"Importance of Latin America's Contribution to the Global Supply of Copper, Lead, Zinc and Nickel and their By-product Metals"

Don Smale

Secretary-General

International Lead and Zinc Study Group
International Copper Study Group
International Nickel Study Group

EU- Latin America Dialogue on Raw Materials

Lima, Peru, 10-11 March 2014

INTERNATIONAL STUDY GROUPS
INTRODUCTION

- Shared headquarters in Lisbon, Portugal, since 2006
- Intergovernmental organizations consisting of member governments plus the European Union representing metals producing and using countries
- **International Lead and Zinc Study Group**: established in 1959, has presently 30 members
- **International Copper Study Group**: established in 1992, has presently 24 members
- **International Nickel Study Group**: established in 1990, has presently 15 members

STUDY GROUPS
MAIN OBJECTIVES & FUNCTIONS

- To conduct **consultations** and **exchanges of information** on the international copper, nickel, lead & zinc economies.
- To improve **statistics** on these metals.
- To increase **market transparency**.
- To undertake **studies** on issues of interest to the Groups.
- To consider special problems or difficulties that exist or may arise in these **metal's international economies**.

The Study Groups endeavour to provide its membership with the most accurate, comprehensive and timely **information** on capacities, production, usage, trade, stocks, prices, technologies, research and development, and other areas that may influence the supply and demand for **copper, nickel, lead & zinc**.

STUDY GROUPS
FORUMS FOR DISCUSSION

- **Markets**: forecasts of supply and demand for metals a year ahead
- **Trade**: monitoring of international trade in metals
- **Environmental policy**: sharing information on approaches to regulation
- **Industry Advisory Panel**: metals industry executives provide input to member governments
- Invite **observer countries, industry and observer organizations** such as UNCTAD, World Bank, UNIDO, Common Fund for Commodities and metals associations

ILZSG Membership

- Membership open to any country involved in lead and/or zinc production, usage, or trade.
- 30 members (>85% of global lead/zinc industry):

Australia
Belgium
Brazil
Bulgaria
Canada
China
Finland
France

Germany
India
Iran
Ireland
Italy
Japan
Korea Rep.
Mexico

Morocco
Namibia
Netherlands
Norway
Peru
Poland
Portugal
Russian Fed.

Serbia
South Africa
Sweden
Thailand
United States
European Community

ICSG Membership

- Membership open to any country involved in copper production, usage, or trade.
- 24 member governments (>80% of global copper industry)

Australia
Belgium
Chile
China
Finland
European Union

France
Germany
Greece
India
Italy
Japan
Iran

Luxembourg
Mexico
Peru
Poland
Portugal
Russian Fed.
Serbia

Spain
Sweden
United States
Zambia

INSG Member Countries

- Australia
- Brazil
- Cuba
- European Union
- Finland
- France
- Germany
- Greece
- Italy
- Japan
- Norway
- Portugal
- Russian Federation
- Sweden
- United Kingdom

ILZSG Main Publications

50% Discount

For companies based in member countries

- **Lead and Zinc Statistics: ILZSG's Monthly Statistical Bulletin**
- **Lead and Zinc New Mine and Smelter Projects 2013**
- **Study on Chinese Zn First Use Market 2012**
- **The By-Products of Copper, Zinc, Lead and Nickel**
- **Indian Lead Market 2012**
- **The Market for Lead: Fundamentals Driving Change 2012**
- **World Directory: Primary and Secondary Lead Plants 2011**
- **Environment and Health Controls on Lead 2011**
- **Environment and Health Controls on Zinc 2011**
- **China Lead Acid Battery Market** (prepared for ILZSG by BGRIMM)
- **China Zinc Recycling Industry** (prepared for ILZSG by BGRIMM)

ICSG Main Outputs

Copper Bulletin (monthly): includes annual and monthly statistics, by country, on copper mine, smelter, refined and semis production, copper usage and trade, as well as stocks and exchange prices, providing a global view of supply and demand.

Statistical Yearbook : As above, covering the past 10 years.

ICSG Online Statistical Database: The ICSG maintains one of the world's most complete historical and current databases with statistics on copper production capacities, data on copper production, consumption, stocks, prices, recycling and trade for copper products.

Monthly Press Release on the state of the copper market and **Forecast Press Release** presenting twice a year ICSG forecasts for the copper market (to be included in the email distribution list please contact mail@icsg.org)

Copper Factbook: The Factbook provides a broad overview of all facets of copper, from production to trade, usage, recycling and more. It is designed to promote copper and educate readers about the importance and contribution of copper to society. Available on ICSG Website for download

Directory of Copper & Copper Alloy Fabricators (annual): provides a global overview of semis fabricators processing cathode and scrap into semi-finished products. The Directory covers wire rod plants, ingot makers, master alloy plants, brass mills, and electrodeposited copper foil mills.

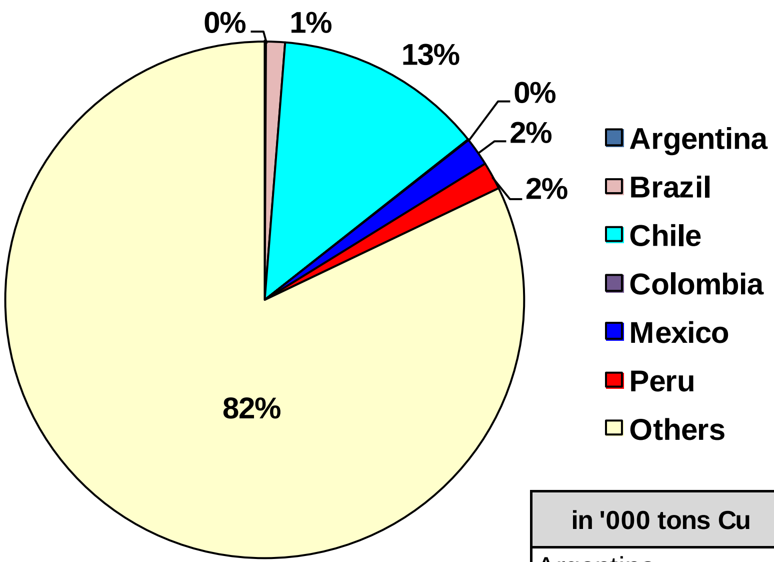
Special Reports: ICSG undertakes regularly special reports on topics of interest to the copper Industry/Governments (list available in ICSG website)

Next Study Group Meetings in Lisbon, Portugal

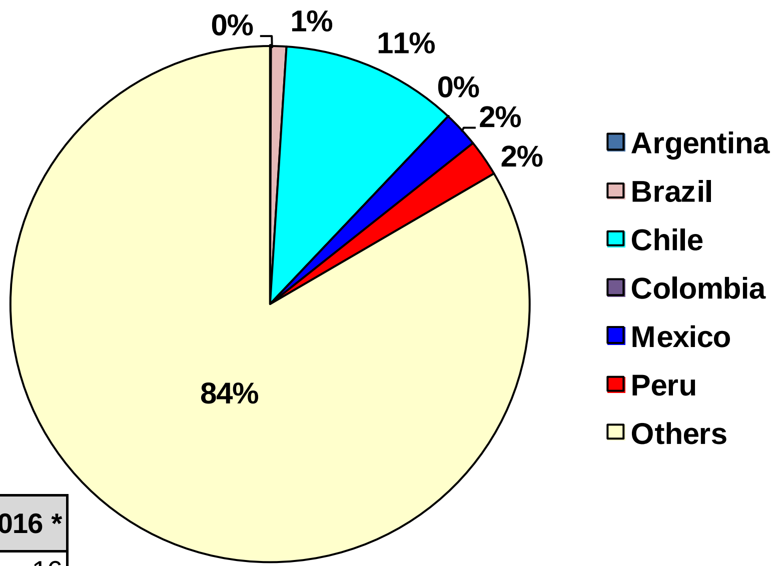
- **31 March - 1 April 2014** — **International Copper Study Group**
- **Morning 2 April 2014** — **International Lead and Zinc Study Group**
- **2.00pm 2 April 2014** — **Joint Study Groups Seminar *“The Mining and Metals Industry in Europe”***
- **3-4 April 2014** — **International Nickel Study Group**

Copper Refined Production
Latin America Countries vs World

2013 share in World Production



2016 share in World Production *

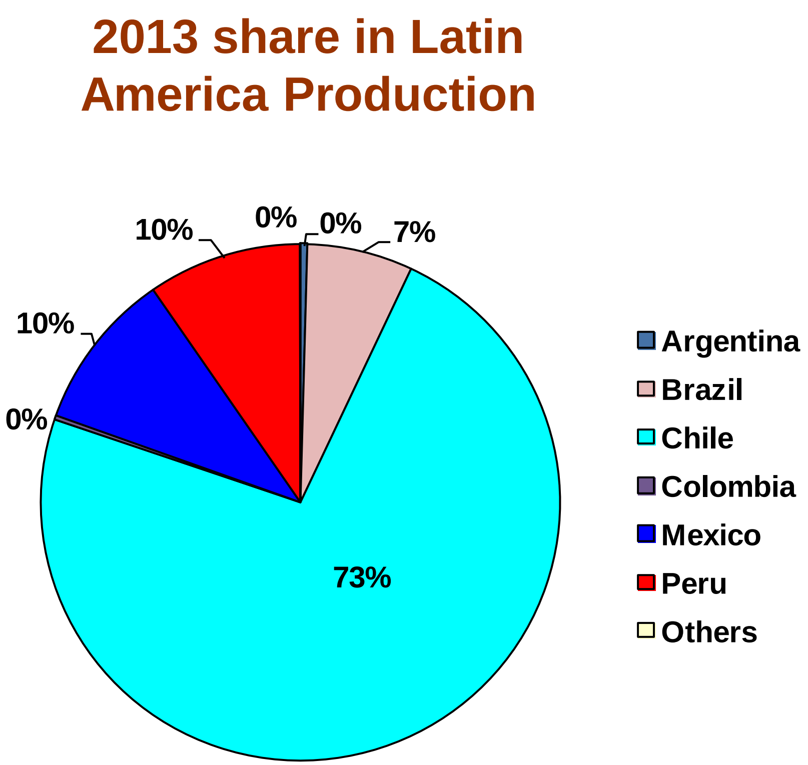


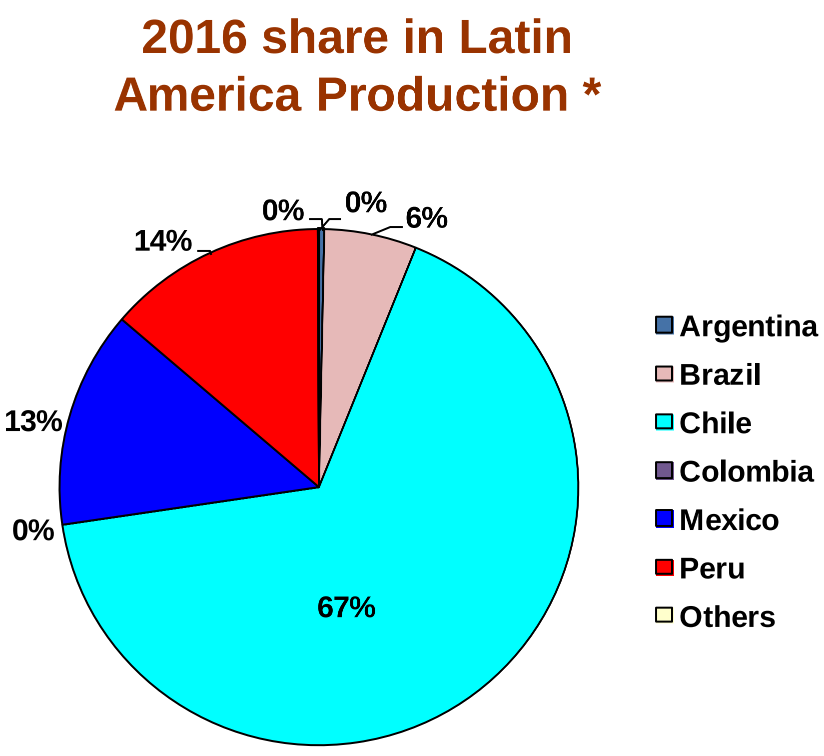
in '000 tons Cu	2013	2016 *
Argentina	16	16
Brazil	249	280
Chile	2,753	3,222
Colombia	10	10
Mexico	373	656
Peru	361	663
Others	17,245	24,328
World	**21,007**	**29,165**
Latin America	**3,763**	**4,841**
share in World	**18%**	**17%**

*** Based on expected production capacity**

Note: In the last 5 years, global refineries have operated at an average of 79% of the reported capacity

Copper Refined Production
Latin America Countries vs Latin America

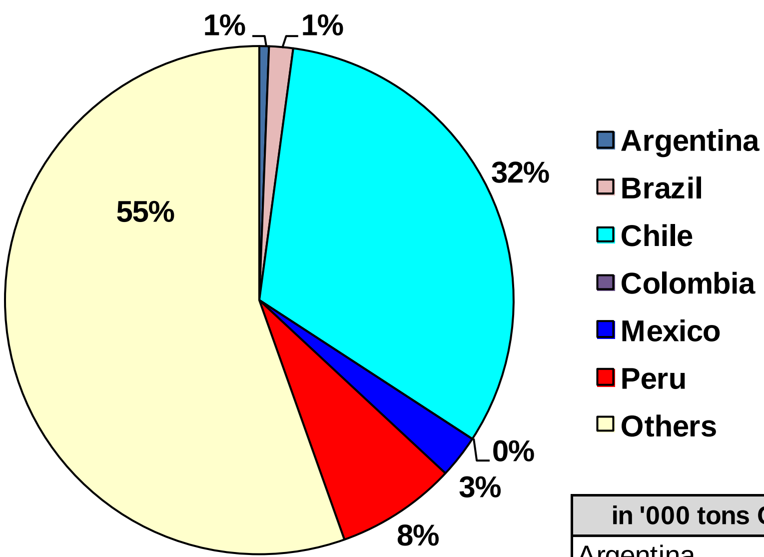




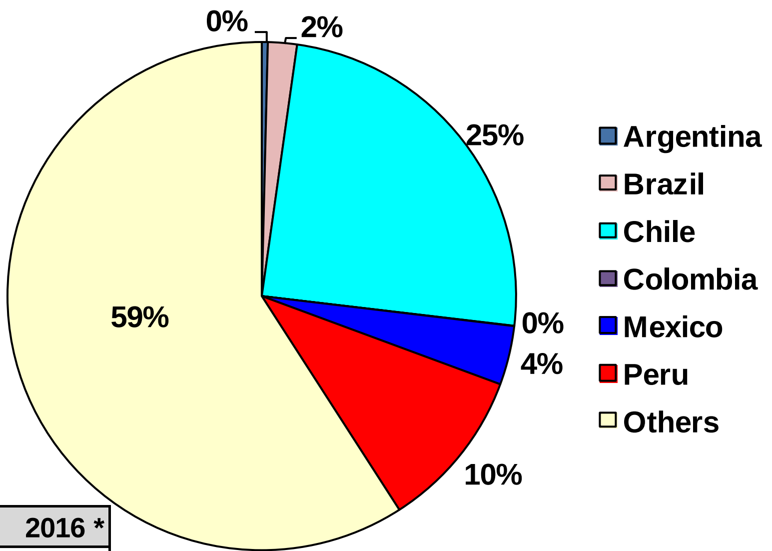
* Based on expected production capacity

Copper Mine Production
Latin America Countries vs World

2013 share in World Production



2016 share in World Production *



in '000 tons Cu	2013	2016 *
Argentina	110	100
Brazil	275	483
Chile	5,776	6,458
Colombia	1	5
Mexico	492	983
Peru	1,376	2,689
Others	9,986	15,488
World	**18,015**	**26,206**
Latin America	**8,050**	**10,802**
share in World	**45%**	**41%**

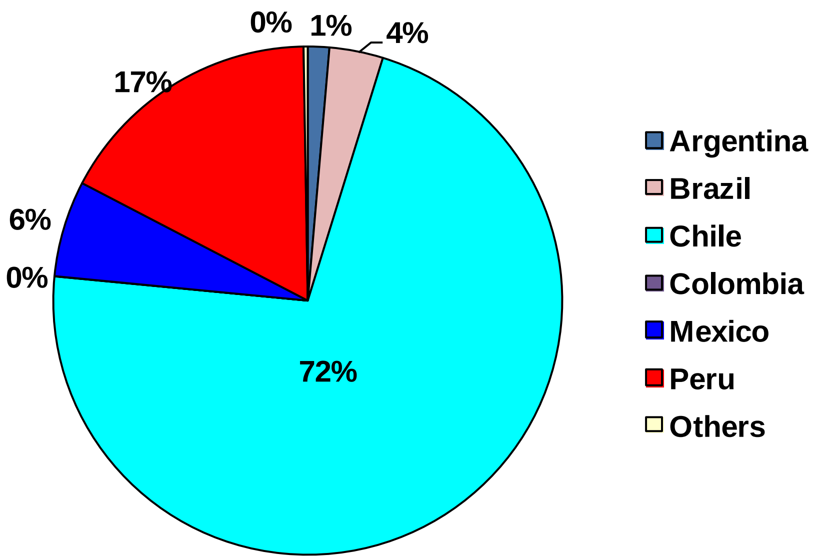
* Based on expected production capacity

*** Based on expected production capacity**

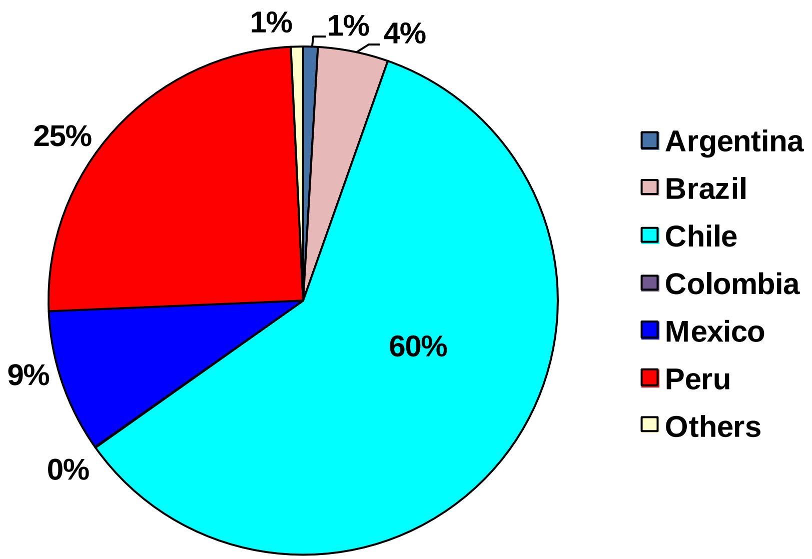
Note: In the last 5 years, global mines have operated at an average of 83% of the reported capacity

Copper Mine Production
Latin America Countries vs Latin America

2013 share in Latin America Production

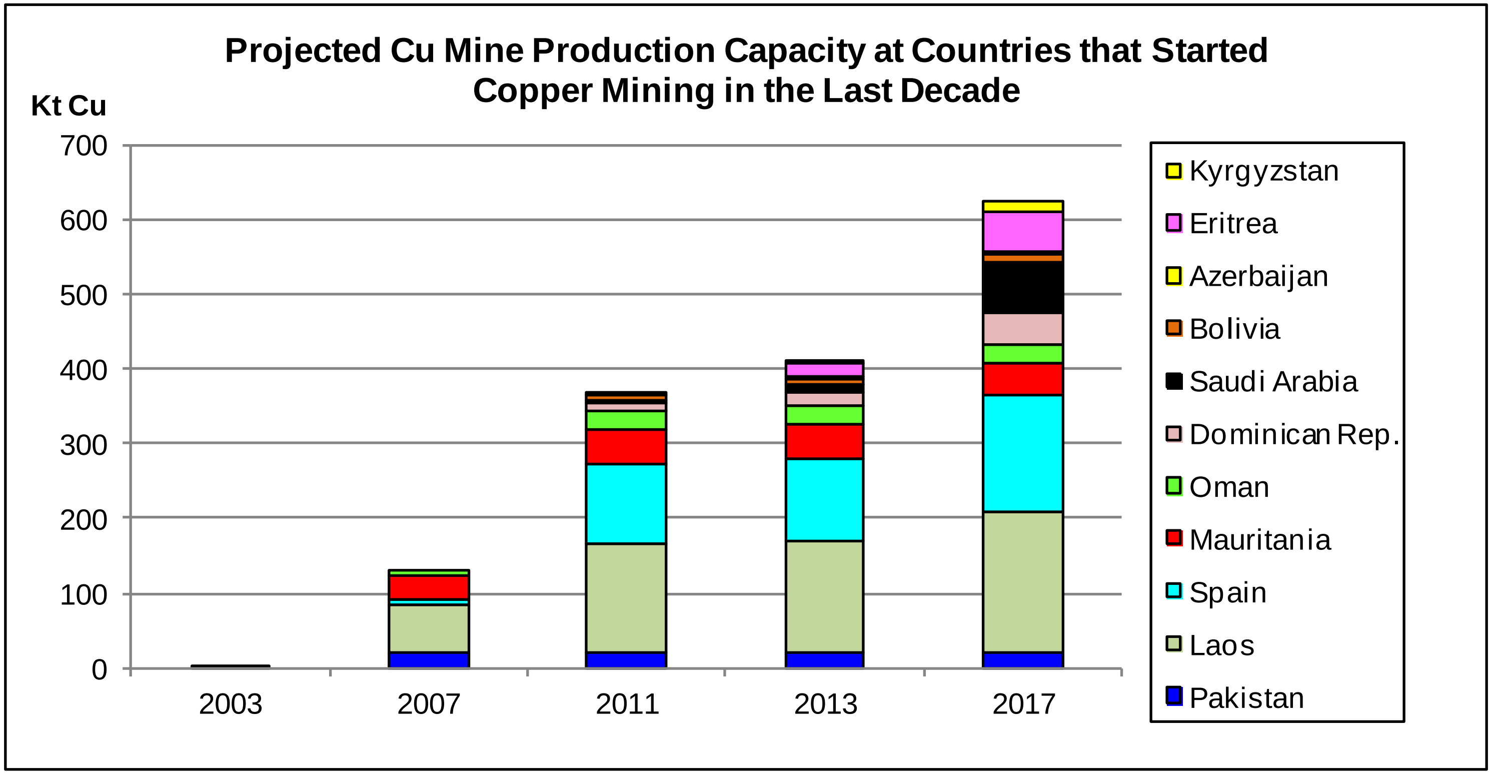


2016 share in Latin America Production *



* Based on expected production capacity

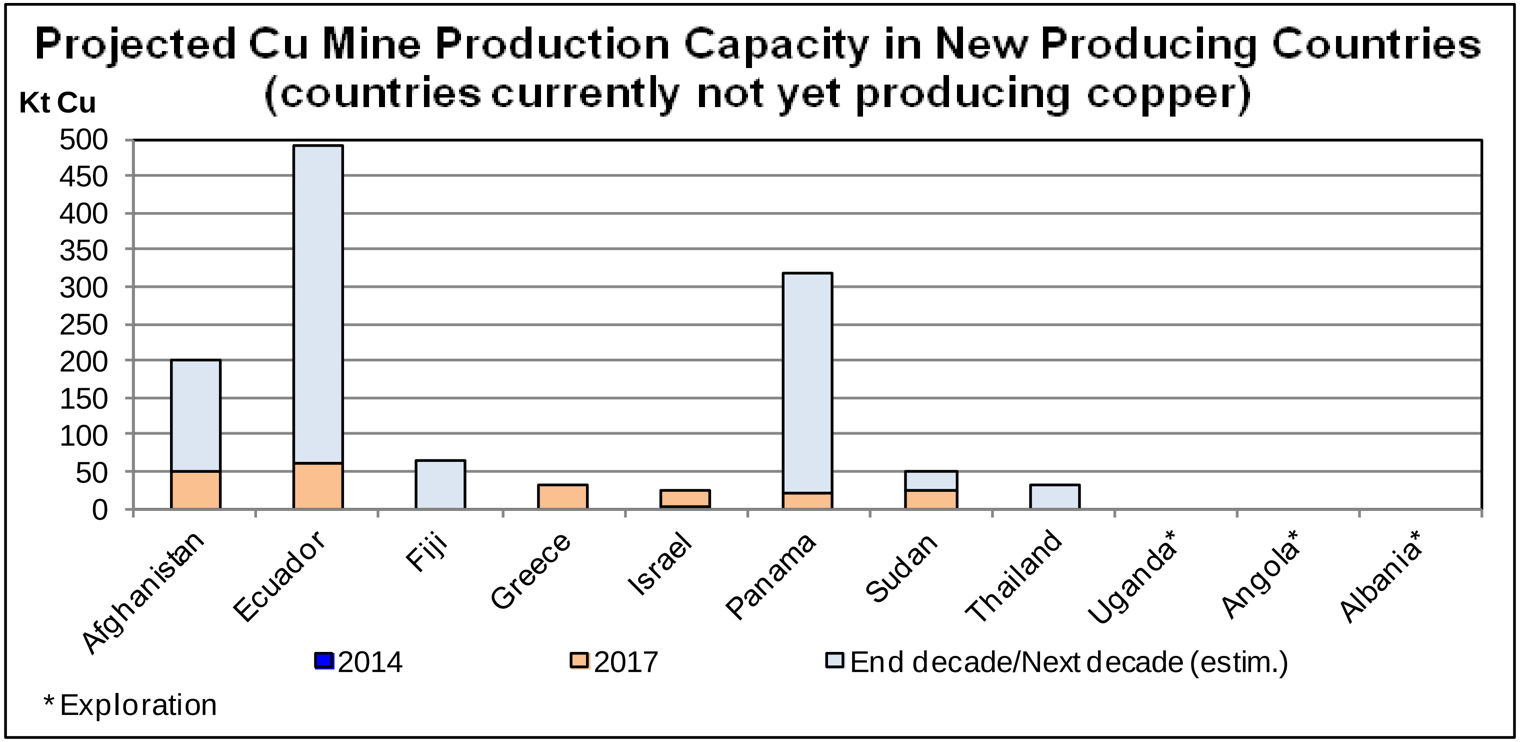
Copper Mine Production



New countries emerged, last decade, in Latin America as copper mine producers: Dominican Republic and Bolivia *

*** Based on expected production**

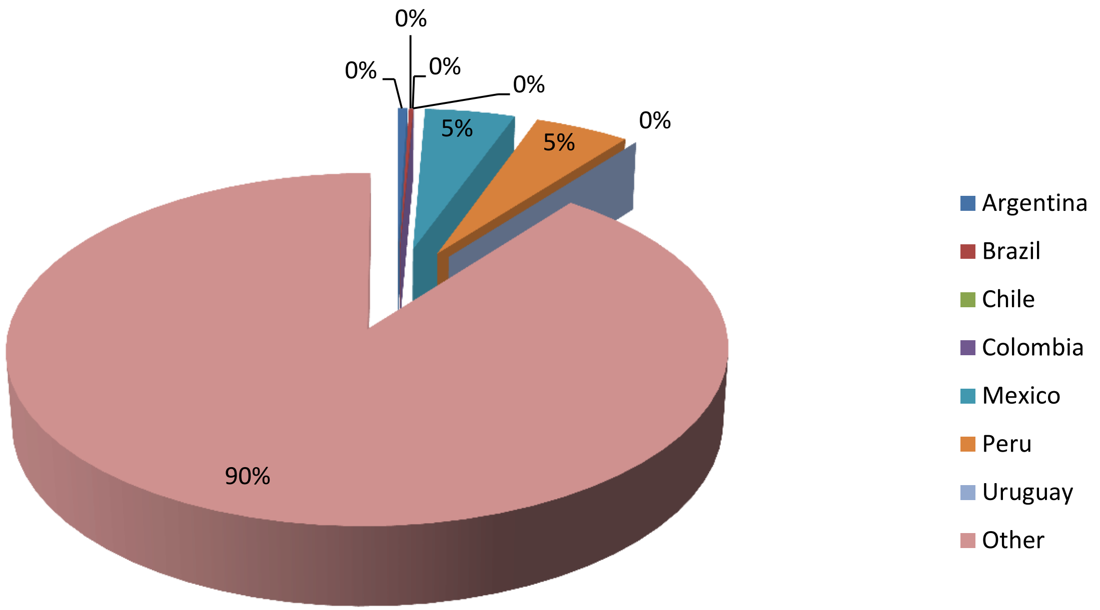
Copper Mine Production

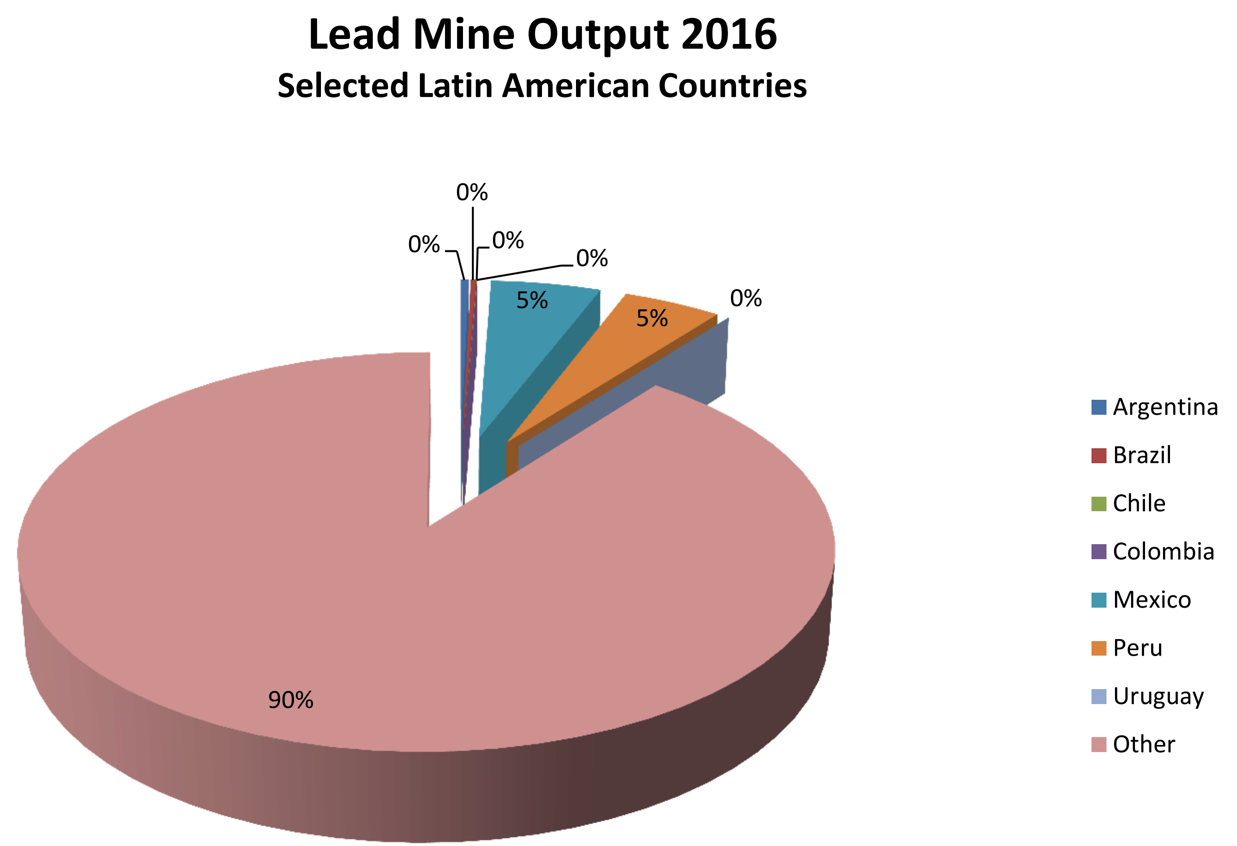


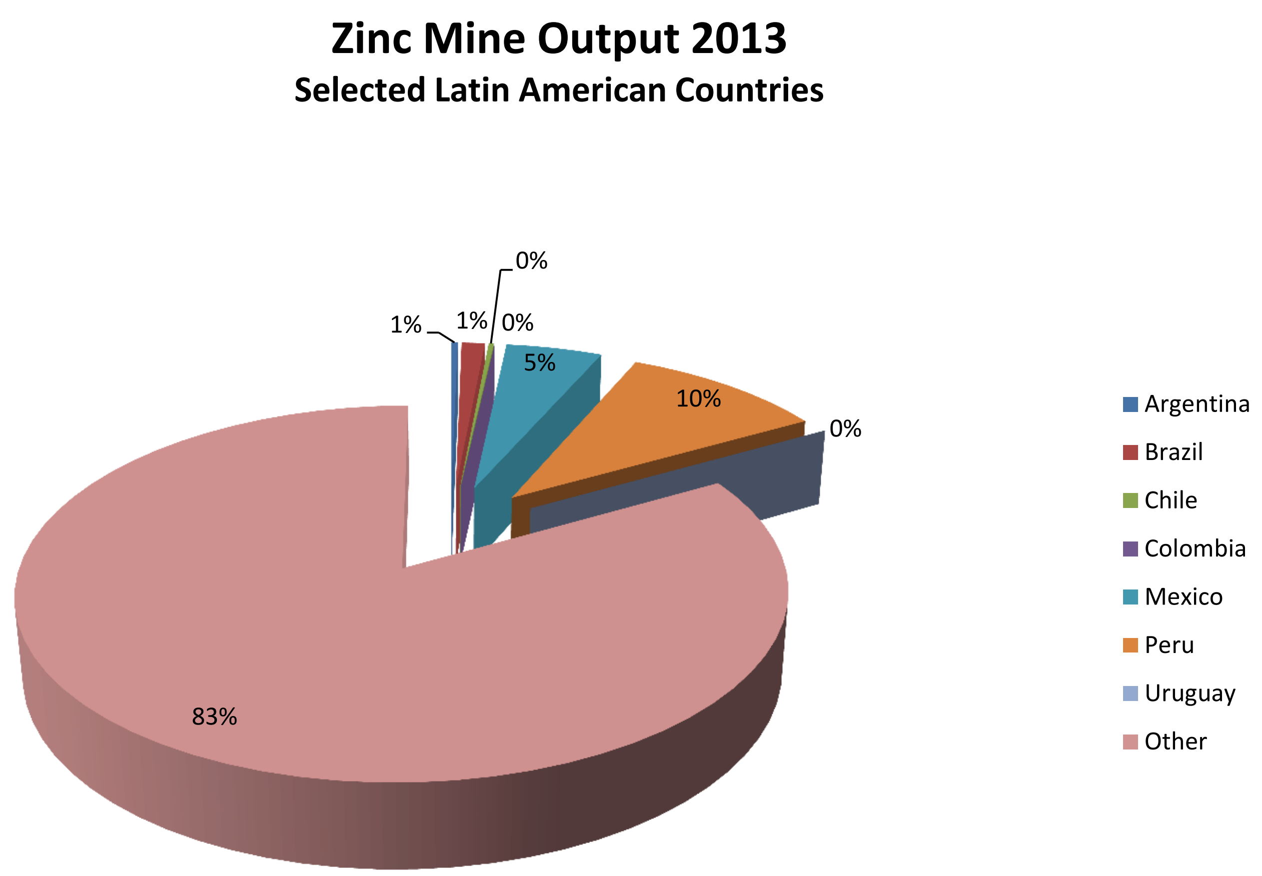
New countries will potentially emerge in Latin America as significant copper mine producers: Panama and Ecuador *

*** Based on expected production capacity**

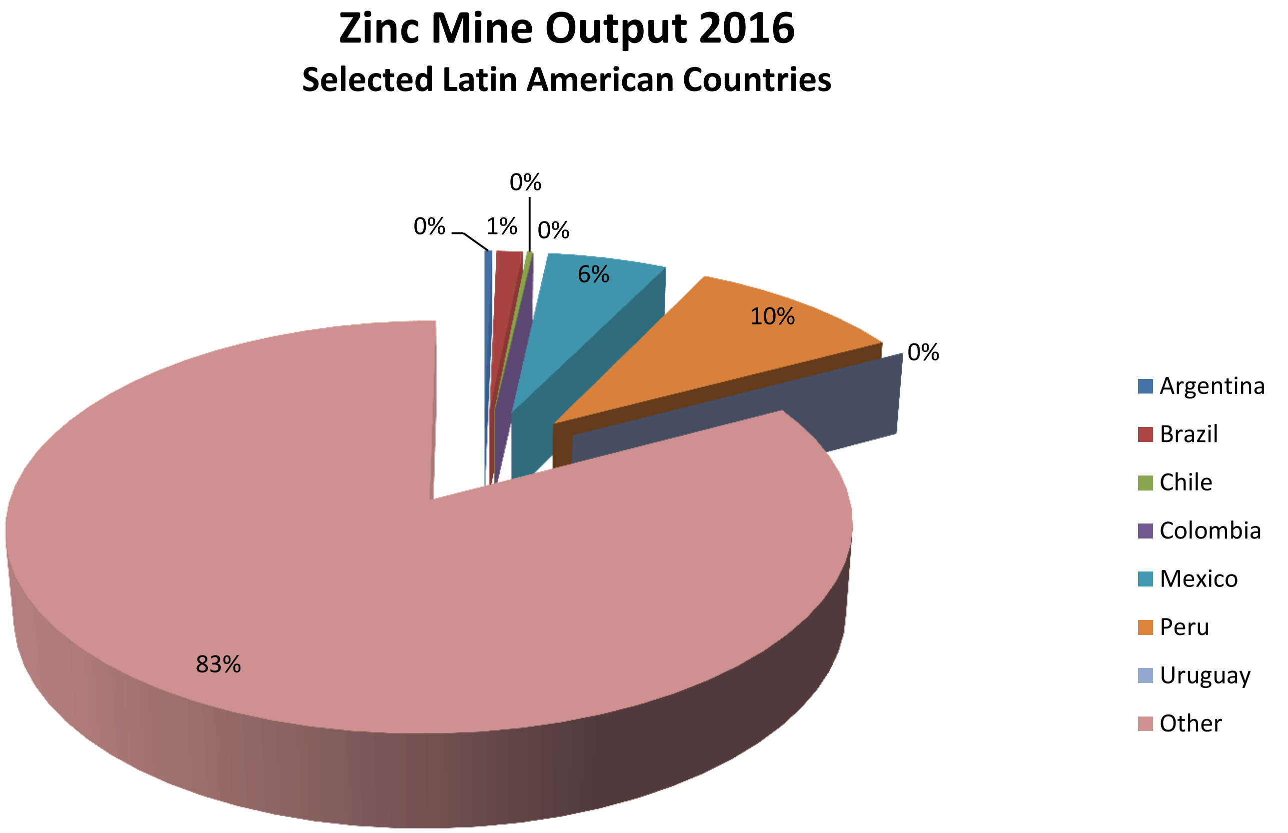
Lead Mine Output 2013
Selected Latin American Countries



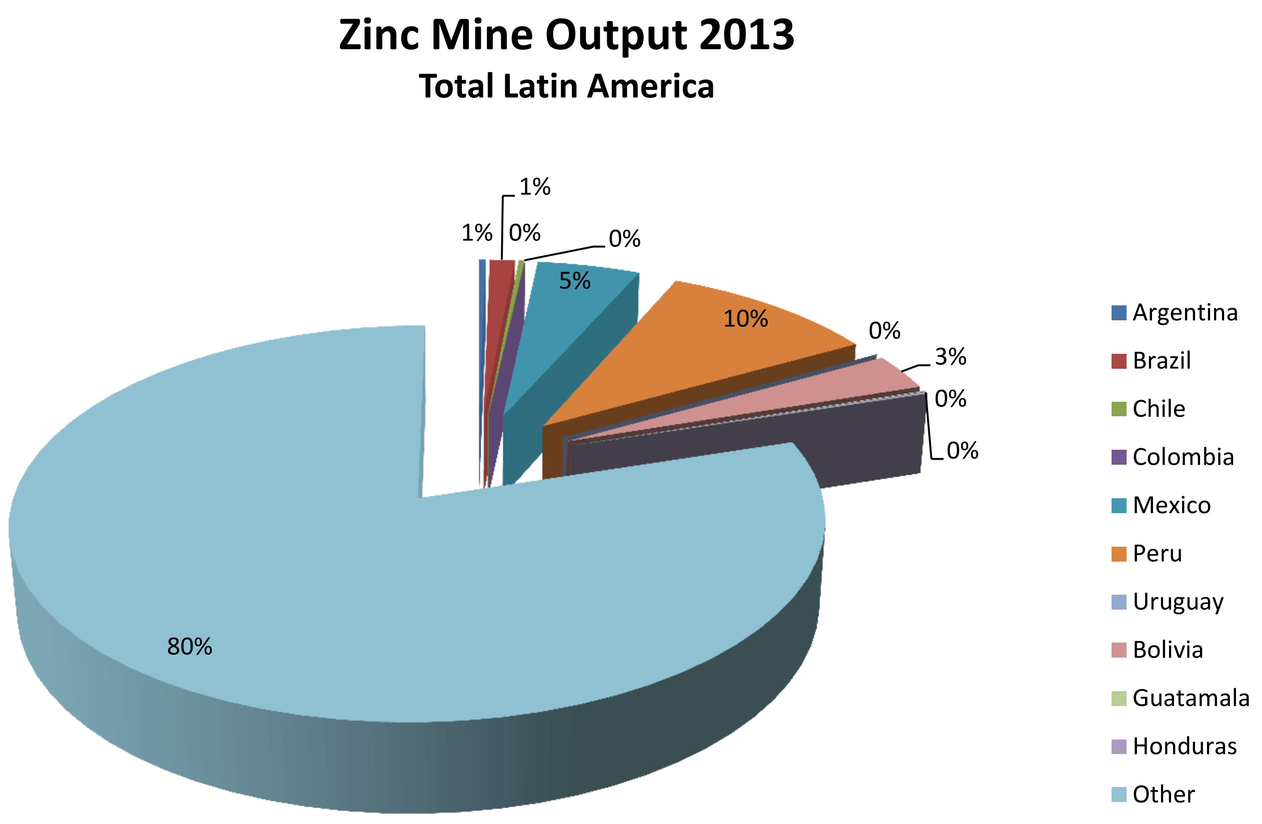

Lead Mine Output 2016
Selected Latin American Countries
0%
0%
0%
0%
0%
5%
5%
90%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Other

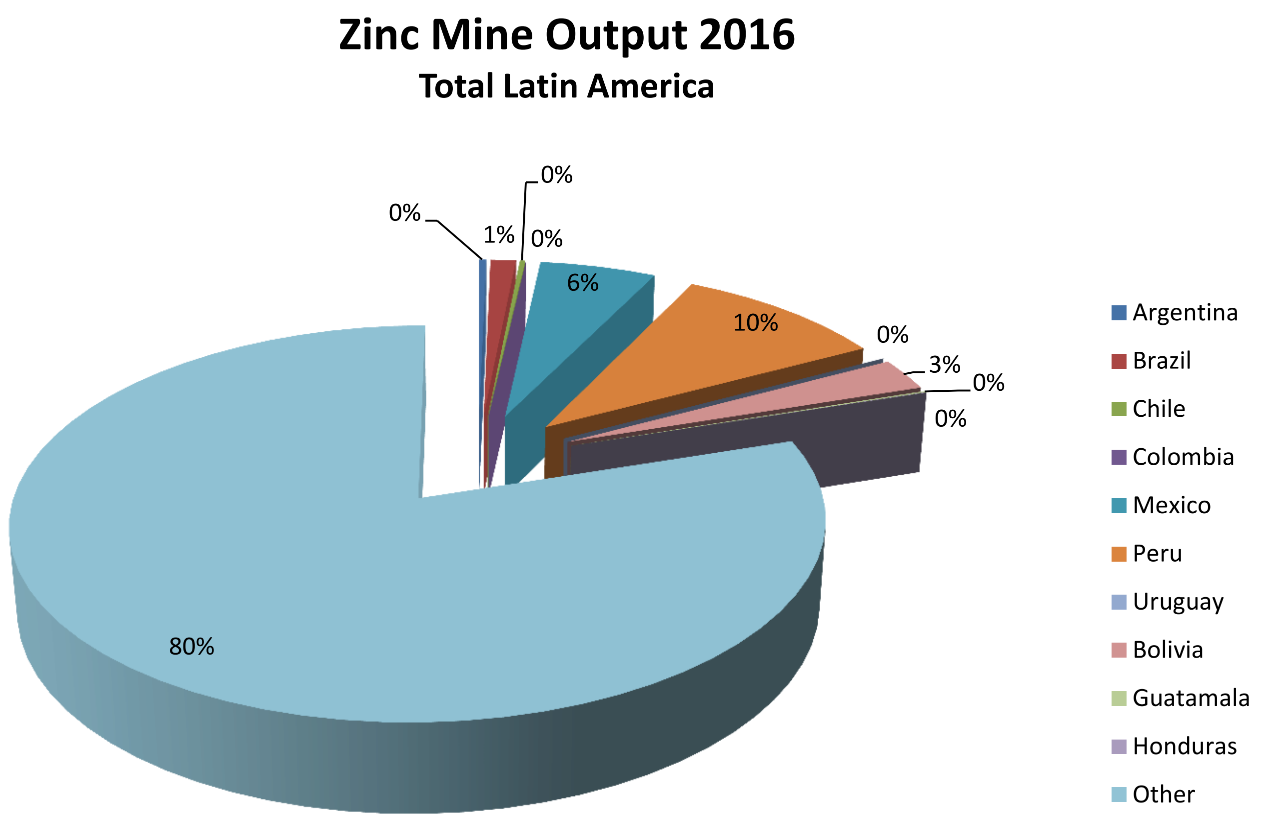


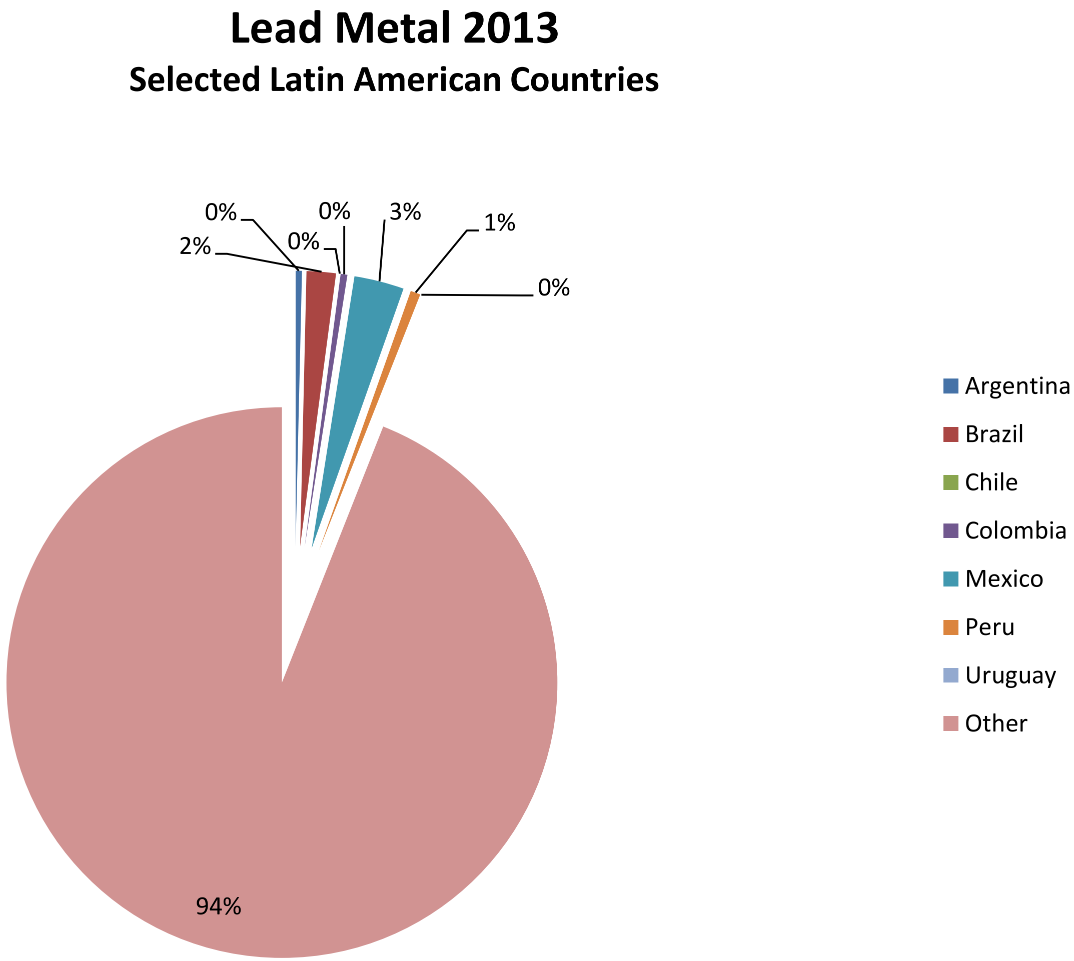
Zinc Mine Output 2013
Selected Latin American Countries
1%
1%
0%
0%
5%
10%
0%
83%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Other

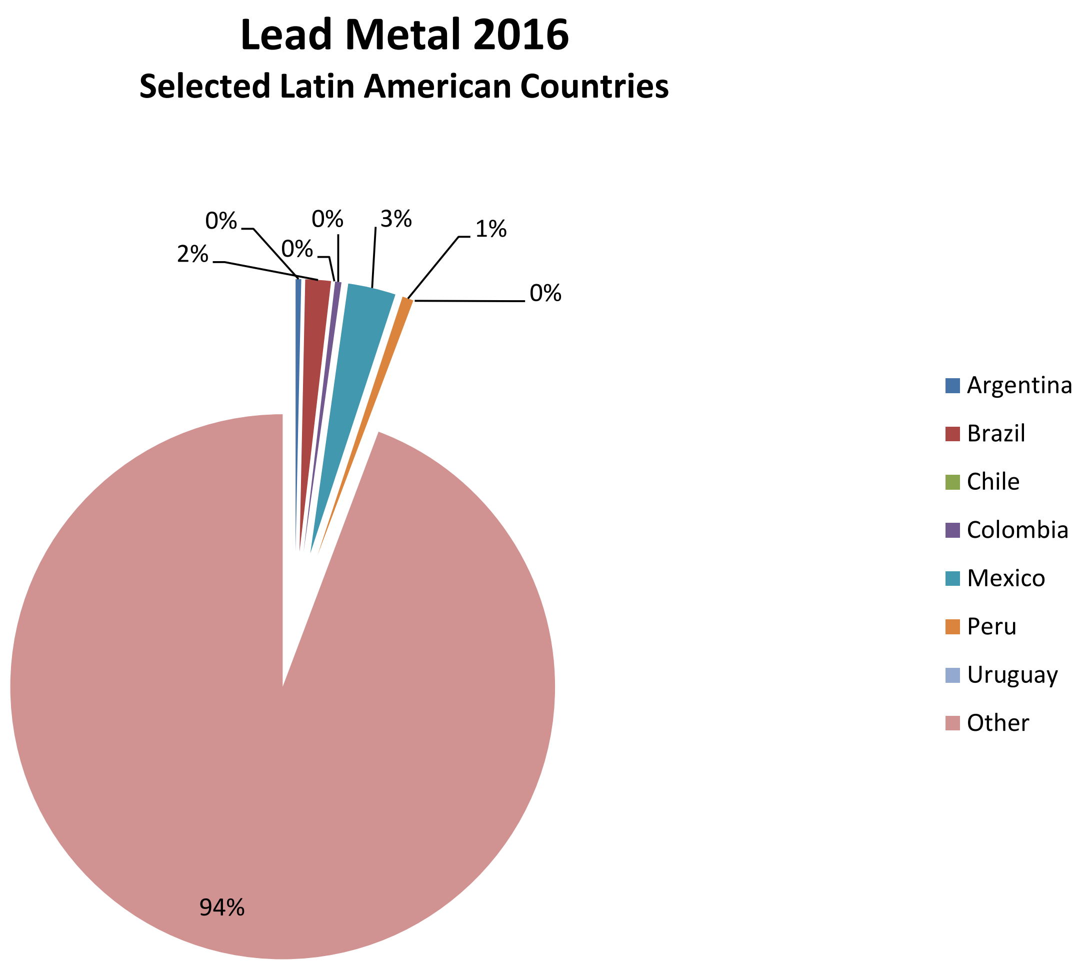


Zinc Mine Output 2016
Selected Latin American Countries
0%
1%
0%
0%
6%
10%
0%
83%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Other

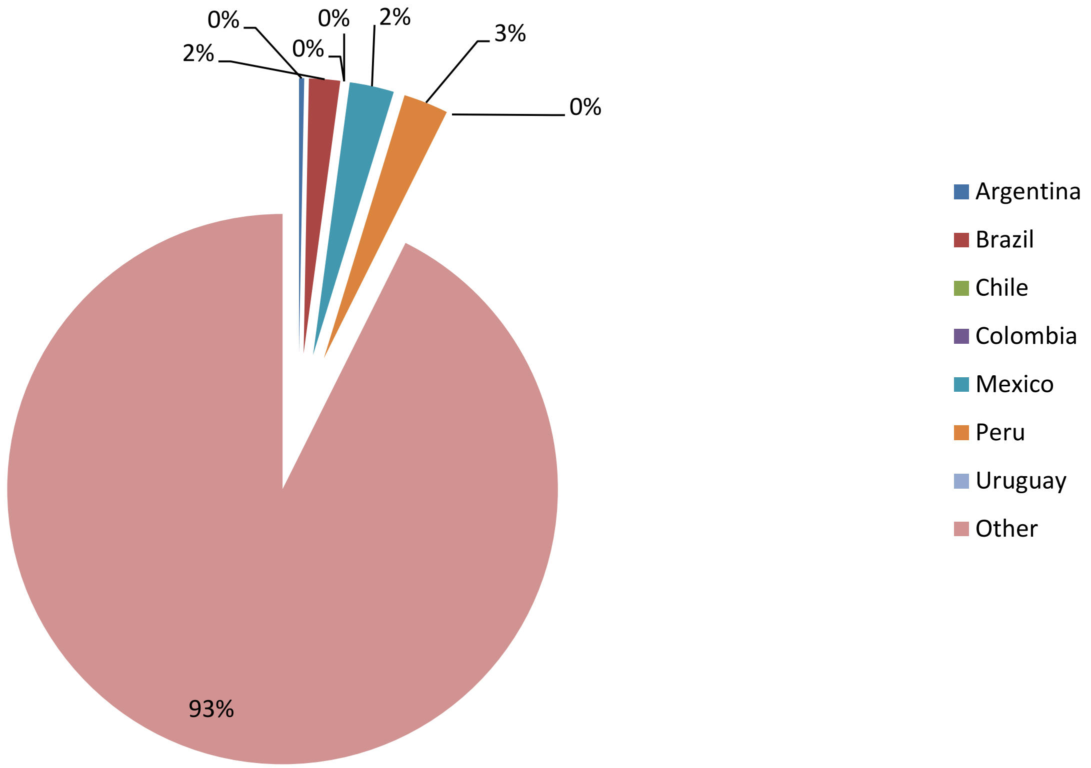

Zinc Mine Output 2013
Total Latin America
1%
1%
0%
0%
5%
10%
0%
3%
0%
0%
80%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Bolivia
Guatamala
Honduras
Other


Zinc Mine Output 2016
Total Latin America
0%
1%
0%
0%
6%
10%
0%
3%
0%
0%
80%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Bolivia
Guatamala
Honduras
Other

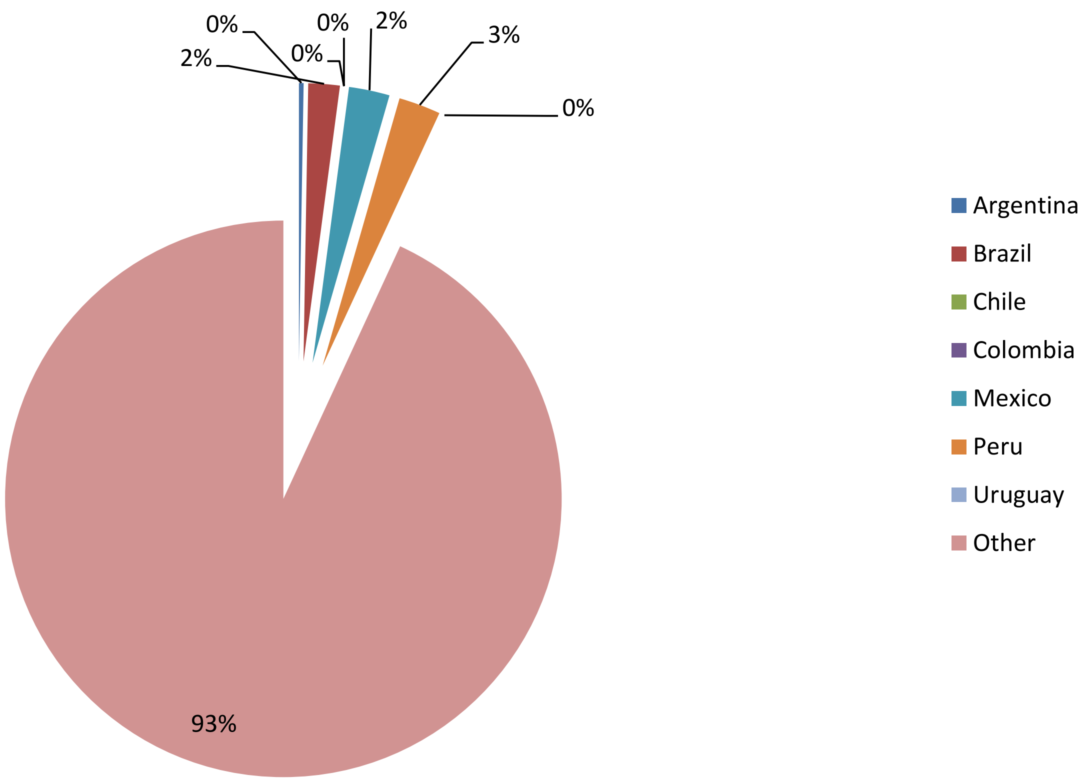

Lead Metal 2013
Selected Latin American Countries
0%
2%
0%
0%
3%
1%
0%
94%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Other


Lead Metal 2016
Selected Latin American Countries
0%
2%
0%
0%
3%
1%
0%
94%
Argentina
Brazil
Chile
Colombia
Mexico
Peru
Uruguay
Other

Zinc Metal 2013
Selected Latin American Countries

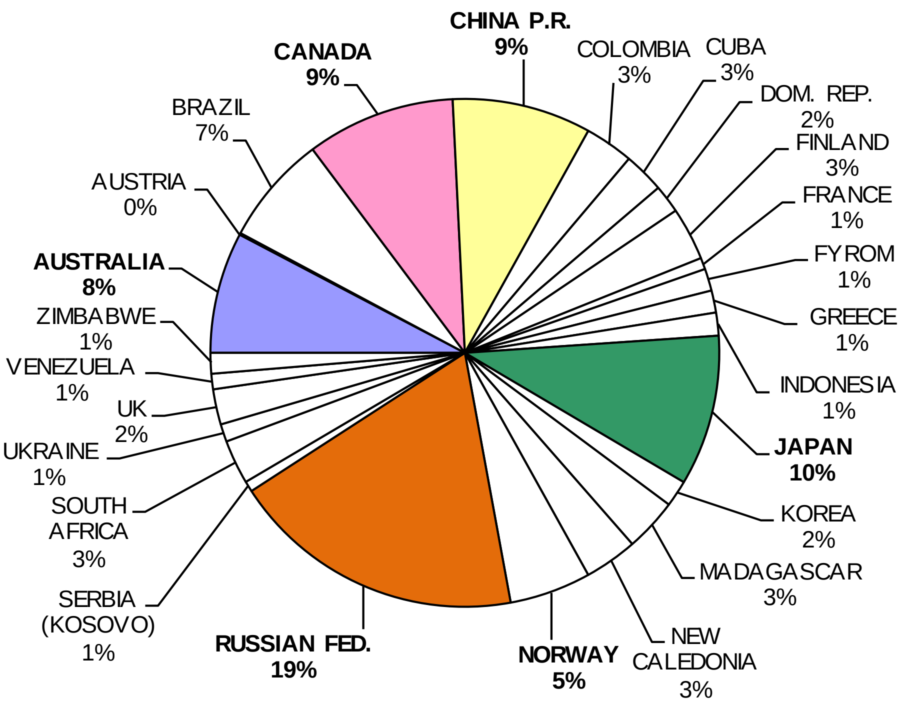


Zinc Metal 2016
Selected Latin American Countries

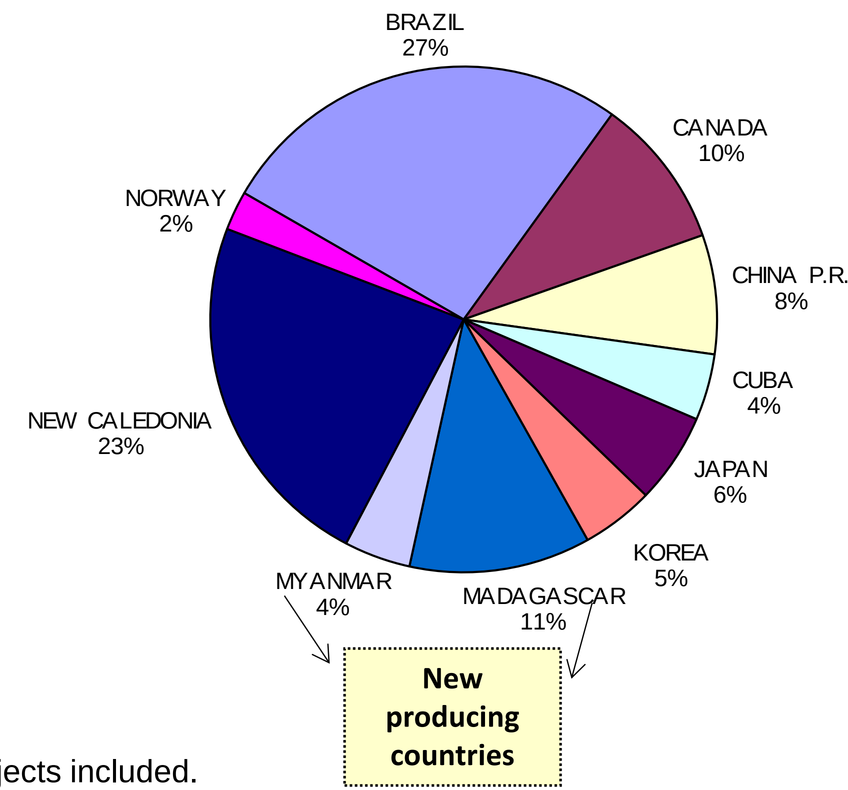


Primary Nickel Capacity by Country

2012: ≈ 1.8Mt



New committed developments: ≈ 0.5Mt

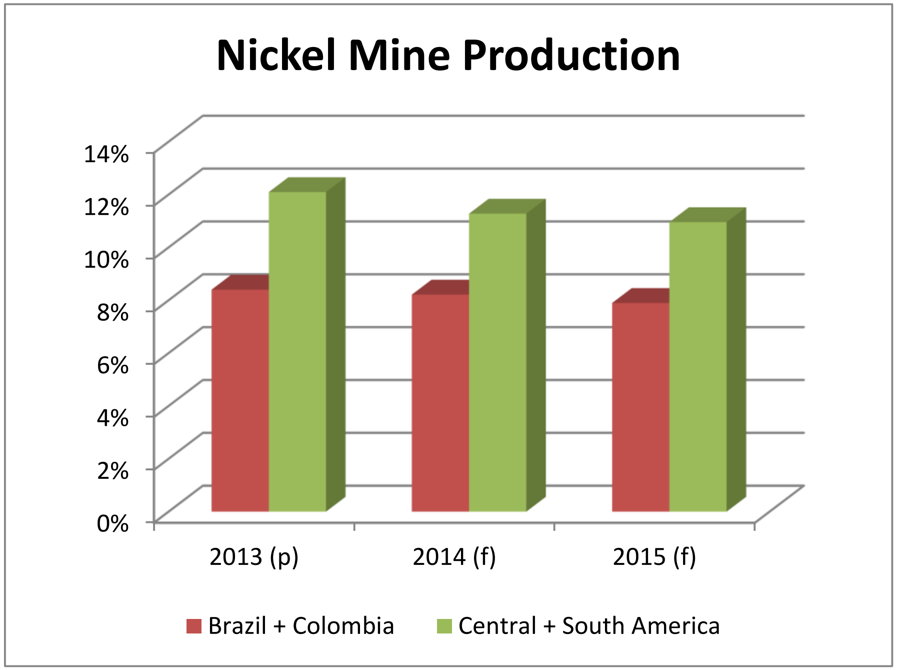


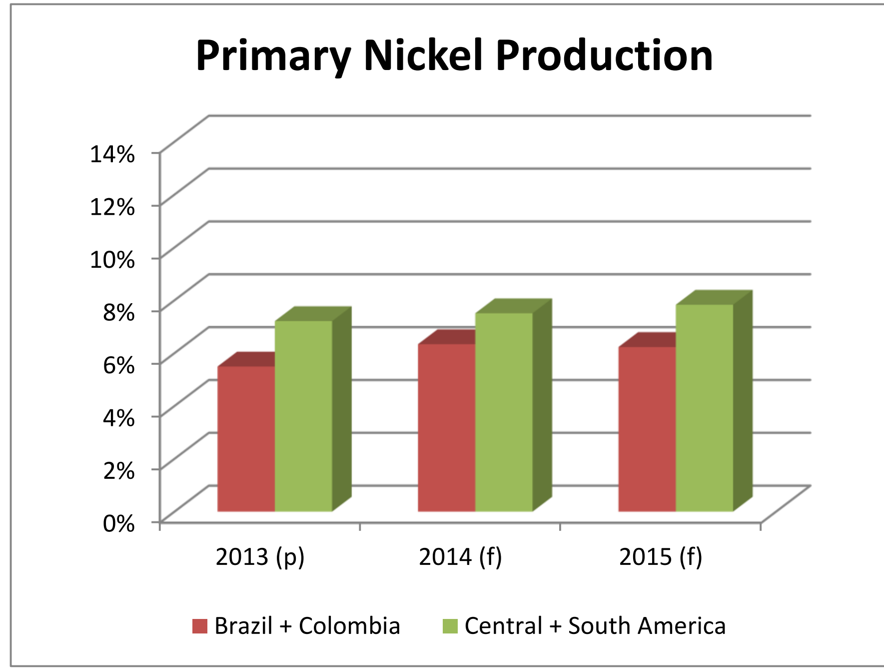
Note: no Chinese NPI projects included.

New Nickel Capacity on Stream / Ramp Up - 2014

Project Name / Country	Product	Mode	Estimated Production	Projected Total Production	Remarks
Ambatovy / Madagascar	Class I	Ramp Up	≈ 40 000	60 000	Open market
Long Harbour / Canada	Class I	Start Up	≈ 10 000	50 000	Mainly replacement
Tagaung Taung / Myanmar	FeNi	Start Up	≈ 15 000	22 000	China
Koniambo / New Caledonia	FeNi	Start Up	≈ 26 000	60 000	Open market
Onça Puma / Brazil	FeNi	Ramp Up	≈ 12 000	58 000	Open market
Barro Alto / Brazil	FeNi	Ramp Up	≈ 25 000	36 000	Open market
Goro / New Caledonia	Semi / Class I	Ramp Up	≈ 25 000	60 000	Australia & China
Ramu / PNG	Semi	Ramp Up	≈ 20 000	30 000	China & Other
Talvivaara / Finland	Semi	Ramp Up	≈ 15 000	35 000	Finland
Raventhorpe / Australia	Semi	Ramp Up	≈ 35 000	39 000	Australia & Other
Taganito / The Philippines	Semi	Start Up	≈ 20 000	30 000	Japan
Santa Rita / Brazil	Conc.	Ramp Up	≈ 20 000	25 000	Brazil & Finland
Kevitsa / Finland	Conc.	Ramp Up	≈ 10 000	10 000	Open market

Note: no Chinese NPI projects included.





- Guatemala restarted mining in 2012 and may start producing FeNi later this year
- Brazil: Onça Puma ramping up but Barro Alto will rebuild 2 furnaces
- Dominican Rep. (2014) and Venezuela stopped producing

- The Indonesian legislation on nickel ore export restrictions, what effect will that have on ore availability in China and NPI in the near and medium future?
- Building up of NPI capacity in Indonesia, what effect will that have on nickel prices, NPI production in China and the world nickel supply/demand balance in coming years?
- High world nickel stocks, particularly LME, what effect will that have on nickel prices and availability of primary nickel in coming years?

Joint Report on By-Product Metals

- Information on the by-product metals of copper, zinc, lead and nickel published in a *Report* and a *Directory*
- Metals covered: bismuth, germanium, indium, cobalt, platinum group metals, scandium, molybdenum, rhenium, selenium, tellurium and rare earth elements
- Data on sources, refinery processes, recycling, markets, contracts, pricing, uses, government regulations, REACH status of compounds, government stockpiles and trade restrictions

Joint Report on By-Product Metals

World production of the by-product metals and the principal metals (*2011 estimates*)

Principal Metal	Mine Production (tonnes)	By-product Metal	Production (tonnes)
Lead	4,500,000	Bismuth	8,500
Zinc	12,400,000	Germanium*	118
		Indium*	640
Nickel	1,800,000	Cobalt	98,000
		Platinum Group Metals	472
		Scandium*	10#
Copper	16,100,000	Cobalt	98,000
		Molybdenum	250,000
		Rhenium	46#
		Selenium*	2,600#
		Tellurium*	450#
		Rare Earth Elements	130,000

By-Product Metals in Latin America

The Joint Study Group Report and Directory provide information on the following metals from Latin American Producers

- **Bismuth**
- **Indium**
- **Cobalt**
- **Molybdenum**
- **Rhenium**
- **Selenium**
- **Tellurium**
- **Rare Earth Elements**

By-Product Metals
in Latin America

Latin American Countries identified in the Directory include

- **Argentina**
- **Bolivia**
- **Brazil**
- **Chile**
- **Cuba**
- **Mexico**
- **Peru**

Other sources indicate that by-product metals resources exist in

- **Columbia (Cobalt)**
- **Dominican Republic (Cobalt)**

By-Product Metals in Latin America

An example of a by-product metal – Indium

In the Western world (excluding China & CIS) ~ 1000 MT Indium mined

- 25-30% of Indium mined yearly becomes refined indium
- 25-30% accumulates in residues
- 40-50% goes to non-Indium-capable refineries and is (now) lost

- ***Indium extraction is still currently inefficient and can be expanded***
- ***Indium is often found in combination with Zn and Pb***
- ***Ores in Bolivia and Peru have relatively high Indium content***

Source: Indium Corporation figures

By-Product Metals in Latin America

Bismuth

Mexico	Grupo Penoles	
Peru	Xstrata	Antamina Mine
Peru	Doe Run	La Oroya
Brazil	Verena Minerals Corp	

Indium

Brazil	Votorantim	Tres Marias
Bolivia	SOAM (South American Silver Corp)	Ag-In-Ga-Cu-Pb

Cobalt

Brazil	Mirabela Nickel	Santa Rita Mine
Brazil	Votorantim Metais Niquel S.A.	
Cuba	Moa Nickel & Sherritt International Corp	
Cuba	Cubaniquel	
Mexico	Baja Mining/Korean Consortium	

By-Product Metals
in Latin America

Molybdenum

- Argentina Alumbrera/Xstrata/Goldcorp/Yamana
- Chile Amerigo Resources Ltd Minera Valle Central
- Chile Anglo American/Falconbridge Collahausi
- Chile Antofagasta Esperanza/ Telégrafo Sur
- Chile Antofagasta/Minera Los Pelambres
- Chile Codelco El Teniente / Andina
- Chile Molibdenos y Metales SA (MOLYMET)
- Mexico Mercator Minerals Ltd El Creston
- Mexico Molymex SA de CV
- Peru Anglo American Quellaveco/Michiquillay
- Peru Freeport-McMoRan Cerro Verde II
- Peru Southern Copper Toquepala/Cuajone

By-Product Metals in Latin America

Molybdenum Future Projects

Argentina	Lumina Copper Corp	Taca Taca
Argentina	Yamana Gold Inc	Agua Rica
Chile	Pan Pacific Copper	Caserones
Chile	KGHM, Sumitomo	Serra Gorda
Chile	Teck	Andacollo Expansion
Peru	Aluminum Corp. of China (CHINALCO)	Toromocho
Peru	Anglo American	Los Bronces Expansion &Quellaveco
Peru	China Minmetals /Jiangxi Copper	El Galeno
Peru	Mercator Minerals	Creston
Peru	SCC - Southern Copper	Cuajone & Toquepala Expansions
Peru	Xstrata	Las Bambas

By-Product Metals in Latin America

Rhenium

Chile	Teck Codelco	Chuquicamata
Chile	Molymet	Disputada and Los Pelambres
Mexico	Mexicana de Cobre	La Caridad
Mexico	Molymex	Maria
Peru	Southern Copper	Mine

Rhenium Future Projects

Chile	Xstrata	Altonorte Metallurgical Facility
Chile	Molymet	Production

By-Product Metals in Latin America

Selenium

Chile	Codelco	Chuquicamata Refinery
Chile	Cormiqium	Lonquen Facility
Peru	Southern Copper	

Tellurium

Chile	Anglo-American/Xstrata/Mitsui and Nippon	Collahuasi
Chile	Codelco	Chuquicamata Refinery/Codelco Norte
Peru	Doe Run	Oroya Smelter
Mexico	Mexivada Mining	La Bambolla & AuroTellurio

By-Product Metals in Latin America

Rare Earth Elements

Brazil	Industrias Nucleares do Brasil SA	Buena Norte
Brazil	CBMM	Morro Dos Seis Lagos
Brazil	Mitsubishi/Neo Material Technoliges Inc/Mineracao Taboca SA	Pitinga
Brazil	MBAC Fertilizer	Araxá

By-Product Metals in Latin America

Latin American production is significant, especially in Molybdenum and Rhenium

Metal	Latin American Production (mt) (%)		Global Production (mt)
Bismuth	1,112	(9.4)	11,744
Cobalt	4,969	(5.4)	91,039
Molybdenum	80,096	(31.9)	251,186
New Molybdenum Projects	15,200	(33.7)	45,000
Rhenium	28,000	(59.5)	47,000
New Rhenium Projects	6,500	(36.7)	17,700
Selenium (refined)	195	(8.6)	2,265
Rare Earth Elements	10,500	(9.0)	116,175

Data from Joint Directory – Figures for 2011. Note that not all projects reported production for 2011. Future projects are intended capacity.

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