WIPO Workshop on Global Innovation
Patterns in the Mining Industry

WIPO
WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

Innovation in the Mining Sector: the Brazilian Case

Geneva, May 31st, 2017

INPI INSTITUTO
NACIONAL DA
PROPRIEDADE
INDUSTRIAL

MINISTÉRIO DA
**INDÚSTRIA, COMÉRCIO EXTERIOR
E SERVIÇOS**

BRASIL
GOVERNO FEDERAL

Agenda

- Economic Affairs Advisory

- INPI Intellectual Property Statistical Database - BADEPI

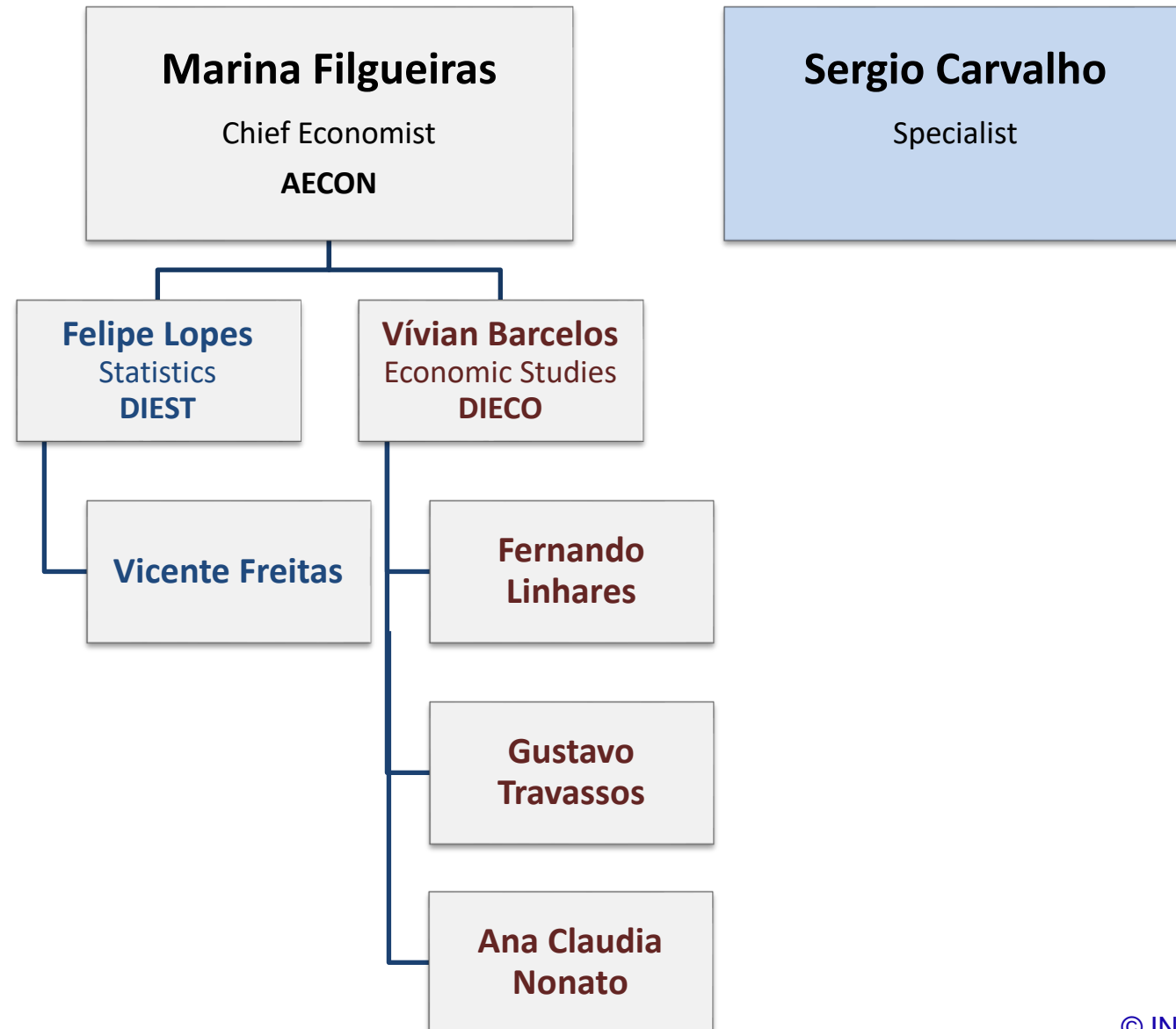- Brazilian Mining Sector Overview

- Preliminary Results

Economic Affairs Advisory

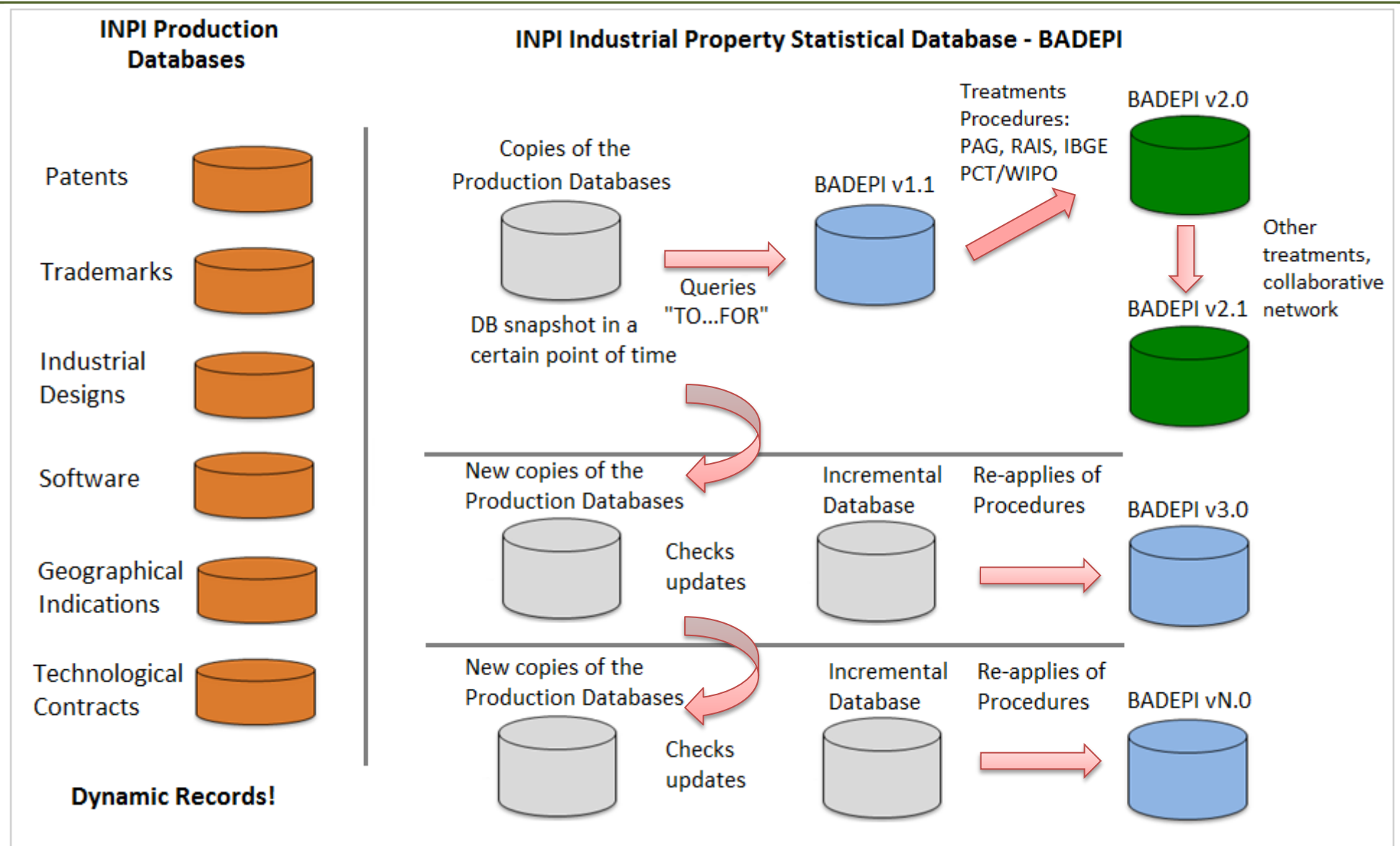The **Economic Affairs Advisory (AECON)** is responsible for:

- Planning, preparing, publishing and keeping updated statistics of the INPI;

- Promoting, coordinating and implementing economic studies on the impact of intellectual property and the actions of the INPI on the national development process and the competitiveness of companies and economic sectors.

Economic Affairs Advisory

Marina Filgueiras

Chief Economist

AECON

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Specialist

Felipe Lopes
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DIEST

Vívian Barcelos
Economic Studies
DIECO

Vicente Freitas

Fernando Linhares

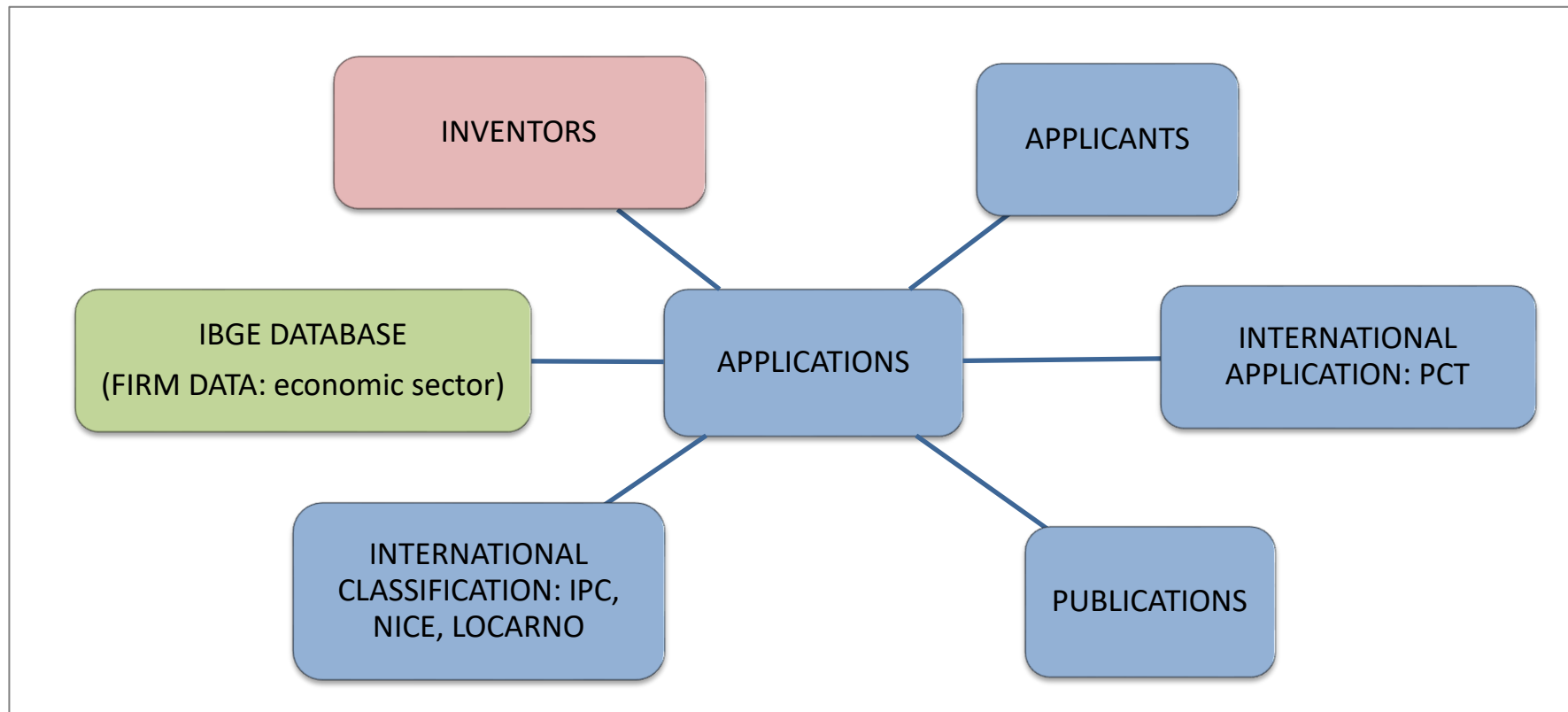**Gustavo Travassos**

Ana Claudia Nonato

INPI Intellectual Property Statistical Database – BADEPI (First Phase)

- The Brazilian IP Office (INPI) has, with the technical and financial support of WIPO/Economic and Statistical Division, prepared a database designed to assist in statistical research into intellectual property information.

- IP Coverage:
  - Patents
  - Trademarks
  - Industrial Designs
  - Software
  - Geographical Indications
  - Technological Contracts

- Time coverage: 2000-2012

- Collaborative Project between: INPI, WIPO and among Brazilian agencies

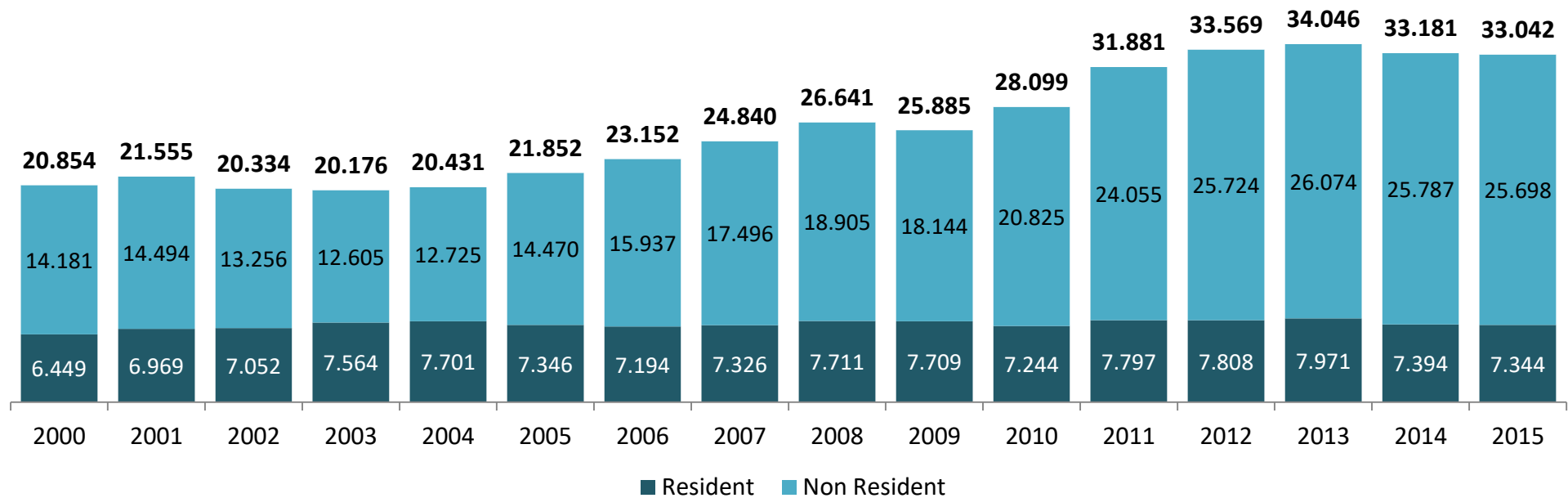- Coordinated by INPI/AECON (Economic Affairs Advisory)

BADEPI

INPI Production Databases

- Patents
- Trademarks
- Industrial Designs
- Software
- Geographical Indications
- Technological Contracts

Dynamic Records!

INPI Industrial Property Statistical Database - BADEPI

Copies of the Production Databases

DB snapshot in a certain point of time

Queries "TO...FOR"

BADEPI v1.1

Treatments Procedures: PAG, RAIS, IBGE PCT/WIPO

BADEPI v2.0

Other treatments, collaborative network

BADEPI v2.1

New copies of the Production Databases

Checks updates

Incremental Database

Re-applies of Procedures

BADEPI v3.0

New copies of the Production Databases

Checks updates

Incremental Database

Re-applies of Procedures

BADEPI vN.0

Conceptual Model

INPI Intellectual Property Statistical Database – BADEPI (Current Phase)

- Use INPI Services Payment System (PAG) to infer data more efficient and in a monthly basis *(As discussed at WIPO meeting in 2013)*

- BADEPI is being updated with the new methodology, integrating PAG System and the Production Databases

- IP Coverage: similar to the first phase

- Time coverage: 2013-2015

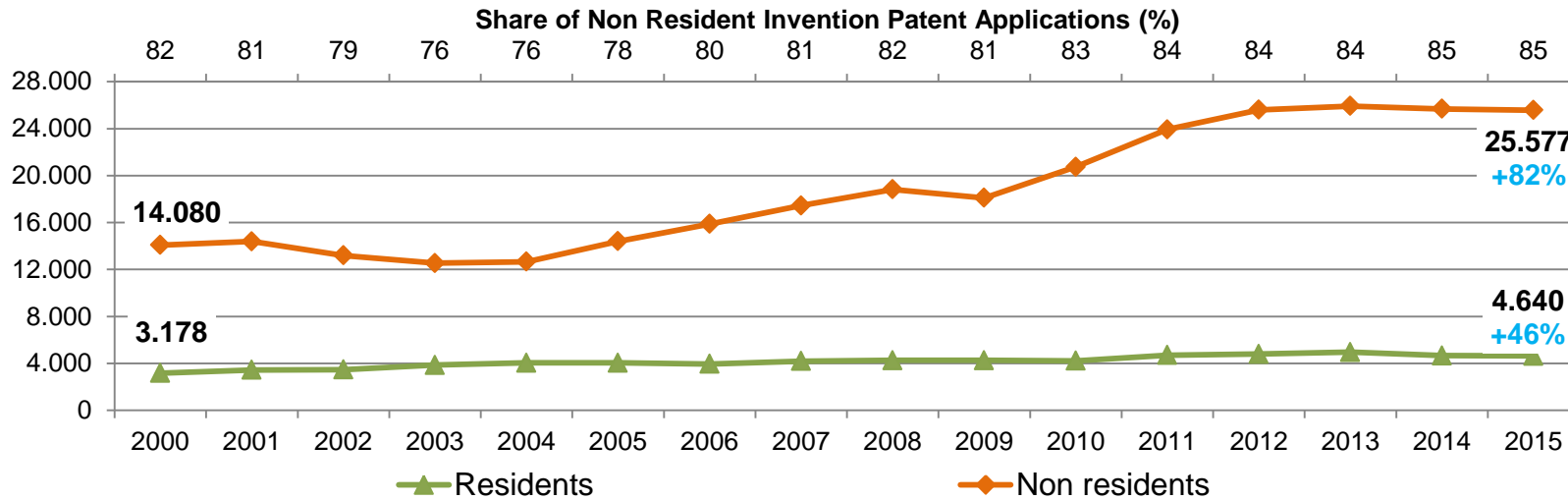- Coordinated by INPI/AECON (Economic Affairs Advisory)

INPI

BADEPI

Patent applications by residents and non residents, 2000-2015*

Year	Non Resident	Resident	Total
2000	14.181	6.449	20.854
2001	14.494	6.969	21.555
2002	13.256	7.052	20.334
2003	12.605	7.564	20.176
2004	12.725	7.701	20.431
2005	14.470	7.346	21.852
2006	15.937	7.194	23.152
2007	17.496	7.326	24.840
2008	18.905	7.711	26.641
2009	18.144	7.709	25.885
2010	20.825	7.244	28.099
2011	24.055	7.797	31.881
2012	25.724	7.808	33.569
2013	26.074	7.971	34.046
2014	25.787	7.394	33.181
2015	25.698	7.344	33.042

■ Resident ■ Non Resident

Total Patent Applications
2000: 20.854
2015: 33.042
+58%

Share 2000/2015
Patents: 84% to 91%
Utility Models: 16% to 8%
Addition certificate: 0,4% to 0,3%

* Note: It includes Utility Model and Addition Certificate applications .

BADEPI

Invention Patent applications by residents and non residents, 2000-2015

Share of Non Resident Invention Patent Applications (%)

| 82 | 81 | 79 | 76 | 76 | 78 | 80 | 81 | 82 | 81 | 83 | 84 | 84 | 84 | 85 | 85 |

14.080

25.577
+82%

3.178

4.640
+46%

▲ Residents   ◆ Non residents

Utility Model applications by residents and non residents, 2000-2015

Share of Resident Utility Model Applications (%)

| 97 | 97 | 98 | 98 | 98 | 98 | 98 | 99 | 98 | 99 | 97 | 96 | 96 | 95 | 97 | 96 |

3.200

2.607
-19%

94

112
+19%

■ Residents   ● Non residents

Changes in the share of Resident and Non resident applications 2000/2015

Non Residents:
Patents: 82% to 85%
Utility Models: 3% to 4%

X
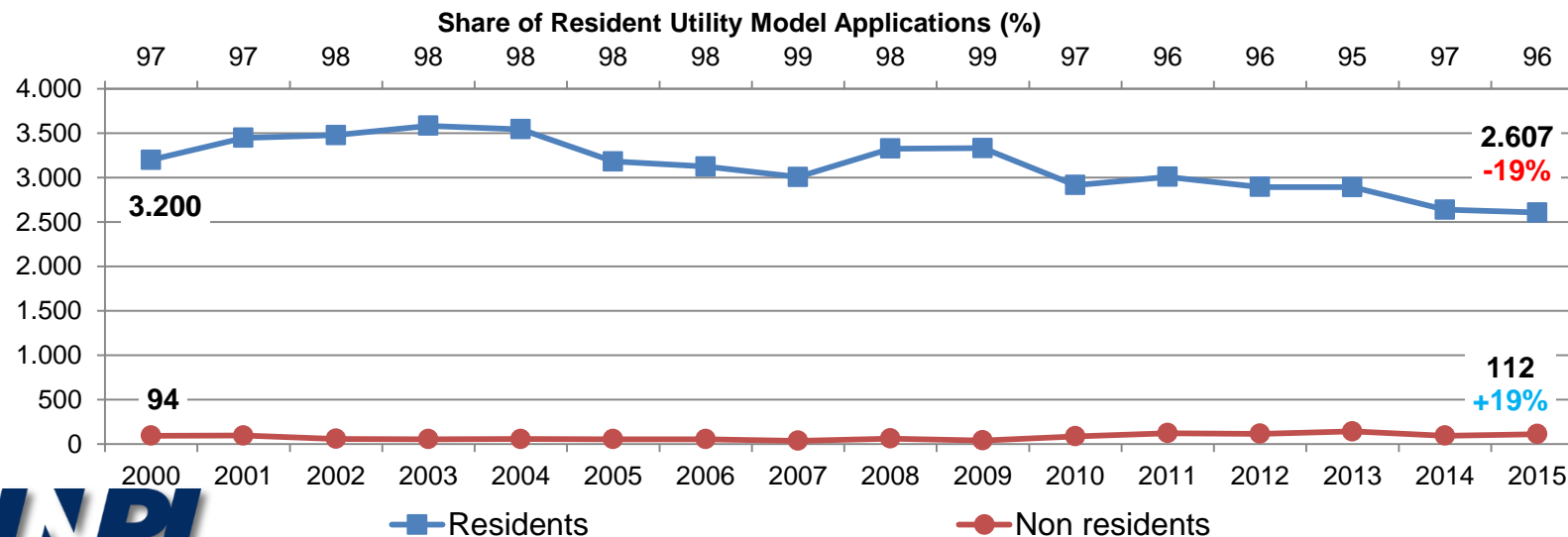
Residents:
Patents: 18% to 15%
Utility Models: 97% to 96%

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Patent applications (direct and PCT national phase entries), 2000-2015

Share of Non Resident Applications (%)

| | 82 | 81 | 79 | 76 | 76 | 78 | 80 | 81 | 82 | 81 | 83 | 84 | 84 | 84 | 85 | 85 |

Applications per year

Total:
17.258, 17.828, 16.668, 16.404, 16.702, 18.455, 19.832, 21.638, 23.098, 22.356, 24.958, 28.630, 30.399, 30.876, 30.341, 30.217

PCT - National phase entry:
10.488, 11.143, 10.742, 10.376, 10.306, 11.994, 13.647, 15.254, 16.813, 16.137, 18.689, 21.316, 22.628, 22.609, 22.642, 22.467

Direct:
6.770, 6.685, 5.926, 6.028, 6.396, 6.461, 6.185, 6.384, 6.285, 6.219, 6.269, 7.314, 7.771, 8.267, 7.699, 7.750

Years: 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015

Legend: Total — PCT - National phase entry — Direct

PCT	Direct
2000: 10.488	2000: 6.770
2015: 22.467	2015: 7.750
+214%	**+14%**

BADEPI

Patent Applications by technology field by residents and non residents , 2006-2015

Legend: Chemistry, Electrical engineering, Instruments, Other fields, Mechanical Engineering

BADEPI
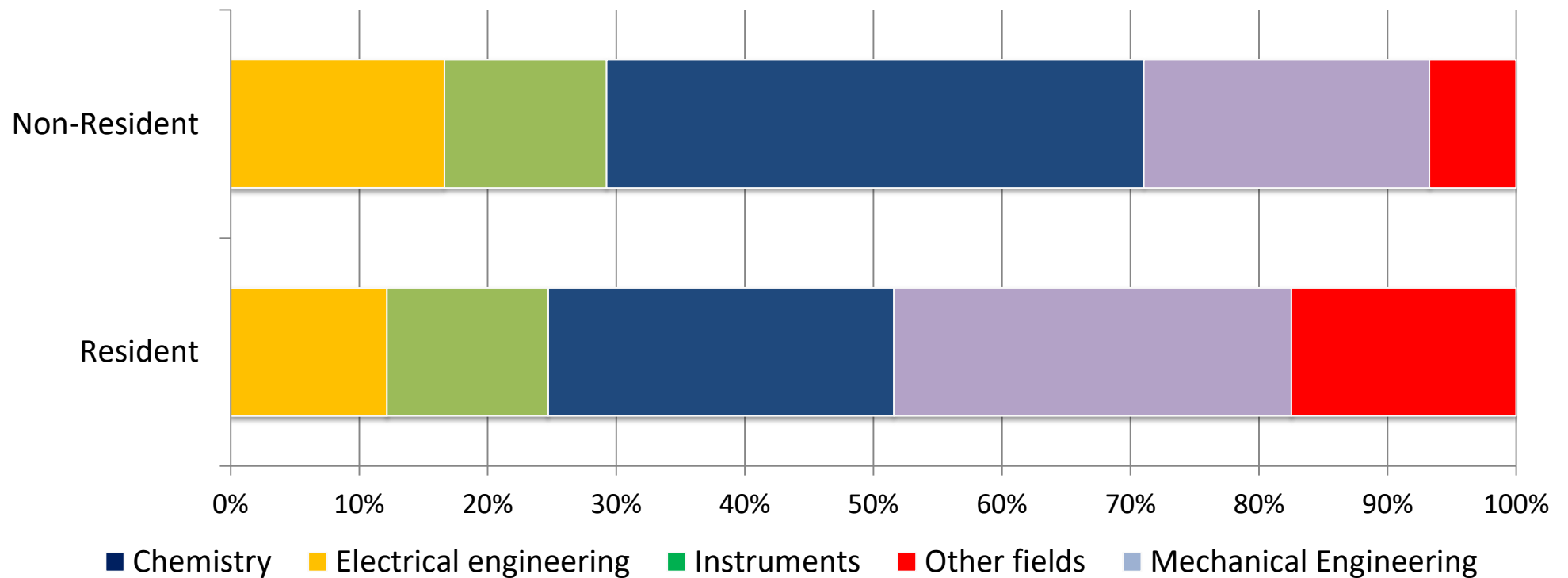
Top Non Resident applicants of Patents at INPI Brazil, 2000-2015

		2000-2012	2013-2015
Patent	1	Basf	Philips
	2	Qualcomm	Dow
	3	The Procter & Gamble	Basf
	4	Philips	General Eletric
	5	Unilever	Halliburton

Top Resident applicants of Patents at IP Brazil, 2000-2015

		2000-2012	2013-2015
Patent	1	Petrobras	Whirlpool
	2	Whirlpool	USP
	3	UNICAMP	UNICAMP
	4	USP	Petrobras
	5	UFMG	UFMG

Brazilian Mining Sector Overview

Main Mineral Reserves

Location of main mineral reserves of Aluminium (Bauxite), Copper, Tin, Iron Ore, Manganese, Niobium, Nickel, Gold.
Source: Brazilian National Department of Mineral Production (DNPM)

Al, Au, Cu, Fe, Mn, Nb, Ni, Sn
2015

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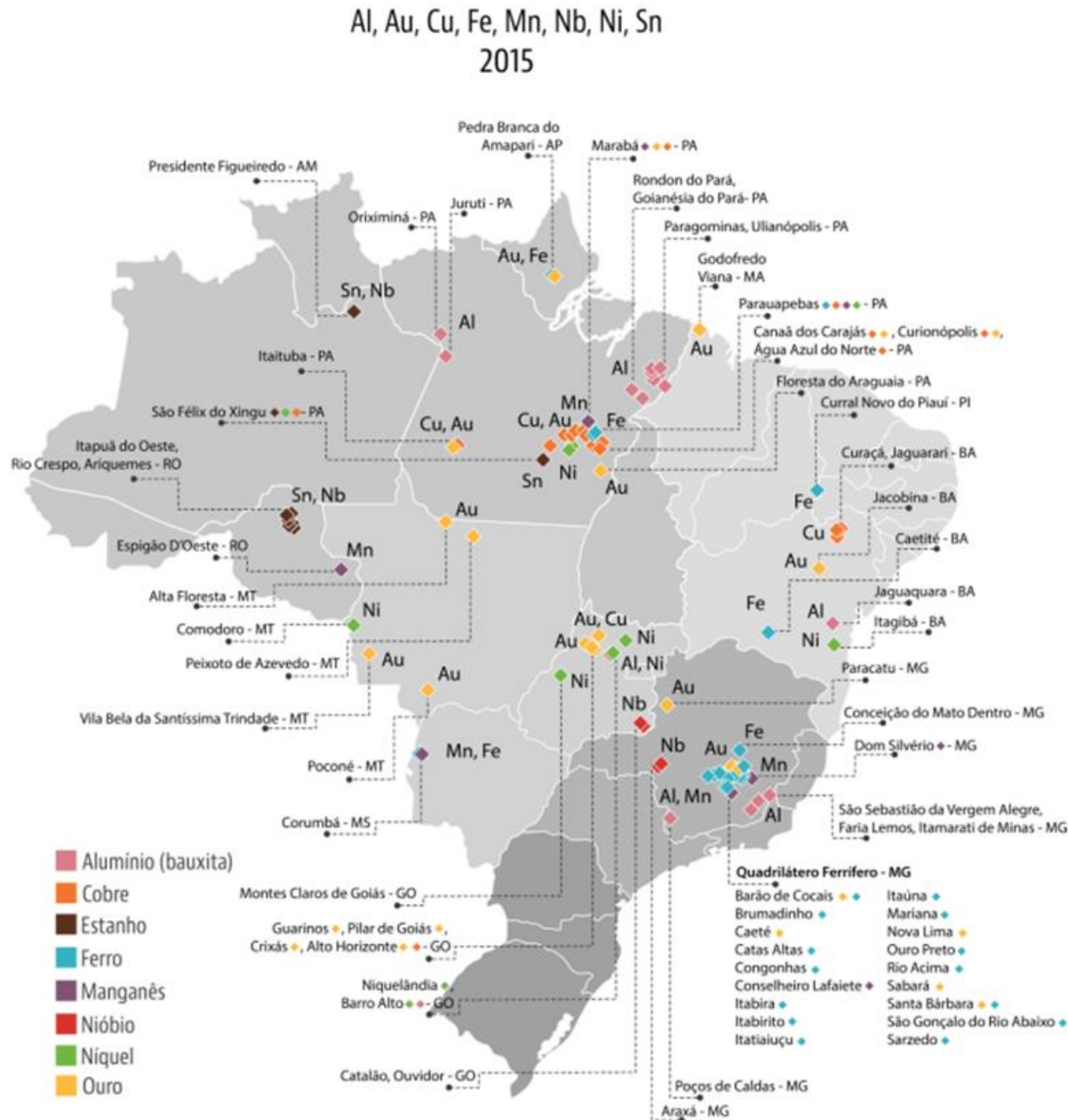
Brazilian Mining Sector Overview

Production (2015)

Mineral	Tons	World Rank	World Share
Niobium	84.189	1º	92.29%
Iron	275.589.840	3º	17.52%
Bauxite (Crude ore)	37.057.000	3º	12.77%
Manganese	1.226.458	5º	6.74%
Tin	18.824	6º	5.87%
Nickel	89.302	9º	4.24%
Gold (*)	83.127	12º	2.69%
Copper	359.463	14º	1.86%

(*) Gold production is in kg.

Source: World Mining Data 2017

INPI

Brazilian Mining Sector Overview

Top Producing Companies - 2015

Aluminium (Bauxite)

Company	Share (%) (*)
MINERAÇÃO RIO DO NORTE	47,38
MINERAÇÃO PARAGOMINAS	33,19
ALCOA WORLD ALUMINA BRASIL	14,18
OTHER COMPANIES	5,25

Copper

Company	Share (%) (*)
SALOBO METAIS	47,43
VALE	26,32
MINERAÇÃO MARACÁ INDÚSTRIA E COMÉRCIO	19,04
OTHER COMPANIES	7,21

Tin

Company	Share (%) (*)
MINERAÇÃO TABOCA	52,84
COOP. MINERADORA DOS GARIMPEIROS DE ARIQUEMES	11,33
COOPERATIVA DE GARIMPEIROS DE SANTA CRUZ	19,04
OTHER COMPANIES	16,79

Iron

Company	Share (%) (*)
VALE	73,77
COMPANHIA SIDERÚRGICA NACIONAL	4,49
SAMARCO MINERAÇÃO	3,98
OTHER COMPANIES	17,76

Manganese

Company	Share (%) (*)
VALE MINA DO AZUL	53,75
MINERAÇÃO CORUMBAENSE REUNIDA	28,75
MINERAÇÃO BURITIRAMA	14,08
OTHER COMPANIES	3,42

Niobium

Company	Share (%) (*)
ANGLO AMERICAN NIÓBIO BRASIL	51,17
COMPANHIA MINERADORA DE PIRICLORO DE ARAXÁ	41,11
MINERAÇÃO TABOCA	3,55
OTHER COMPANIES	4,17

Nickel

Company	Share (%) (*)
ANGLO AMERICAN NÍQUEL BRASIL	37,85
VALE	28,22
VOTORANTIM METAIS	20,47
OTHER COMPANIES	13,46

Gold

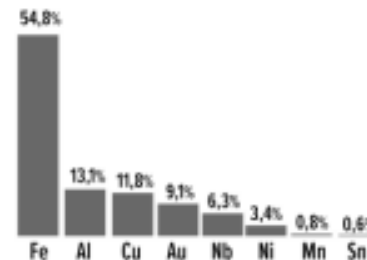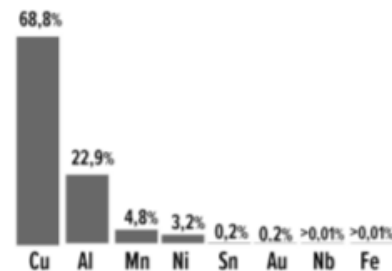| Company	Share (%) (*)
KINROSS BRASIL MINERAÇÃO	18,88
ANGLOGOLD ASHANTI CÓRREGO DO SÍTIO MINERAÇÃO	17,33
SALOBO METAIS	8,43
OTHER COMPANIES	55,36

(*) Share in the total value of the mineral production.

Source: Brazilian National Department of Mineral Production (DNPM)

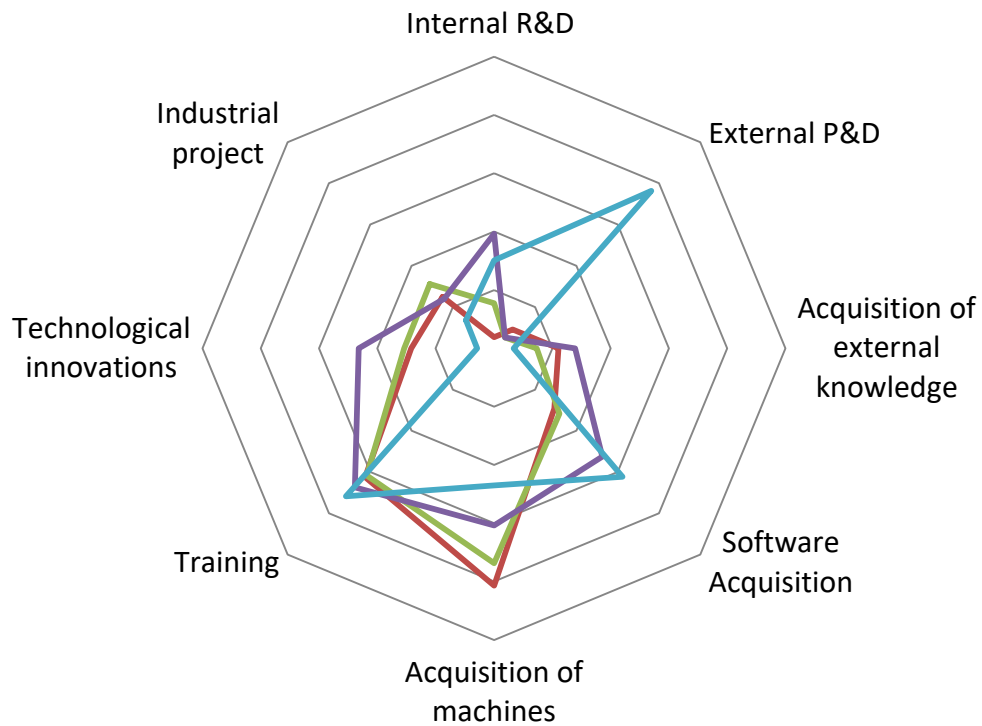# Brazilian Mining Sector Overview

Exports (2015) – Main Destinations

Canadá
Valor das exportações: US$ 1,05 bilhões
Al, Au, Nb, Fe, Cu, Sn, Mn

Países Baixos
Valor das exportações: US$ 1,48 bilhões
Fe, Nb, Ni, Sn, Cu, Mn, Al

China
Valor das exportações: US$ 8,20 bilhões
Fe, Cu, Nb, Ni, Al, Mn, Sn

Estados Unidos
Valor das exportações: US$ 1,07 bilhões
Nb, Al, Au, Fe, Ni, Sn, Cu, Mn

Japão
Valor das exportações: US$ 1,73 bilhões
Fe, Al, Nb, Ni, Sn, Cu, Mn

Metallic Commodities Exports - Total Value
US$ 25.668.387.363

Fe 54,8% · Al 13,1% · Cu 11,8% · Au 9,1% · Nb 6,3% · Ni 3,4% · Mn 0,8% · Sn 0,6%

Exports (2015)
China: US$ 8,2 billions
Japan: US$ 1,73 billion
Netherlands: US$ 1,48 billion
United States: US$ 1,07 billion
Canada: US$1,05 billion

Source: Brazilian National Department of Mineral Production (DNPM)

Brazilian Mining Sector Overview

Imports (2015) – Main Origins

Rússia
Valor das importações: US$ 0,38 bilhões
Al, Cu, Ni

China
Valor das importações: US$ 0,12 bilhões
Cu, Mn, Al, Ni, Sn, Nb, Au, Fe

Peru
Valor das importações: US$ 0,51 bilhões
Cu, Al, Ni, Fe

Chile
Valor das importações: US$ 1,79 bilhões
Cu, Al

Argentina
Valor das importações: US$ 0,13 bilhões
Al, Cu, Ni, Sn

Metallic Commodities Imports - Total Value
US$ 3.843.375.430

Cu: 68,8%
Al: 22,9%
Mn: 4,8%
Ni: 3,2%
Sn: 0,2%
Au: 0,2%
Nb: >0,01%
Fe: >0,01%

Imports (2015)
Chile: US$ 1,79 billion
Peru: US$ 0,51 billion
Russia: US$ 0,38 billion
Argentina: US$ 0,13 billion
China: US$ 0,12 billion

Source: Brazilian National Department of Mineral Production (DNPM)

Brazilian Mining Sector Overview

Importance of the Activity to Innovation

Extractive Industry
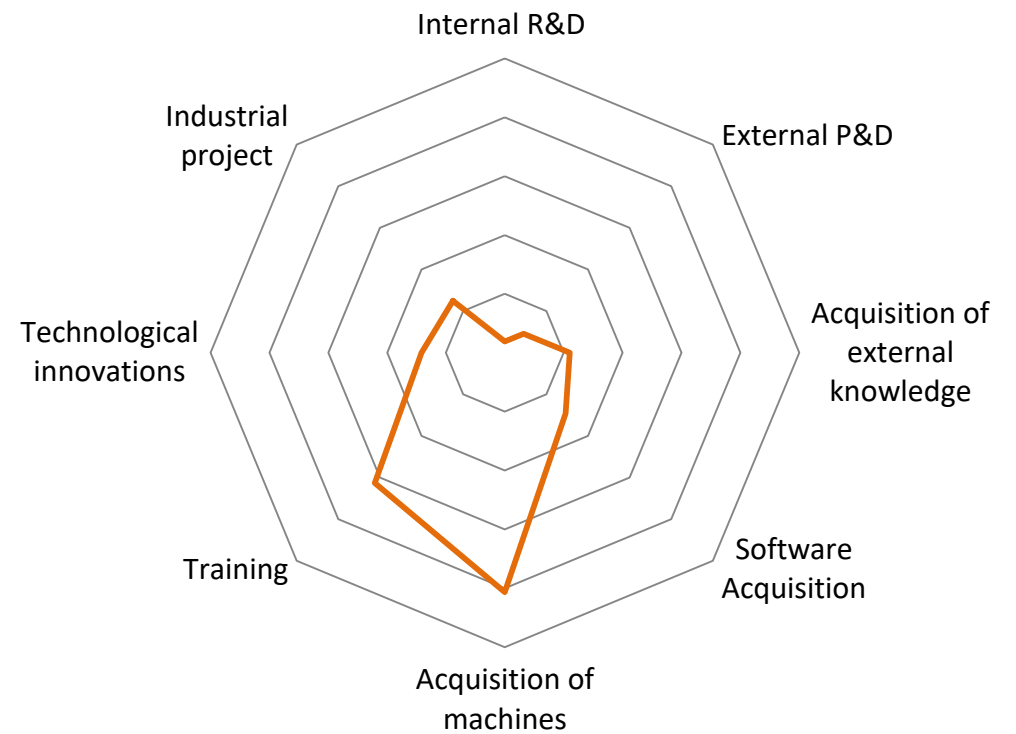
Legend: Extractive Industry — Manufacturing Industry — Services — Electricity and Gas

Brazilian Mining Sector: Preliminary Results

- For residents the National Classification of Economic Activities (CNAE) was used, corresponding to the classification of ISIC Rev.4.
- Selected categories were:

FROM SECTION B - EXTRACTIVE INDUSTRIES:
DIVISION 05 - MINING OF COAL
DIVISION 07 - MINING OF METAL ORE
DIVISION 08 - MINING OF NON-METALLIC MINERALS

GROUP 099 – SUPPORT ACTIVITIES TO MINERAL EXTRACTION, EXCEPT PETROLEUM AND NATURAL GAS

FROM SECTION C - MANUFACTURING:
CLASS 2852-6 – MANUFACTURE OF OTHER MACHINERY AND EQUIPMENT FOR USE IN MINERAL EXTRACTION, EXCEPT FOR PETROLEUM EXTRACTION

SUBCLASS 2853-4 / 00 – PRODUCTION OF TRACTORS, PARTS AND ACCESSORIES, EXCEPT AGRICULTURAL
SUBCLASS 3314-7 / 15 – MAINTENANCE AND REPAIR OF MACHINERY AND EQUIPMENT FOR USE IN MINERAL EXTRACTION,   EXCEPT IN THE PETROLEUM EXTRACTION

FROM SECTION M – PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES:
SUBCLASS 7119-7 / 02 GEOLOGICAL STUDIES ACTIVITIES

Brazilian Mining Sector: Preliminary Results

Methodology to identify patent applications by residents:

Identification of CNAE classifications related to the mining sector + RAIS to Indentify firms

Once firms were identified, a search was made in BADEPI, using applicants´CNPJs
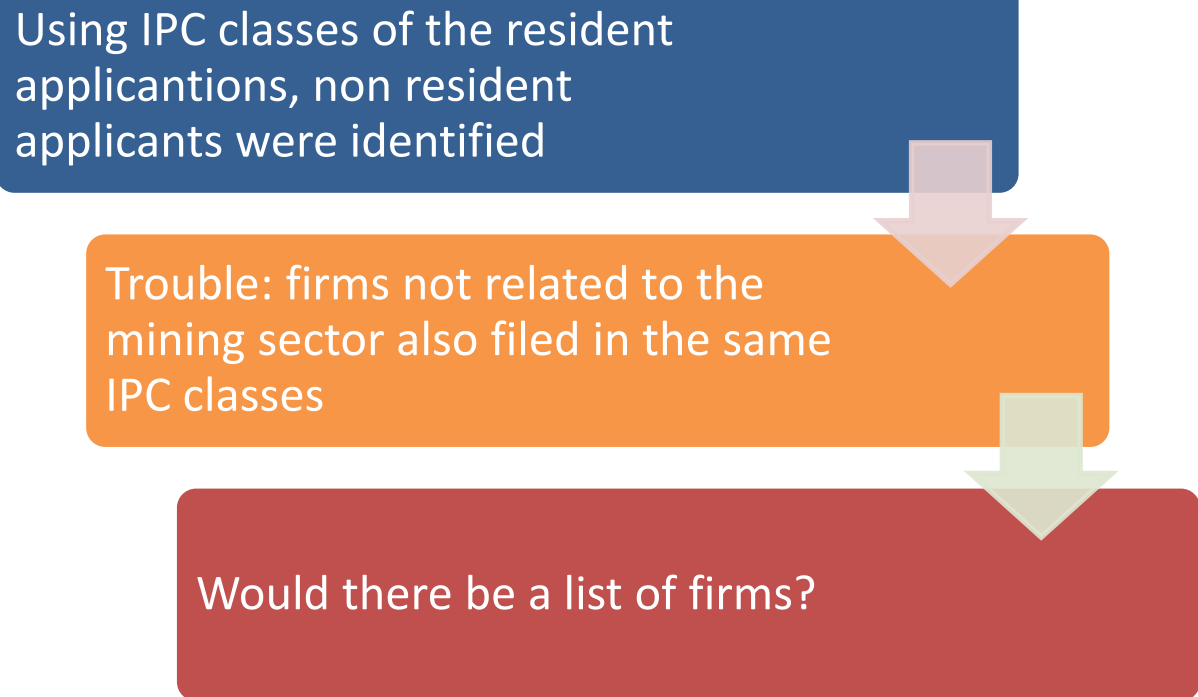
Patent applications by resident firms in the mining sector were identified

Brazilian Mining Sector: Preliminary Results

- How to define the methodology for non resident applicants ? And for Brazilian universities?

Using IPC classes of the resident applicantions, non resident applicants were identified
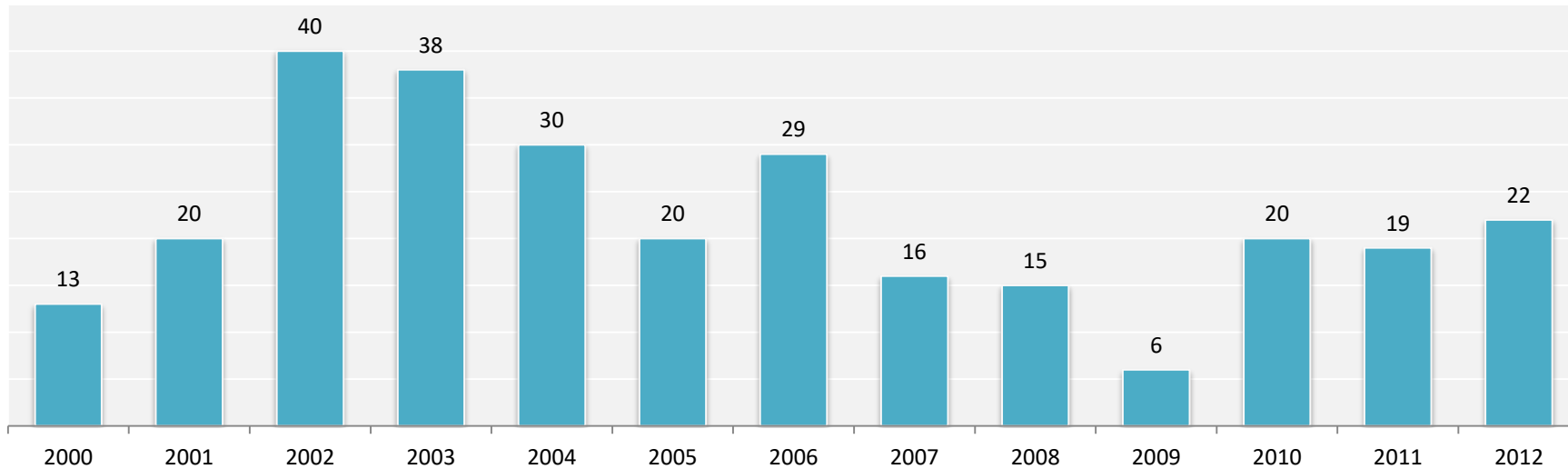
Trouble: firms not related to the mining sector also filed in the same IPC classes
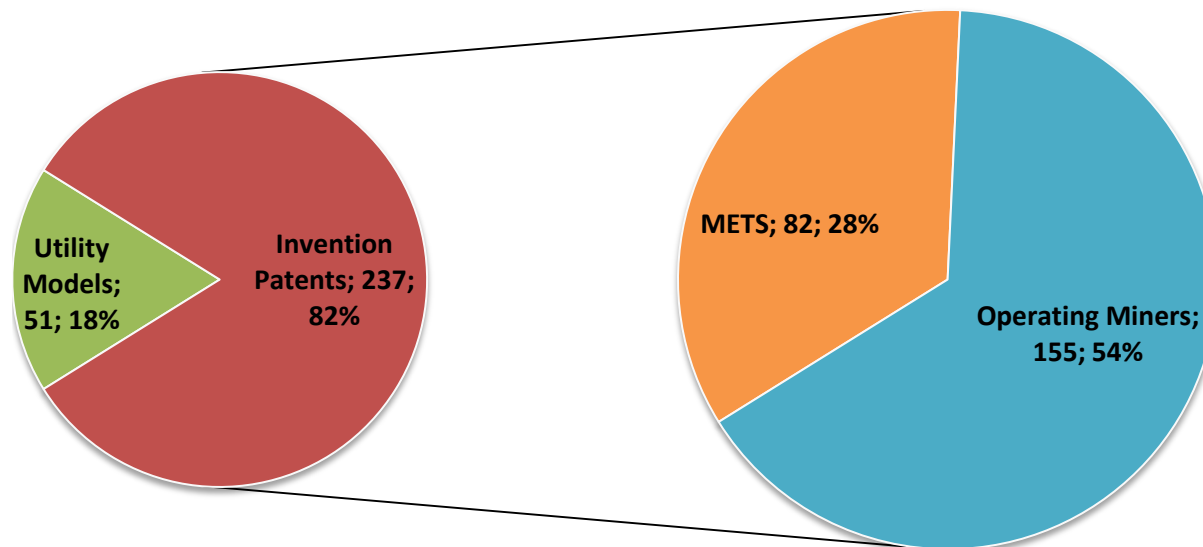
Would there be a list of firms?

Brazilian Mining Sector: Preliminary Results
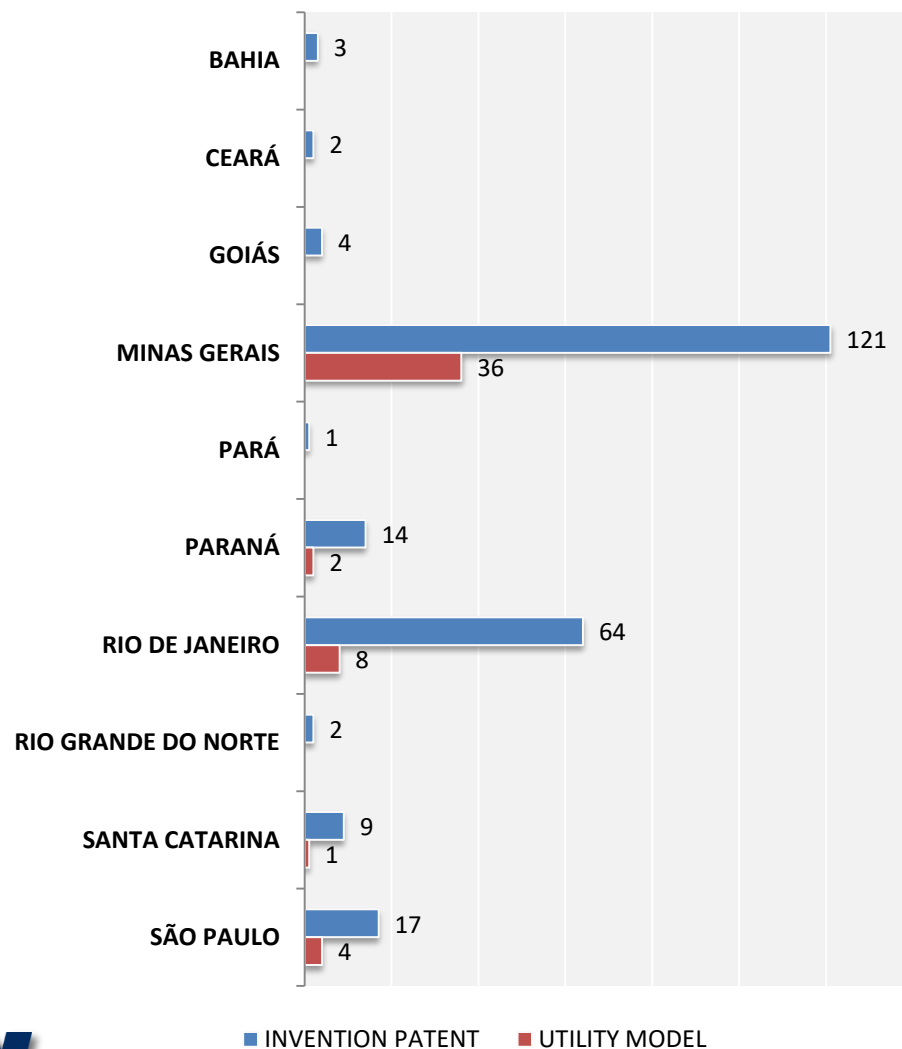
Applications of Resident Mining Firms, 2000-2012

Applications by Type of Patent and by Type of Firm (METS x Operating Miners)

288 applications by 48 different firms

Brazilian Mining Sector: Preliminary Results

Applications of Resident Mining Firms by State, 2000-2012

Legend: ■ INVENTION PATENT ■ UTILITY MODEL

State	Invention Patent	Utility Model
BAHIA	3	
CEARÁ	2	
GOIÁS	4	
MINAS GERAIS	121	36
PARÁ	1	
PARANÁ	14	2
RIO DE JANEIRO	64	8
RIO GRANDE DO NORTE	2	
SANTA CATARINA	9	1
SÃO PAULO	17	4

Brazilian Mining Sector: Preliminary Results

Main IPC Subclasses Used by Resident Mining Industry, 2000-2012

IPC Subclass	Number of Patent Applications
TREATMENT OF WATER, WASTE WATER, SEWAGE, OR SLUDGE	6
COMPOUNDS CONTAINING METALS NOT COVERED BY SUBCLASSES C01D	6
LIME; MAGNESIA; SLAG; CEMENTS; COMPOSITIONS THEREOF	7
SEPARATING SOLIDS FROM SOLIDS BY SIEVING, SCREENING, OR SIFTING OR BY USING GAS CURRENTS; OTHER SEPARATING BY DRY METHODS APPLICABLE TO BULK MATERIAL	7
TREATMENT OF INORGANIC MATERIALS, OTHER THAN FIBROUS FILLERS, TO ENHANCE THEIR PIGMENTING OR FILLING PROPERTIES	8
CRUSHING, PULVERISING, OR DISINTEGRATING IN GENERAL; MILLING GRAIN	11
TRANSPORT OR STORAGE DEVICES	20
PRODUCTION OR REFINING OF METALS; PRETREATMENT OF RAW MATERIALS	43

■ Number of Patent Applications
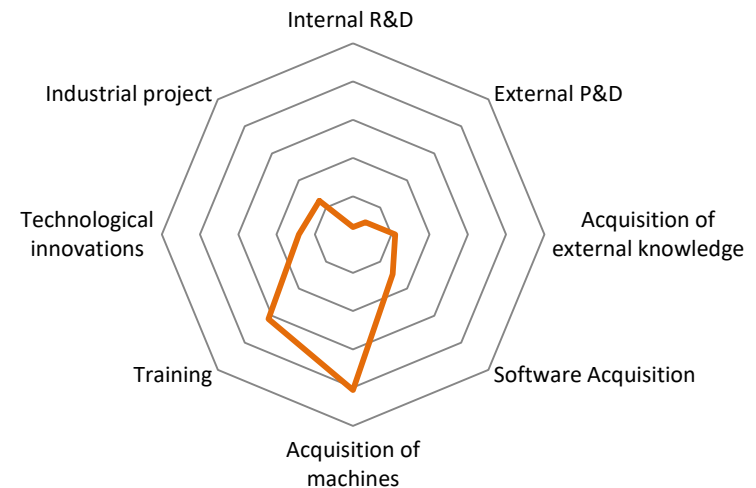
Research Question:
How does the Innovation in the Machines/Equipments Sector Impact on the Mining Sector ?

Importance of the Activity to Innovation: Extractive Industry

Thanks!

INPI Brazil Economic Affairs Advisory

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www.inpi.gov.br/sobre/estatisticas