Overview of the Nickel market in Latin America and the Caribbean

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1. Introduction

At the suggestion of the Group’s Brazilian delegation, it was agreed by members that a report, based on INSG Insight No. 26, published in November 2015 entitled “An overview of the nickel industry in Latin America”, be prepared by the secretariat. This would include an update of the operations that resumed production (e.g. Falcondo in the Dominican Republic), and also discuss how the emerging battery market might influence nickel usage in the region as well as the possibility of nickel scrap usage. This detailed and comprehensive Insight report, the 35th in the series of INSG Insight briefing reports, provides members with the results of that research work.

In Latin America and the Caribbean, the nickel producing countries are Brazil, Colombia, Cuba, Dominican Republic, Guatemala and Venezuela. The Dominican Republic stopped nickel mining and smelting in October 2013 but resumed production at the beginning of 2016. Venezuela has not produced since mid-2015. All of these countries mine nickel and process it further to produce intermediate or primary nickel – mainly ferronickel. Most of the mined ore is processed within each country, and then exported to overseas markets, but Brazil and Guatemala also export nickel ore. In terms of usage only Brazil and Mexico are relevant regarding the global nickel market.

The first section of this report briefly describes existing nickel deposits in the region. The second part looks at nickel mine production. The third part provides information on primary nickel production. The fourth part lists the main nickel producers by country, company and facility. The fifth part describes some of the new projects in Brazil. The sixth part addresses nickel usage. The seventh part comments on the potential of the battery market in the region. The eighth part gives an overview of the region’s international nickel trade. The ninth and final part highlights stainless steel scrap trade.
Because of the ongoing COVID-19 pandemic, 2020 was an unusual year. Despite this, the nickel industry in the region presented a high degree of resilience. Mine production increased compared to the previous year (+8%), primary nickel production only marginally decreased (-0.7%). However, primary nickel usage declined sharply (-19%). New projects continued to be developed, while stainless steel scrap trade was weaker than the previous year.

2. Nickel Deposits

Geology

Most nickel deposits discovered and developed in the region are of the nickeliferous laterite type. They are the result of intensive and long-lasting deep weathering under humid tropical conditions.

Laterite deposits that have originated from serpentinite bodies contain iron and nickel (1% nickel) (e.g., Cuba). Other types of laterite deposits originated from peridotite bodies contain nickel silicate with a nickel content higher than 1.5% (e.g., Brazil, Colombia, Dominican Republic, and Venezuela).

In Central America the deposits are basically located on the margins of the Caribbean Plate. In the north of the plate there is a belt stretching from the Dominican Republic in the northeast, passing through Cuba and ending in Guatemala in the northwest. In the south there are Colombia and Venezuela. All of these countries only have lateritic mines: Colombia – saprolite; Cuba – laterite and serpentine; Dominican Republic – laterite, Guatemala and Venezuela – laterite. In the southeast of the plate, in the Guyana Shield, the country Guyana (Kauremembu Blue Mountains area) also has lateritic nickel deposits, though too small for commercial exploitation, and the potential to discover nickeliferous sulphides.

In Brazil, most of the deposits are lateritic weathering products of ultramafic rocks. In this country all the mines but three are laterites/saprolites – Fortaleza de Minas, Santa Rita and Jaguar Project are sulphides. Typically, there are three areas with a higher concentration of ultramafic rocks: central (the largest) – from north to south in Goiás and Pará; northeast – Bahia; and southeast – Minas Gerais.

The Andean Cordillera is sometimes mentioned as having the potential to hold nickel resources.

Nickel Resources and Reserves

The United States Geological Survey (USGS) estimates “land-based resources averaging approximately 0.5% nickel or greater contain at least 300 million tons (Mt) of nickel, with about 60% in laterites and 40% in sulphide deposits” in the World, as of January 2021 (Figure 1). A relevant but unexplored source are the nickel resources “found in manganese crusts and nodules on the ocean floor” (USGS, 2021).

The USGS estimates world reserves at 94 Mt, with Latin America holding almost one quarter of this figure: Brazil with 17% (16 Mt) and Cuba with 6% (5.5 Mt) have
the biggest reserves (USGS, 2021). As of February 2019, the USGS also reported that Guatemala held 1.8 Mt and Colombia 440 thousand tonnes (kt).

**Figure 1 - World Nickel Resources, Reserves by Country, and Mine Production**

![Figure 1: World Nickel Resources, Reserves by Country, and Mine Production](image)

Sources: USGS (Resources, Reserves), INSG (Mine Production) (not to scale)

In the remaining part of this section, we will analyse each country in more detail.

In **Brazil** there are several mines and projects (Figure 2). In the state of **Goiás**, where most nickel reserves are, **Anglo American** holds two mining operations – **Barro Alto** and **Niquelândia**, with reserves of 54.7 Mt @ 1.28% Ni and 5.6 Mt @ 1.32% Ni, respectively; and resources (excluding reserves) of 28.5 Mt @ 1.22% and 7.3 Mt @ 1.18% Ni (saprolite and ferruginous laterite), respectively (data as of December 2020).

**Figure 2 – Nickel Reserves in Brazil**

![Figure 2: Nickel Reserves in Brazil](image)

Source: Ministry of Energy and Mines, Brazil
Also located in State of Goiás is the Acampamento Macedo Mine, owned by Companhia Brasileira do Alumínio (a subsidiary of Votorantim). This asset has been on care and maintenance since 2016; its ore is lateritic, with about 1.45% nickel content.

In the State of Pará, Vale owns the Onça Puma mine. Vale reported reserves of 104.7 Mt @ 1.51% Ni (laterite) in December 2020 (there is no report on resources).

Also in Pará, Horizonte Minerals holds two projects, Níquel do Vermelho and Araguaia. Under the Níquel do Vermelho project, the company reports 148.8 Mt @ 1% Ni in resources that include 141.3 Mt @ 0.91% Ni of probable reserves (as of October 2018). The ore is laterite that includes limonite suitable for hydrometallurgy and saprolite for pyrometallurgy. The Araguaia project reported reserves of 27.29 Mt @ 1.69% Ni (as of October 2018) and resources of 132 Mt @ 1.26% Ni (laterite, data as of February 2017).

Still in Pará, Anglo American holds the Jacaré Project, with reported 306.6 Mt @ 1.29% Ni in resources (data as of December 2020) and Centaurus Metals the Jaguar and Itapitanga Nickel-Cobalt Projects. The former is a sulphide project, with a mineral resource reported at 58.9 Mt @ 0.96% Ni (as of March 2021). There is less available information regarding the latter.

In the State of Bahia, Atlantic Nickel is exploring the Santa Rita Mine (sulphide). This asset has open pit and underground sections, and reports resources of 227 Mt @ 0.59% Ni and reserves (only from the open pit section) of 50.6 Mt @ 0.31% Ni (data as reported in September 2020).

In Piauí, Brazilian Nickel is exploring the Piauí Nickel Project, with resources recently updated to 72 Mt @ 1% Ni (laterite, as reported in February 2021).

In the State of Mato Grosso, there is the Morro Sem Boné project (laterite). GK Resources is reportedly in negotiations with Anglo American over this asset.

Finally, the Fortaleza de Minas Mine is located in the State of Minas Gerais. This asset comprises a sulphide deposit. Nexa Resources (subsidiary of Votorantim) reported the sale of this asset to a third party in 2019.

In Colombia (Figure 3), South 32 is exploring the Cerro Matoso mine and smelter. It is located close to Montelibano town, in the Cordoba department of the Caribe region. The mine and smelter are currently operating. South 32 reported resources of 247 Mt with 0.9% Ni, which include 16 Mt with 1.1% Ni in reserves (laterite, as of June 2020).

The Colombian Geological Service also reports two other possible exploration zones that might have a potential for nickel (although the main minerals reported are Lead, Zinc and Copper). One of these is Vergara 1, located in the department of Cundinamarca in the Andean region, reported to have medium potential. The other, Guadalupe 1, is located in the Santander department of the Andean region and is reported to have a low potential.
In **Cuba**, the main region with nickel reserves is Holguín in the south, followed by Guantánamo on a smaller scale (Figure 4).

In **Holguín**, there are the **Nicaro, Punta Gorda** and **Pedro Sotto Alba Mines**. Regarding the former two mines, the INSG has information on reserves and resources dating back to 1992, indicating reserves of 59.3 Mt @ 1.2% Ni, 0.10% Co in Nicaro and 310.1 Mt @ 1.32% Ni, 0.11% Co in Punta Gorda. Both mines are held by Cubaniquel (a government owned company).
The Pedro Sotto Alba Mine is being explored jointly by Sherritt and Cubaniquel (equal shares of 50%). Sherritt reported resources at this mine to be 151.7 Mt @ 1% Ni, including 49.4 Mt @ 1.16% Ni (December 2020).

In Camaguey, there is a deposit known as San Felipe. This deposit has been investigated but not much information is available on it. Resources are thought to be around 230 Mt @ 1.25% Ni 0.1% Co.

In the Dominican Republic, a concession named Quisqueya comprises the Loma de Níquel La Peguera mine (Bonao, Monseñor Nouel province, Central Region). This mine is being explored by Falcondo (85.26% owned by American Nickel Limited, a subsidiary of GSOL, 9.98% by Corporacion Dominicana de Empresas Estatales, Government owned and 4.76% by minority shareholders). In 2014, it reported reserves of 71.2 Mt @ 1.31% Ni (laterite). Loma de Níquel was put on care and maintenance by Glencore in 2013 then sold in 2015 to American Nickel. In 2016, it restarted operations. There is potential to develop another mine in the same concession, Loma Miranda, but there is public discussion regarding the future of the site (either exploit the resources or conserve the site).

In the Eastern Region of the country, in the provinces of El Seibo and Hato Mayor and in the Northern Region, provinces of Santiago, Dajabón and Santiago Rodriguez, there is reportedly geological potential for base metals (as well as gold and silver).

In Guatemala, the nickel laterite district was discovered in the 1950’s and Inco (today Vale) conducted significant exploration there between 1950 and 1970. Nickel deposits are mainly located in the Departments of Izabal, Altaverapaz and Zacapa, in the east part of the country close to the Caribbean Sea and the port city of Puerto Barrios (Figure 5). In other parts of the country, it is also possible to find nickel deposits, such as the Rio Negro project in the centre of the country, around 200 km north of Guatemala City.

The Exmibal nickel laterite operation was commissioned in 1977. In 2006, the company was acquired by Skye Resources and in 2008 by Hudbay Minerals. In 2011 Exmibal – today Fenix – was purchased by Solway Investment Group, through its subsidiary Compañía Guatemalteca de Níquel (CGN). The Fenix mine is located 6 km west of El Estor in the department of Izabal. Solway reports probable reserves of 36.1Mt @ 1.86% Ni (laterite, unchanged since 2014) and the rights to an additional 70 Mt in the license area. An adjacent smelter has a production capacity of 25,000 t/y of ferronickel.

Exploration on Mayaniquel licences began in the 1970’s. Anfield acquired the operation from BHP Billiton in May 2009 and sold it in 2014 to the Cunico Resources’ subsidiary Guaxilan. The company’s deposits around Lake Izabal (Sechol Project in Alta Verapaz and Cerro Colorado Mine in Izabal and Zacapa) have laterite reserves of 69.9Mt @ 1.41% Ni (Sechol, reported in October 2012) and 6 Mt @ 1.9% Ni plus an estimated 1.5 Mt @ 1.7% Ni (Cerro Colorado).
Venezuela has one nickel deposit with commercial exploration, Loma de Níquel, located 80km Southwest of Caracas. Anglo American explored this mine until November 2012, when it was unable to renew its permit and ceased exploration. The most recent report of reserves and resources is from 2011, indicating 4.6 Mt @ 1.48% Ni in reserves and an additional 7.4 Mt @ 1.34% Ni in resources (laterite).

This deposit is not located in the country’s main mining area, Arco Minero del Orinoco, where there is abundance of other minerals (containing gold, iron, aluminium, as well as non-metallic minerals). Co-located with Loma de Níquel is a plant for nickel recovery from its slags, which started in 2019, according to CVM Loma de Níquel, the current owner of the mine.

3. Nickel Mine Production

In 2020, preliminary data shows that the Latin American and Caribbean region accounted for 10% of the all the nickel mined in the world, a decrease from 13% in 2010 (Figure 6). This period was marked by the remarkable production growth
recorded in Indonesia and the Philippines (accounting for a combined 10% of world output in 2000, 30% in 2010 and 45% in 2020).

During the 10-year period from 2010 to 2020 production in Latin America rose from 215kt to 240kt, peaking in 2012 at 281kt (Graph 7). In this year, Guatemala started mining nickel.
Brazil was the region’s biggest producer over the period in analysis. Mine production in the country reached its maximum in 2012, supported by the ramp up of the then new projects to produce ferronickel, namely Vale’s Onça Puma and AngloAmerican’s Barro Alto. In February 2016, Mirabela stopped mine production and exports of ore from the Santa Rita mine, and, in the second quarter of the same year, Votorantim ceased nickel cathode production at its more than 25kt capacity nickel refinery São Miguel Paulista. At the end of 2018, Vale had legal issues with the Onça Puma mine and Brazil’s nickel ore output declined further in that year and in 2019, partly recovering in 2020. The Santa Rita mine, now owned by Atlantic Nickel (a subsidiary of Appian Capital Advisory), restarted commercial production at the beginning of 2020.

In 2001, Cuba achieved its highest production level of 76.5kt, at which point the country was Latin America’s biggest nickel producer. However, output declined to almost 70kt in 2010 and then to 48kt in 2020.

Colombian production peaked in 2007, with an estimated 100kt of mined nickel. From 2005 to 2010, Colombia was the region’s main producer. From 2015 onwards, mine production was estimated to be in the range of 40 to 50kt. Less ferronickel production combined with nickel ore stocks management and lower ore grades were the main reasons for this decline.

Guatemala restarted mining in 2012 and smelting of ferronickel in 2014. The country has been exporting both nickel ore and ferronickel products.

The Dominican Republic has been mining nickel and smelting ferronickel for several decades, but stopped producing in 2009-2010 and again in 2014-2015. In August 2015, American Nickel acquired the Falcondo operation from Glencore Canada Corporation and restarted production.

Venezuela mined nickel from 2000 to 2012, stopped for around one year and produced again from 2014 to 2015. The Minera Loma de Niquel operation was then nationalized and has not produced nickel since 2015.

4. Primary Nickel Production

In 2020, preliminary data shows that the Latin American and Caribbean region accounted for 6.3% of the primary nickel in the world, decreasing from 8.2% in 2010 (Figure 8). During the last decade, China P.R. became the primary nickel production counterpart of Indonesian and Filipino mine production. Since 2017, nickel pig iron producers in Indonesia started and ramped up activity partly replacing Chinese production, a trend that became even more relevant in 2018, 2019 and 2020, and that was reinforced by the Indonesian ore export ban effective from January 2020 (resulting in less available feed for Chinese smelters). Asia thus gained prominence over the last ten years as a primary nickel producer.
Latin America lost share in percentage terms, but showed a significant increase in volume, between 2010 and 2020 (Graph 9), from 118kt to 157kt.

In 2010, Colombia was the largest primary nickel producer in Latin America and the Caribbean and seventh in the World. Yet, by 2012, Brazil had become the largest
primary nickel producer in the region. Colombia, which has kept production at a stable level over the review period, kept its second place since. In 2020, Brazil was the tenth largest producer in the World, Colombia followed in twelfth place.

Brazil's primary nickel production increased after 2010 mainly because of the ramp up of Vale’s Onça Puma and AngloAmerican’s Barro Alto operations, as mentioned previously. Partially offsetting this was the fact that Votorantim ceased nickel cathode production at São Miguel Paulista (Australian Jervois Mining agreed to acquire 100% ownership of the refinery on closing). Onça Puma stopped production by the end of 2019Q2, but restarted during the following quarter.

Cuba’s and Colombia’s primary nickel production trends were downwards from 2010 to 2020. The former declined from 27kt to 13kt, while the latter went from 49kt to 36kt.

Guatemala and the Dominican Republic restarted smelting ferronickel in 2014 and 2016, respectively. Preliminary estimated figures show output levels of 27kt for Guatemala and 22kt for the Dominican Republic in 2020.

Venezuela produced almost 12kt of ferronickel in 2010, stopped production at the end of 2012, resumed the operation in 2014 and ceased again during 2015Q3 until now.

In terms of nickel production processes in Latin America and the Caribbean (Graph 10), in 2010 around 45% refers to ferronickel, 33% to Laterite-Caron and 22% Hydro-PAL. Over the next decade, ferronickel gained relevance and accounted for almost 75% in 2020, while Laterite-Caron and Hydro-PAL decreased to 8% and 18%, namely.

Graph 10 – Nickel Production by Process in Latin America and the Caribbean

![Graph 10 – Nickel Production by Process in Latin America and the Caribbean](source: INSG)
5. Main nickel producers

Table 11 complements the analysis above by listing the main nickel producers in Latin America and the Caribbean by country/facility, producer/company, product type, estimated production for 2020 and projected total production (capacity), when available.

Table 11 – Main Nickel Producers in Latin America

<table>
<thead>
<tr>
<th>Country / Facility</th>
<th>Producer / Company</th>
<th>Product Type</th>
<th>Estimated Production 2020 (tonnes)</th>
<th>Projected Total Capacity (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barro Alto</td>
<td>Anglo American</td>
<td>FeNi</td>
<td>35,000</td>
<td>45,000</td>
</tr>
<tr>
<td>Codemin</td>
<td>Anglo American</td>
<td>FeNi</td>
<td>8,600</td>
<td>9,000</td>
</tr>
<tr>
<td>São Miguel Paulista</td>
<td>Votorantim</td>
<td>Electrolytic</td>
<td>-</td>
<td>25,000</td>
</tr>
<tr>
<td>Onça Puma</td>
<td>Vale</td>
<td>FeNi</td>
<td>16,000</td>
<td>53,000</td>
</tr>
<tr>
<td>Santa Rita</td>
<td>Atlantic Nickel</td>
<td>Concentrate</td>
<td>5,000</td>
<td>16,500</td>
</tr>
<tr>
<td>Colombia</td>
<td>Cerro Matoso</td>
<td>FeNi</td>
<td>40,600</td>
<td>55,000</td>
</tr>
<tr>
<td>Cuba</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Punta Gorda</td>
<td>Empresa Niquelífera Ernesto Che Guevara (100% Gov.)</td>
<td>Ni Oxide</td>
<td>14,800</td>
<td>31,000</td>
</tr>
<tr>
<td>Nicaro</td>
<td>Empresa Niquelífera Com.te René Ramos Latour (100% Gov.)</td>
<td>Ni Oxide</td>
<td>-</td>
<td>15,000</td>
</tr>
<tr>
<td>Moa Pedro Sotto Alba</td>
<td>Sherritt (50%), GNC of Cuba (50%)</td>
<td>Mixed Sulphides</td>
<td>34,100</td>
<td>35,000</td>
</tr>
<tr>
<td>Dominican Rep.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Falcondo</td>
<td>American Nickel (previously Glencore)</td>
<td>FeNi</td>
<td>24,000</td>
<td>32,000</td>
</tr>
<tr>
<td>Guatemala</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fénix</td>
<td>Solway Invest. Group</td>
<td>FeNi</td>
<td>25,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Montufar</td>
<td>Solway Invest. Group</td>
<td>Ni Ore</td>
<td>n.a.</td>
<td>25,000</td>
</tr>
<tr>
<td>Cerro Colorado</td>
<td>Guaxilan (Cunico Resources)</td>
<td>Ni Ore</td>
<td>n.a.</td>
<td>25,000</td>
</tr>
<tr>
<td>Venezuela</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loma do Níquel</td>
<td>Petróleos de Venezuela</td>
<td>FeNi</td>
<td>-</td>
<td>17,000</td>
</tr>
</tbody>
</table>

Source: Company Data, Public Data, INSG

The region is well diversified, covering potential production from mining to processing to unwrought nickel. Brazil is the country with the most active producers (Vale, Anglo American and Atlantic Nickel) and also has 4 new developments currently (Horizonte Minerals’ Araguaia and Niquel do Vermelho projects; Brazilian Nickel’s Plaúi project; and Centaurus Minerals’ Jaguar project – more details on section 6). Cerro Matoso in Colombia went through a restructure in 2015, when it was spun out of its parent company BHP Billiton, becoming part of South32.
Cuba’s nickel industry is partially controlled by the Central Government, with a joint venture in one of the companies (Moa Pedro Sotto Alba) with the Canadian company Sherritt, and the Punta Gorda smelter is fully owned by the State. Falcondo in the Dominican Republic was shut down by Glencore, to be sold to American Nickel, a subsidiary of the international investment fund Global Special Opportunities Ltd. in August 2015. Guatemala has two operating companies (Solway Invest. Group and Guaxilan, a subsidiary of Cunico Resources) although more licenses were issued in the past to other producers. Venezuela’s Loma do Niquel was nationalised after being acquired from Anglo American and now belongs to Petróleos de Venezuela. The facility was shut down in September 2015.

6. New Nickel Projects

There are 4 projects in Brazil with the potential to start operating in the short to medium term:

Araguaia project – Horizonte Minerals

Resources (Measured, Indicated & Inferred): 132 Mt @ 1.26% Ni (2018).
Reserves (Proven & Probable): 27.29 Mt @ 1.69% Ni (2017).
Laterite ore suitable for production of ferro-nickel via the RKEF process.
Feasibility study published in October 2018, which allows a second RKEF line, with the potential to double production capacity from 14,500 t/y to 29,000 t/y Ni.
Construction licence awarded in January 2019.

Níquel do Vermelho project – Horizonte Minerals

Resources (Measured, Indicated & Inferred): 148.8 Mt @ 1% Ni (2019).
Production of nickel and cobalt sulphate via the HPAL process.
Acquired from Vale S.A. in December 2017.
Saprolite ore suitable for processing at the RKEF plant to be built at the Horizonte’s Araguaia FeNi project and limonite ore for the Pressure Acid Leach (PAL) process and subsequent purification stages, allowing Vermelho’s limonite ore to be used to produce high purity nickel and cobalt sulphate suitable for EV batteries. Facility expected to produce an average of 25,000 t/y Nickel and 1,250 t/y Co (through HPAL process).
Pre-feasibility study released in October 2019.

Piauí project – Brazilian Nickel

Resources (Measured, Indicated & Inferred): 72 Mt @ 1% Ni (as reported in 2021).
Acquired from Vale in January 2014. Heap Leach Demonstration Plant operational in May 2016. Environmental licenses received in January 2020. Bankable feasibility study under way, scheduled to be published in early 2022. Production targeted for end-2024. At the same time, there is an expansion plan (PNP1000) of the existing demonstration plant by a factor of 10 (approx.) to 1,400 t/y of Ni to start production in early 2022, with first shipments in the second quarter of 2022.
Jaguar project – Centaurus Minerals

Sulphide ore, resources estimated at 58.9 Mt @ 0.96% Ni (2021).
Acquired from Vale in April 2020.
Scoping study released in March 2021 confirms commercial and technical viability of a 2.7 Mt/y flotation plant (approximately 20,000 t/y contained Ni). Pre-feasibility study to be conducted.

7. Primary nickel usage

Latin America’s total nickel usage is relatively small compared with other regions in the world. Only Brazil and Mexico are relevant regarding the global nickel usage market, with 0.52% and 0.11% of world usage in 2020, respectively. In this section, we will focus on Brazil.

Brazil has three stainless steel producing companies using nickel: Aperam, Villares Metals and Gerdau. Together they produced almost 330kt of stainless steel in 2020, which corresponds to an estimated 13kt of nickel usage, including some tonnage used in non-stainless sectors. Graph 12 displays the yearly evolution of both stainless steel production and nickel usage in Brazil from 2010 to 2020.

Graph 12 – Primary Nickel Usage – Brazil

Nickel-containing stainless steel scrap usage to produce stainless steel is estimated to be in the range of 30% to 35% in Brazil for most years.

8. Potential Supply to the Battery Market

Several countries and automakers have established ambitious targets regarding the transition from internal combustion engine cars to electric vehicles (EVs), therefore the production of batteries is widely seen as a very promising sector regarding demand for nickel as well as several other raw materials.
For governments and nickel producers, one of the key decisions is where to position themselves in the supply chain for EVs (Figure 13). In the strict sense, when battery precursors are fabricated, it is where arguably the input from the nickel industry ends. This is the point where nickel sulphate is combined with other raw materials to create a new “product”. In the broad sense, this ends when EVs are made. Usually, higher value-added returns are located further downstream, but it also implies higher investments, larger R&D expenditure and companies willing to invest – established companies, new ones and / or foreign companies.

Figure 13 – Simplified Nickel Supply Chain for Electric Vehicles – NMC

Around the world, there are announcements regarding companies investing in one or several points of the value chain and even to become fully integrated. In many cases, those investments are being done with the support of national governments or supranational bodies (like the European Union). Also, joint ventures and agreements are being put in place to secure access to different raw materials. The analysis of the EV value chain is beyond the scope of this report, nevertheless it would be of great interest for the region to produce batteries and EVs locally.

More specifically on nickel, the production of nickel sulphate can be done following different routes (Figure 14). All Latin America and the Caribbean countries have laterite ores, and Brazil also has some sulphide deposits, but most processing is for the purpose of producing ferronickel for the stainless steel industry.

Cuba has the potential to integrate one of the nickel sulphate production routes, in principle, from both Punta Gorda smelter and Pedro Sotto Alba plant. In Brazil, the São Miguel Paulista refinery, after restarting, can also supply to produce nickel sulphate – apparently, that is what Jervois Mining plans to do. Níquel do Vermelho project is also focusing on the battery and EV market.

Additionally, there will be a flow of used car batteries that will need to be reused or recycled. This will start gaining relevance in 5 to 10 years’ time, or later, but there is already increasing research and investment in this area to prepare for this coming reality. Examples include the recently announced Volkswagen pilot plant in Salzgitter (Germany), Renault’s agreement with Solvay and Veolia, and TES opening a battery recycling plant in Singapore. Battery producers are also looking carefully at this issue. Northvolt recently launched a joint venture with Norsk Hydro to build a pilot battery-recycling plant in Norway. There are also other similar examples. GEM in China and Umicore in Belgium are well established and known for recycling e-waste with a focus on batteries. It is possible that companies in Latin America and the Caribbean may also include battery recycling as part of an overall strategy for the EV sector.
Figure 14 – Simplified Nickel Value Chain

Source: CRU (February 2019)
9. Nickel International Trade

Latin American and the Caribbean nickel producing countries share a common feature: they all rely on international trade through exports.

The most important product exported is ferronickel (Graph 12), used to produce stainless steel – most miners also operate smelting facilities. Exports of nickel ore, nickel matte, nickel oxide sinter and unwrought nickel decreased in importance over the last decade.

With the support of the graphs in the Annex, we will highlight further the main characteristics of the international nickel trade in Latin America by destination country, focusing on type of product: nickel ore, nickel matte, nickel oxide sinter and unwrought nickel. We will start with ferronickel exports.

Total exports of ferro-nickel were just under 470kt in gross weight in 2020. The trend over the last 10 years has been of increasing exports, almost tripling from about 160kt in 2010.

The shares of the different countries greatly varied over the period. In absolute terms, Colombia has kept a stable quantity of about 130kt, while Brazil, the largest exporter since 2014, has grown from close to zero to over 200kt since 2010. Among the smaller exporters, Guatemala has seen the most growth since its exports started in 2013, surpassing the Dominican Republic in 2020. Venezuela reports no trade since 2016.
Between 2010 and 2020 ferronickel exports have grown significantly (CAGR of 11% over the last 10 years). In 2020, the main destinations were China (55%), Italy (8%), Belgium (6%), USA (5.5%) and South Korea (4%). A total of 22 countries are reported to have been export destinations of Latin American and Caribbean ferronickel. The profile of export partners has changed over the last 10 years. China’s share soared from 30% to over 50%, while all other partners saw a decrease in their importance, although all countries saw increases in the volumes traded.

**Graph 13 – Export Destinations of Ferronickel from Latin America – breakdown by country**
(gross weight, tonnes, inner circle 2010, outer circle 2020)

**Brazil** reported rising exports in the period of 2010 to 2020. From under 20kt in 2010 to 211kt in 2020. The main destination was China, with a share of 45% in 2020 (up from 35% in 2019). Export destinations of Brazilian ferro-nickel were diverse and
included Belgium and the United States with figures increasing steadily over the last years. Sweden, Italy and Finland were also important destinations with volatile figures over the review period. South Korea has grown in importance since 2016, reaching 17kt in 2019 and 14kt in 2020. The Netherlands has been decreasing in importance, from a peak of 28kt in 2014 to a figure of just above 5kt in 2020.

**Colombia** has had stable ferronickel export figures over the last eleven years. From 141kt in 2010, the figure was barely changed as just under 140kt in 2019. Remarkably, the Netherlands has decreased in importance as a destination, from a peak of 44kt in 2012, to 8kt in 2020, while China has been the main destination over the whole review period (peaking at 102kt in 2019). In 2019, Japan, Hong Kong, Germany and the Netherlands were the other main destinations (adding up to just above 31kt) with these countries recording similar trade volumes to each other, but considerably less than China. In 2020, exports decreased a little, to 125kt. China saw a drop to 75kt compensated predominantly by increases in exports to Germany, South Korea and Taiwan, China (combined increase of 13kt).

The **Dominican Republic** restarted exports in 2016, after 2 years of stoppage. In both 2019 and 2020, the country exported around 57kt of ferronickel, the majority of which went to China. The United States and India have been important export destinations, although with some year by year variation in the quantities. In 2020, exports to China decreased significantly from 44kt to 36kt. This was balanced with a surge of 10 kt of exports to the Netherlands. Since 2018, the INSG has been using mirror statistics to estimate the exports of Dominican Republic exports of ferronickel.

**Guatemalan** total ferronickel exports in 2014 (when the country started production) were about 7.5kt, and went chiefly to Italy (about 3.6kt) and the United States (2.8kt). The total figure has been increasing drastically, reaching 75kt in 2020, 33% higher than in 2019. China is now the major export destination (45kt), followed by Italy (falling to 15kt from just above 20kt in 2019). The Netherlands appeared as an important destination for the first time in 2020, with 11kt. Exports to the USA have been more volatile over the review period, reaching 15.6kt in 2017, but almost disappearing since 2019.

For **Venezuela**, there is no data available since 2016, when figures dropped drastically. In 2015, the country exported nearly 14kt. The main destinations were the Netherlands (8.6kt) and India (2.9kt).

Looking at nickel ore exports, in **Brazil**, Mirabela Nickel placed the **Santa Rita Mine** on care and maintenance in 2015 – which was reflected in an almost total cessation of exports of ores and concentrates. In 2018, the operation was bought by Appian Capital Advisory and its subsidiary Atlantic Nickel restarted the mine, making its first shipments of sulphide concentrate in the first quarter of 2020. This is reflected by a restart of exports, reaching 53kt in 2020, practically exclusively to China. The mine has a capacity of 120kt of nickel concentrate per year. Most ore exports while Santa Rita Mine’s operations were halted were reported to be sent by air, which suggests these could be samples to potential customers.

**Guatemala** also exports nickel ore. It is an important supplier to Ukraine. In 2019, a slump of exports to Ukraine was seen (falling from over 1 Mt to 433 kt). This was probably a result of the fact that the Pobuzhskiy Ferronickel Plant (Ukraine) was
operating at reduced capacity in the first quarter of 2019 due to maintenance and repair, recovering in the first quarter of 2020. Exports to Ukraine also recovered in 2020 to about 1.3 Mt, close to the figures seen since 2014 (roughly between 1 Mt and 1.5 Mt).

At the beginning of 2020, with the establishment of the Indonesian nickel ore export ban, Guatemala became one of the alternative sources of ore to China and Ukraine, although the nickel content of the Guatemalan ore is lower than that of the Indonesian.

Looking at matte and unwrought nickel exports, in Brazil, Votorantim's Fortaleza de Minas operations (where nickel matte to be shipped mainly to Norilsk's Finnish operations was produced) were suspended in 2013 and divested by its subsidiary Nexa Resources in 2019. Its Niquelândia and São Miguel Paulista operations were put on care and maintenance in April 2016 and are now operated by its subsidiary Companhia Brasileira do Alumínio (CBA) – as mentioned above, Jervois Mining agreed to acquire 100% ownership of the refinery on closing. Suspension of these operations explains the absence of exports of the related materials over the last half of the review period.

Cuba exported nickel oxide sinter to Canada and to the Netherlands. The latest data available goes back to 2005. Material continues to flow to Canada for further processing from the Moa Joint Venture. The Moa Joint Venture is a 50:50 joint venture between the Cuban government, through the General Nickel Company, and Sherritt. The mixed sulphides from Moa Nickel are transported by sea to Canada and then by rail to Fort Saskatchewan, where the Cobalt Refinery Company (also a subsidiary of Sherritt and the General Nickel Company, SA) refines this material together with other nickel and cobalt feed materials purchased from third parties into Class I Nickel (briquettes and powders).

10. Stainless Steel Scrap Trade

In this section, stainless steel scrap trade (SSS) will be discussed. There are two reasons to include this topic: stainless steel scrap contains nickel and it can be a substitute/complement to primary products. This generates revenues and is beneficial for the environment. The two relevant countries in this area are Brazil and Mexico.

Brazil exported between 16kt and 44kt of SSS per year from 2010 and 2019 (Graph 14). Total exports remained quite stable in the second half of this decade, between 34kt and 38kt annually, without a clear trend of growth or decline. 2020 was an atypical year due to the pandemic, with exports slumping to just under 17kt. The main destinations have varied, with the Netherlands capturing half of the exports in 2012, but losing importance over the rest of the decade, leaving space for South Korea (main destination in 2017), Spain (main destination in 2018) and South Africa (main destination in 2019 and 2020 representing 47% and 37% of exports, respectively). While some countries appeared and disappeared as relevant stainless steel scrap export destinations (South Korea, Pakistan, Italy, the USA), the Netherlands, India and Spain have remained constant partners over the decade.
Graph 14 – Stainless Steel Scrap Exports – Brazil (tonnes)

Graph 15 – Stainless Steel Scrap Exports – Mexico (tonnes)

Source: Country Customs, INSG
Mexico exported almost 140kt of SSS in 2020 (Graph 15), making it the largest exporter of this material in Latin America. The main tendency over the last decade has been upwards. The main partner has been the USA, which received 53% of stainless steel scrap exports from Mexico in 2010, peaking at 84% in 2014 and then slowly retreating to 65% in 2019, when India’s share reached 28%. India has had increasing weight as an export partner over the 2017 to 2019 period. Spain has been a regular destination over the decade, but representing a smaller share (8% in 2019).

12. Final Comments

The nickel sector in Latin America comprises six countries – Brazil, Colombia, Cuba, the Dominican Republic, Guatemala and Venezuela – and shows great dynamism, as presented in this report. The potential of the region is easily recognisable considering the geology, the current operations and the possible new projects. Several of these countries are members of one or more of the Study Groups, and the others have been invited to join, with the objective to support the development of their own industries.

Despite the COVID-19 pandemic, the nickel industry in the region presented a high degree of resilience in 2020. Compared with the previous year, mine production increased +8%, primary nickel production decreased marginally by -0.7%, but primary nickel usage was strongly affected, decreasing by an estimated -19%. New projects, especially in Brazil, continue to be developed and stainless steel scrap trade was weaker, reflecting lower demand from overseas combined with more difficult logistics.

Electric vehicles and batteries are regarded as an important future driver for nickel demand. The region has the potential to be a relevant supplier for this sector and is expected to continue to move forward with this objective in mind.
Useful links:
Brazil, Agência Nacional Mineração: www.gov.br/anm
Colombia, Ministerio de Energía y Minas: www.mem.gob.gt
Cuba, Presidencia Y Gobierno de Cuba: www.presidencia.gob.cu
Dominican Republic, Ministerio de Energía y Minas: www.mem.gob.do
Guatemala, Ministerio de Energía y Minas: www.mem.gob.gt
Venezuela, Ministerio del Poder Popular de Desarrollo Minero Ecológico:
   http://www.desarrollominero.gob.ve/

Member countries are encouraged to contact the INSG secretariat with questions or suggestions for further work on this topic.

Comments or Questions
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Annex – International Trade – Brazil

Exports of Nickel Ores and Concentrates, tonnes

Exports of Nickel Matte, tonnes
Annex – International Trade – Brazil

Exports of Ferronickel, tonnes

- China
- Belgium/Lux
- USA
- South Korea
- Italy
- South Africa
- Spain
- Netherlands
- Sweden
- Other

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<th>Year</th>
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<th>South Korea 2010</th>
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Annex – International Trade – Brazil

Exports of Unwrought Nickel, Not Alloyed, tonnes

Year 2010: Total 11,167
- USA 3,764
- Japan 3,986
- Other 3,417

Year 2011: Total 12,773
- USA 4,219
- Japan 4,805
- Other 3,759

Year 2012: Total 16,458
- USA 4,048
- Japan 3,717
- Other 8,713

Year 2013: Total 17,578
- USA 4,393
- Japan 4,279
- Other 8,906

Year 2014: Total 14,861
- USA 4,237
- Japan 2,420
- Other 8,204

Year 2015: Total 17,216
- USA 6,312
- Japan 2,315
- Other 8,599

Year 2016: Total 5,635
- USA 1,380
- Japan 970
- Other 3,285

Legend:
- USA
- Japan
- Netherlands
- China
- Other
- Total
Annex – International Trade – Colombia
Annex – International Trade – Dominican Republic
(NOTE: 2018 to 2020, figures as reported by importing countries)
Annex – International Trade – Guatemala

Exports of Nickel Ores and Concentrates, tonnes

Graph showing the exports of nickel ores and concentrates from 2010 to 2020 by various countries. The countries and their respective contributions to the total exports are:

- Total: 2,427,019
- Greece: 1,262,203
- Ukraine: 1,162,811
- China: 201,734
- Other: 38,470

The graph indicates a significant contribution from Greece and Ukraine, with China also playing a notable role.
Annex – International Trade – Guatemala

Exports of Ferronickel, tonnes

INSG Insight – No. 35
Annex – International Trade – Venezuela

![Graph showing exports of ferronickel, tonnes, 2010-2020]

- Total exports: 23,254 tonnes
- China: 4,270 tonnes
- USA: 6,363 tonnes
- Netherlands: 8,480 tonnes
- India: 7,962 tonnes
- Other: 4,008 tonnes

Yearly exports:
- 2010: 2,216 tonnes
- 2011: 5,045 tonnes
- 2012: 5,105 tonnes
- 2013: 9,317 tonnes
- 2014: 7,984 tonnes
- 2015: 1,105 tonnes
- 2016: 1,187 tonnes
- 2017: 1,871 tonnes
- 2018: 1,687 tonnes
- 2019: 1,871 tonnes
- 2020: 1,187 tonnes