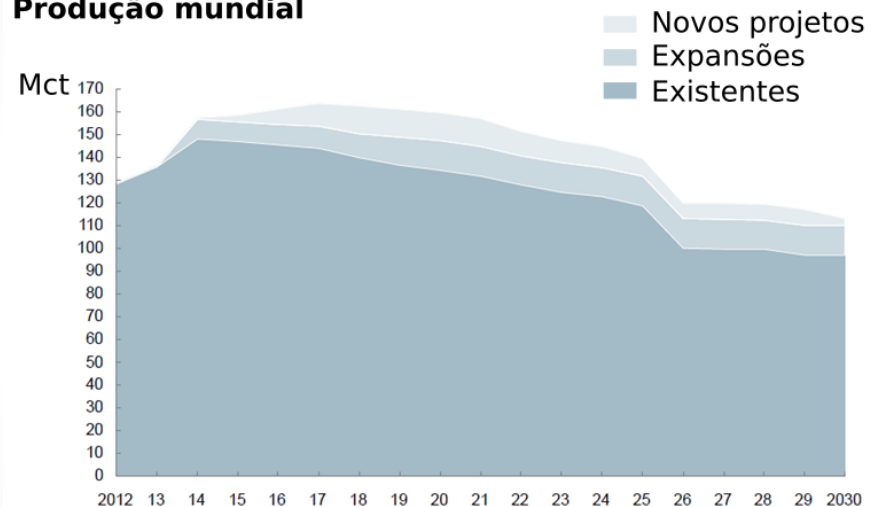
- Existing operations and projects do not meet projected demand for the next 20 years.
- The worldwide success rate of 0.5%, applied to Brazil, indicates the potential for another 6 new mines.
- Low investment maturity (<0.5% of the world total).
- The primary diamond in Brazil presents value (US \$ / cts) twice as much as the Canadian.
- The geological conditions of Brazilian kimberlites point to potential new economic discoveries.
- Infrastructure available / low investment in deployment.

WHY INVEST IN DIAMONDS IN BRAZIL?

Existing operations and projects do not meet projected demand for the next 20 years.



Produção mundial

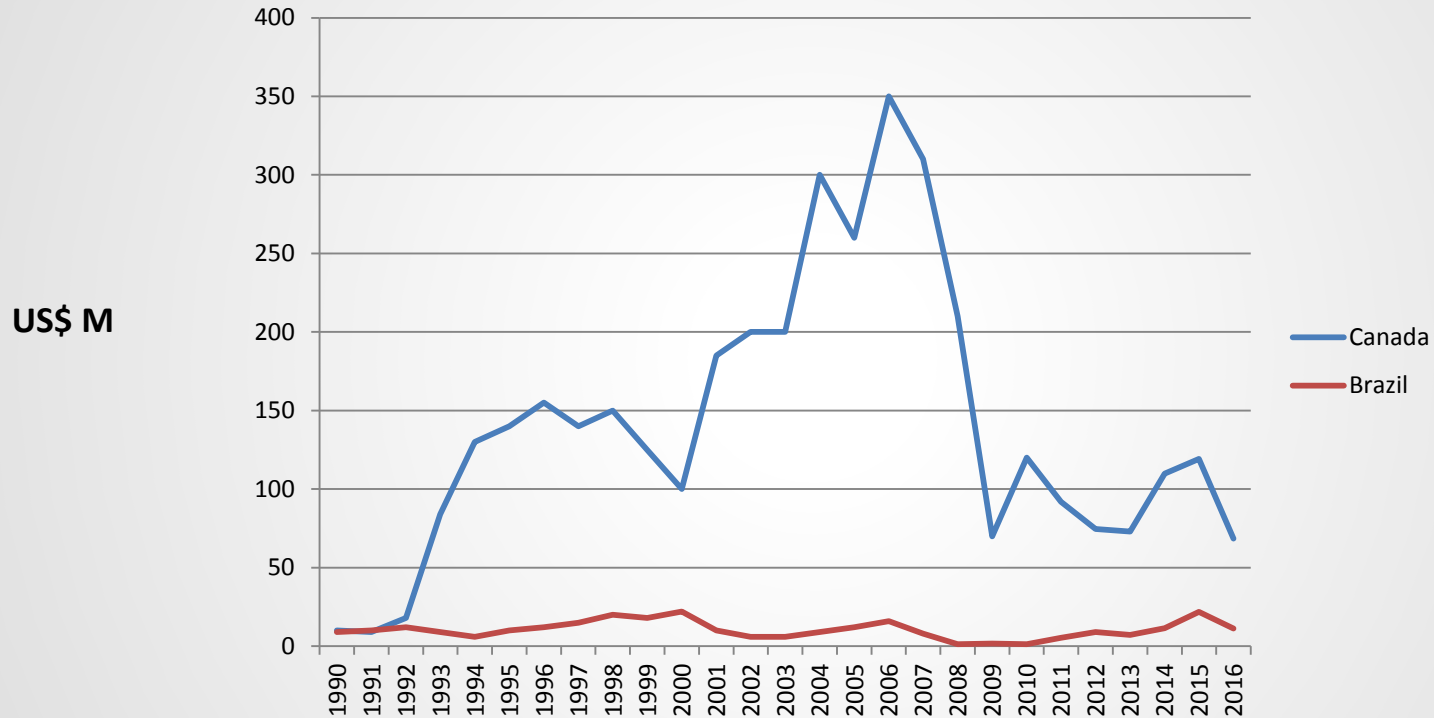


Fonte: McKinsey proprietary diamond sector research

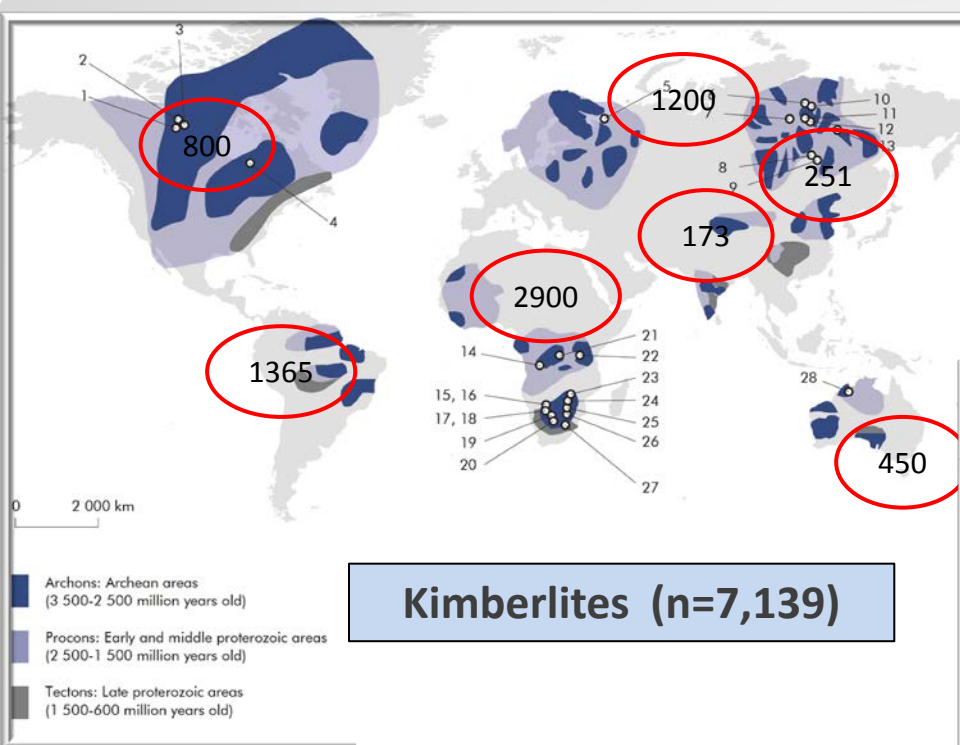
Fonte: DeBeers Group, 2014

WHY INVEST IN DIAMONDS IN BRAZIL?

Low investment maturity (<0.5% of the world total)



Source : Lípari (PDAC 2017)

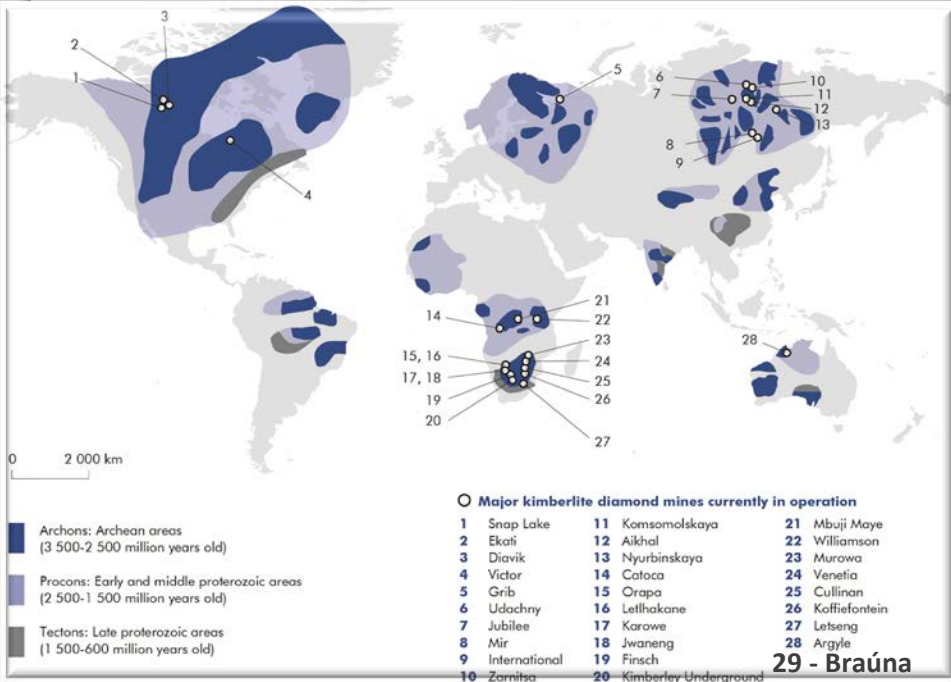


Kimberlites (n=7,139)

Mines (n=29)

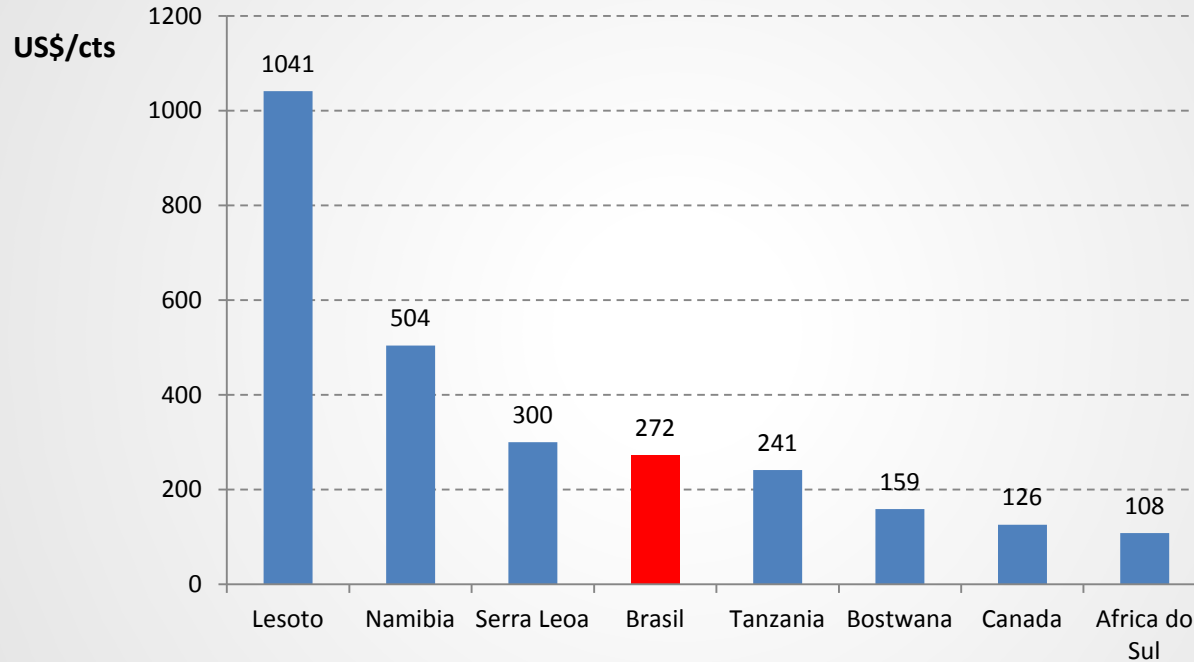
WHY INVEST IN DIAMONDS IN BRAZIL?

The worldwide success rate of 0.5%, applied to Brazil, indicates the potential for another 6 new mines



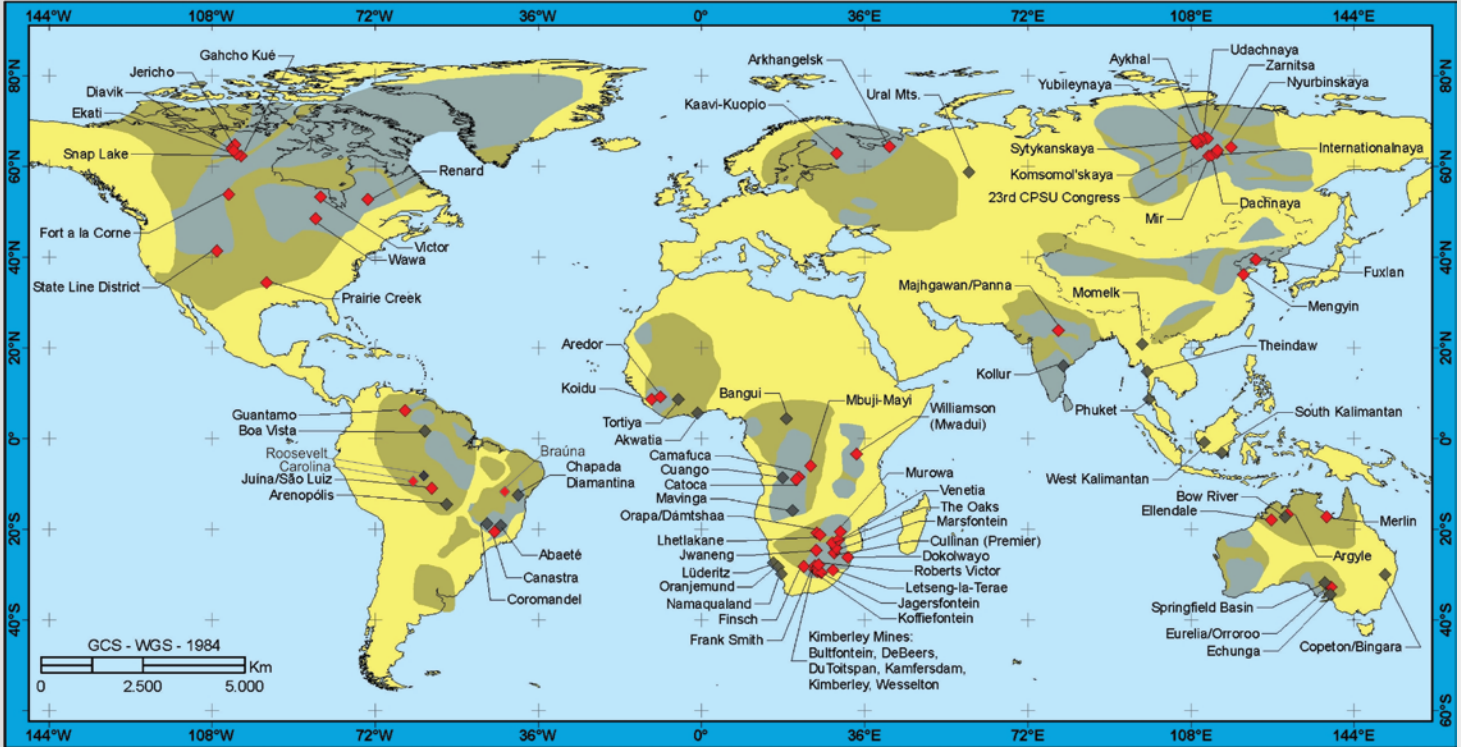
WHY INVEST IN DIAMONDS IN BRAZIL?

The primary diamond in Brazil presents value (US \$ / cts) twice as large as the Canadian



Brazil is currently the 4th in the world ranking in value (US \$ / cts)

WHY INVEST IN DIAMONDS IN BRAZIL?



The geological conditions of Brazilian kimberlites point to the potential of new economic discoveries

MAPA MUNDI COM ZONAS CRATÓNICAS E OS PRINCIPAIS DEPÓSITOS DIAMANTÍFEROS

- | | | |
|--------|--|---|
| Cráton | Crosta continental não-cratônica (< 1.5 Ga) | ◆ Depósitos Primários de diamantes (kimberlitos, lamproitos) |
| | Paleo a Mesoproterozóico (2.5 - 1.5 Ga) | ◆ Depósitos de diamantes em "Placers" |
| | Arqueano (> 2.5 Ga) | |

Fonte: Tappert & Tappert (2011)

WHY INVEST IN DIAMONDS IN BRAZIL?

Infrastructure available / low investment in deployment

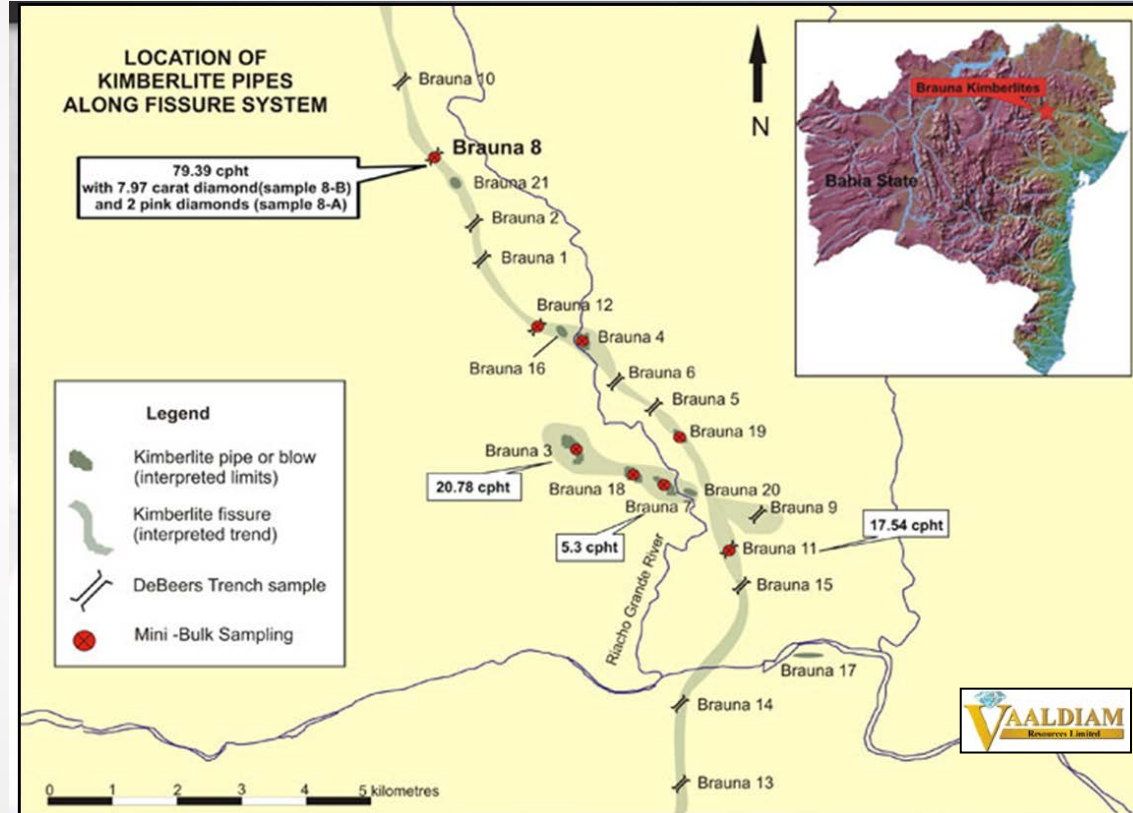
- Diamond "Oppenheimer Blue"
- 14.6 cts (2.92 g) - Cullinan Mine (former Premier) in South Africa
- US \$ 57.6 mi - Auctioned on May 18, 2016

- Project Braúna (BA)
- US\$ 57,05 mi



Brazilian production grew-up 6 times between 2015 and 2016, the Braúna mine accounts for about 63% of the total production in 2016

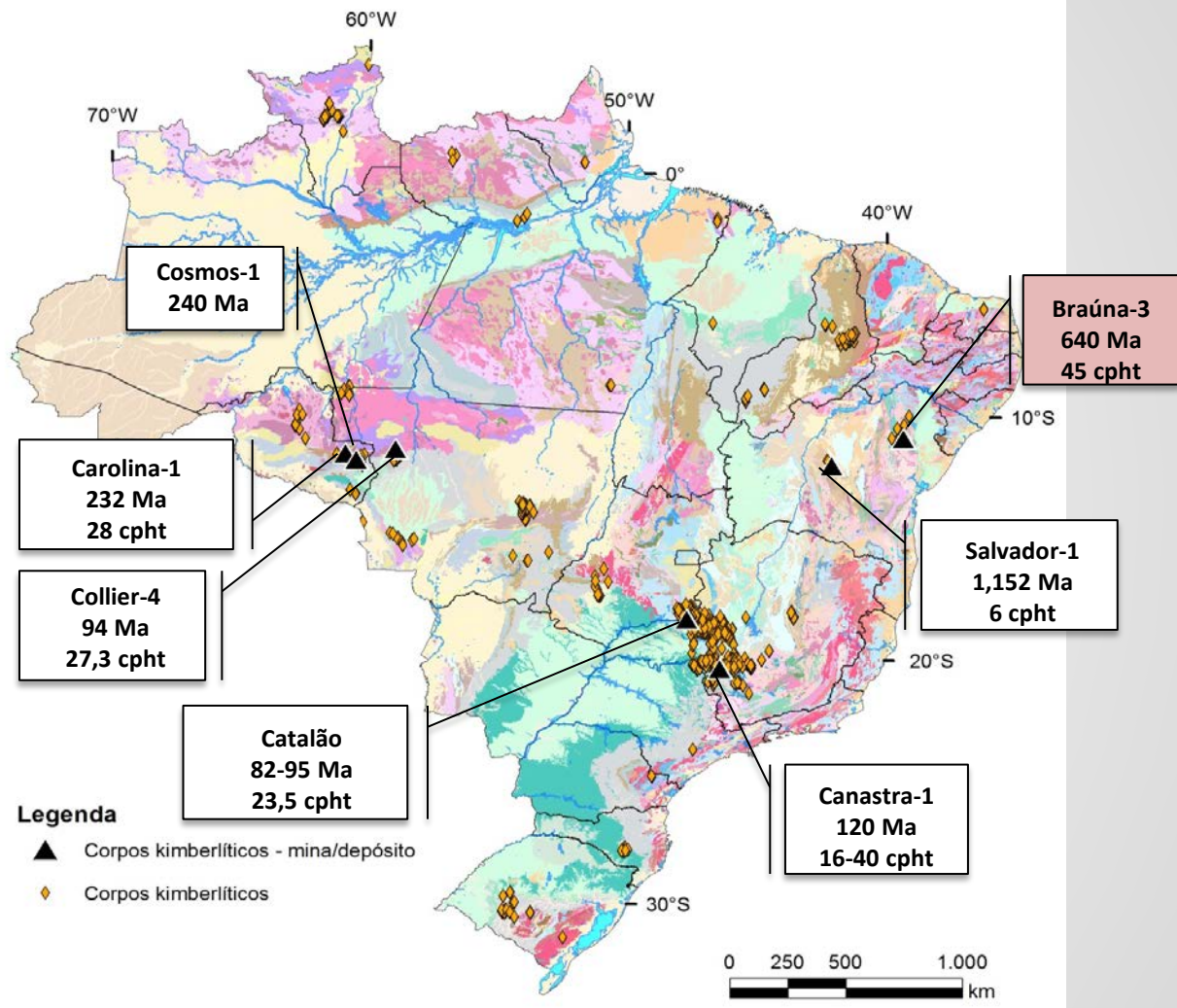
- The CKB is located in the Serrinha Block (3Ga- Archean to Paleoproterozoic), northeast region of the São Francisco Craton;
- 28 intrusions (pipes, dikes, blows), Proterozoic ages (642 Ma). Most were discovered by De Beers in the 1990s;
- 11 diamondiferous;
- The Nordestina mine represents the first diamond mine in primary source of Brazil (Braúna 3). Life span 7 -12 years = 13.5 Mton, 5 Mts, 21-45.5 cphT;
- Braúna 3 = 7,184 recovered diamonds (407 tons of rock).



Primary Source Potential



Carolina 1



Secondary Source Potential Deposits



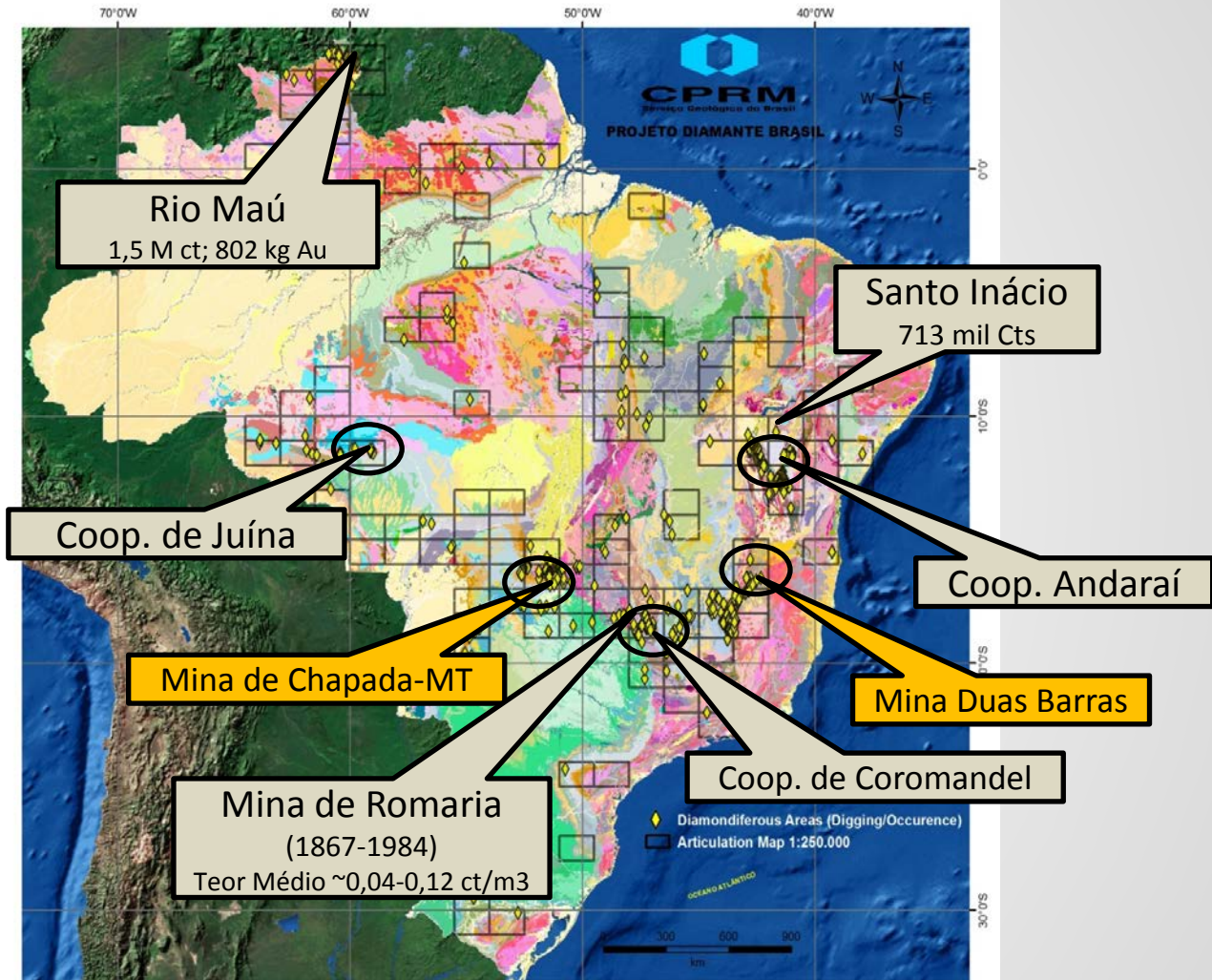
Braúna 8



170 cts. Rio
Douradinho



106 cts.
COOPEGAC



GEOLOGICAL SURVEY OF BRAZIL - CPRM

PROJECT TEAM

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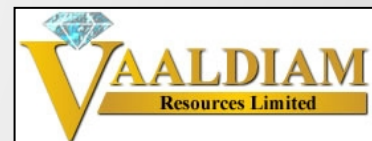
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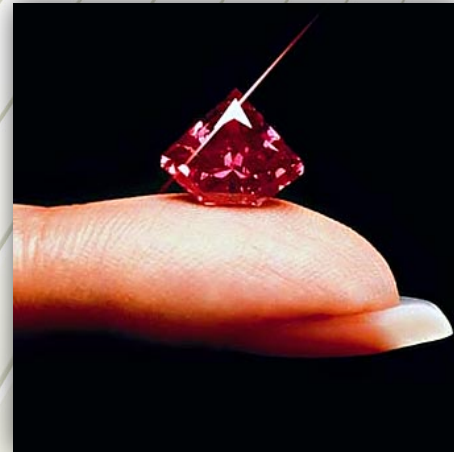
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- Cooperativa de Garimpeiros de Andaraí
- Cooperativa de Garimpeiros de Diamantina
- Francisco Ribeiro – GAR Mineração





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