

LITHIUM GEOPOLITICS IN THE 21ST CENTURY

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Introduction

Because of the abundant presence of common and rare natural resources, South America is considered highly strategic for the new stage of capitalist accumulation and for the reproduction of its mode of production, inserting itself in a new competitive pressure worldwide that tends to accentuate even more as the global demand for the resource increases. In geopolitical terms, it seems that the region has been incorporated in the world's competitive pressure in which some regions "must become international 'zones of fracture', in which conflicts and rebellions involving the great powers and companies that compete for the regions control could rise" (Fiori 2014, 161).

This article aims to evaluate the lithium geopolitics in the 21st century considering the national, regional and global geopolitical disputes that put South America at the center of the debate and create possible new tensions in the Andean region of the subcontinent. Our hypothesis is that lithium is one of the most strategic natural resources, whose world reserves, quantitatively and qualitatively, are concentrated in the South American region, based on a

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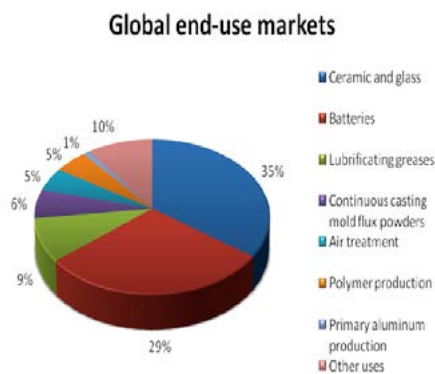
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bibliographical and qualitative review of statistical data on the subject present in studies and government documents. It is extremely important to carry out an analysis that covers the study of its behavior regarding reserves, production, prices, supply, demand and a geographical analysis.

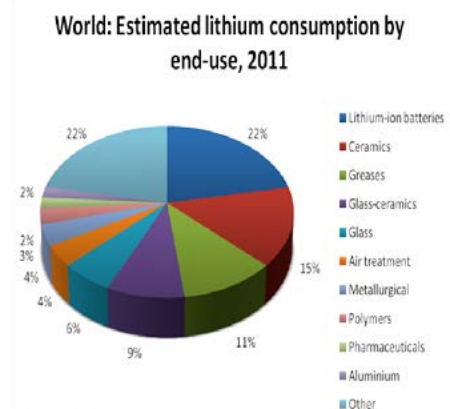
Lithium Characteristics

Lithium is an alkali metal, the smallest and lightest atom among all metals in the periodic table, under normal conditions of temperature and pressure. Because of its low atomic mass, it has a high charge and a specific power. It is not found in its native state. That is, it does not exist free in nature, being located most often in the condition of an ionic chemical compound. In addition, due to its high specific heat it is used in heat transfer applications and, because of its high electrochemical potential and high energy density, it is used as an anode suitable for electric batteries. For example, a typical lithium-ion battery can generate approximately 3 volts per cell, compared to 2.1 volts for the lead acid battery or 1.5 volts of zinc-carbon cells.

As for its applications, it is used in the manufacture of heat conducting metal alloys (aluminum), in the form of ceramics and lenses (telescopes), lubricating greases, military applications (rocket propellants and hydrogen bombs), in medicine (drugs for depression and bipolar disorder), in the electrical and electronic industry (production of batteries and electric batteries, such as cell phones, notebooks and hybrid/electric cars), among others.



Fonte: U.S. Geological Survey, Mineral Commodity Summaries, February 2014 (elaboração própria).

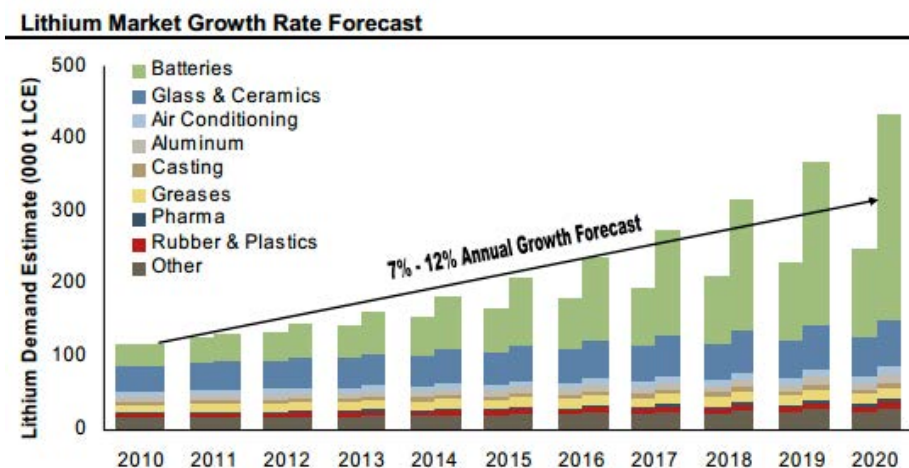


Fonte: Baskin, 2011 (elaboração própria).

The demand for lithium has remained largely unchanged since its discovery in 1817 by the Swedish chemist Johan August Arfwedson. Over the

years, its properties were adjusted to the needs of technological development in several sectors, but its qualities as an energy transmitter were emphasized mainly in the 1970s, “considering a technological paradigm linked to computing and electronics, in which a series of appliances and instruments are, increasingly powered by lithium batteries” (Palacio 2012, 6), such as the case of batteries of electronic devices and hybrid electric cars. From the 1990s onwards, this situation has changed mostly due to the proliferation of cell phones and portable computers.

Since the beginning of the 21st century, with the emergence of high demand for lithium ion batteries, the new companies have expanded lithium extraction to serve industries in this sector. Because of this, since 2007, the lithium market has as its largest consumer lithium ion battery industries, with even greater future projections.



Sourec: Cormarck Securities Inc. 2011; Baylis 2012.

Therefore, the strategic importance of lithium - a consequence of technological innovation and its applicability in the rechargeable battery industry of almost all portable electronic devices consumed in the world - is latent. However, perhaps its most important application, from the technological and environmental point of view, is the production of a new rechargeable battery technology for electric and hybrid vehicles: the EV (Electric Vehicle), which is powered only by electricity and charged in a electric plug-in, and also the Plug-in Hybrid Electric Vehicle (PHEV).

The advantage of the new lithium-ion battery technology is its high energy density, which allows it to store more energy per unit of weight, re-

ducing considerably the total weight of these batteries compared to those produced from NiCd (nickel–cadmium battery) or NiMH (Nickel-metal hydride battery). In 1992, when lithium batteries were introduced, they had only 10% more energy than NiMH batteries. In 2005, the average energy density of lithium batteries was 80% higher than that of NiMH batteries. In 2009, as part of its energy program, the US government awarded 24,000,000 hours to IBM at two national laboratories, Argonne and Oak Ridge, for research to increase battery functionality for electric cars (Palacio 2012, 6).

The increase in the energy density of the lithium batteries has allowed the constant reduction of the total weight of these and consequently the decrease of the weight of the portable devices that use them. In the case of hybrid electric vehicles, the high energy density of lithium batteries is crucial (Viana, Barros and Calixtre 2011, 239).

Even with the technological developments in the scientific field of lithium, some scholars still consider the large and heavy batteries, besides their reactivity being another source of problems. Still, scientists are opening new ways, working on a “lithium-air” battery³. In them, instead of being sealed in a casing, the lithium remains in contact with the air, and uses the ambient oxygen as a cathode, as do the zinc batteries of hearing aids, making the battery much lighter. There are also scientists who have been using nanotechnology to densify the surface of the cathode, which can multiply the number of reactions and increase, at least in theory, the power of the battery.

The use of lithium in these industrial branches is very recent. However, its increasing consumption in several strategic sectors has increased its consumption worldwide over the last 30 years. Thus, its regional/global mapping and its geopolitical disputes are fundamental to understand its growing importance in the international scenario over the years, and especially nowadays with its use for scientific and technological purposes.

In this context, it is highlighted how the presence of lithium in South America has aroused national, regional and global geopolitical disputes, placing the region at the center of the debate and creating possible new tensions in the Andean region of the subcontinent.

3 “A new technology, the lithium-air battery, may be capable of substantially increasing the energy density of lithium batteries, effectively rivaling the energy density of petroleum. Although development of lithium-air battery technology is still in its infancy, a coalition of U.S. national laboratories and commercial partners led by International Business Machines Corp. anticipated having a laboratory prototype battery ready by 2013, a scaled-up prototype capable of powering a car ready by 2015, and commercial batteries in production within a decade” (United States 2012).

The Lithium Geopolitics

The external environment that each state encounters in drawing its own strategy - an environment involving the presence of other states also struggling for survival and advantages -, aligned with periods of global upheaval and constant technological innovations, leads to a rebirth in the ideas regarding geography (Kaplan 2013, 62). This is the case of lithium, whose technological cycle begins between 2000 and 2005 and has a forecast of intensive use until the period 2035-2045, according to estimates by Bruckmann (2011, 217-219).

For a case study analysis of lithium geopolitics in South America, it is very important to carry out an analysis that covers the study of its behavior regarding reserves, production, prices, supply, demand and a geographical area analysis.

Lithium reserves can be found from two distinct types of lithium salt concentrations: in hard rock mines, mainly in Australia, which produce lithium mineral concentrates for technical purposes and for conversion into lithium chemicals, almost exclusively in China; and in continental brines, for example the salares in Argentina, Chile, China and Afghanistan, most commonly used for the production of lithium carbonate, hydroxide and chloride. Generally, these regions are considered to be of lower operating cost and therefore more commercially viable compared to lithium minerals - although both are located in remote locations and present very different technical and logistical challenges.

The main reserves are found in salt regions, lands that for tens of thousands of years were covered by oceans and, with the geological formation of the continents, ended up drying and forming great salt deserts. The lithium is dissolved below the coarse crust in a layer of salt impregnated solution. The fact that it is a mineral that is concentrated in the region of salares causes countries like Bolivia, Salar de Uyuni, Chile, Salar de Atacama, and Argentina, with Salar del Hombre Muerto, to be among the world's largest holders reserves of this resource, forming the so-called "lithium triangle", presenting approximately 92% of world reserves in 2009 (Bruckmann 2011, 219).

The accounting of the world's reserves of lithium varies according to the agencies and companies that realize it, as shown by several reports and the table below. However, its great geographical concentration in the Andean region of South America is an undeniable fact.

Estimated lithium mineral resources (in million tonnes)

País	Mt Li met.	Fuentes
Bolivia	8,90	COMIBOL (1)
Chile	8,04	Roskill (2013), SQM, CORFO (1)
Argentina	7,09	Compañías mineras (2)
China	5,15	Roskill (2013) (1)
EEUU	1,67	Compañías mineras (2)(3)
Australia	1,55	Compañías mineras (2)
Congo	1,15	Roskill (2013) (1)
Serbia	1,05	Roskill (2013) (4)
Rusia	1,00	Evans (2012), USGS (2013) (1)
Canadá	0,74	Compañías mineras, Roskill (2013) (2)
Brasil	0,10	Roskill (2013) (1)
Zimbawe	0,06	USGS (2012) (1)
Austria	0,05	Global Strategic Metals (2)
Portugal	0,01	Roskill (2013) (1)
Otros	0,20	Estimación propia en base a Roskill (2013) (1)
TOTAL	36,74	

(1) Reference value, the methodology and parameters used are unknown.

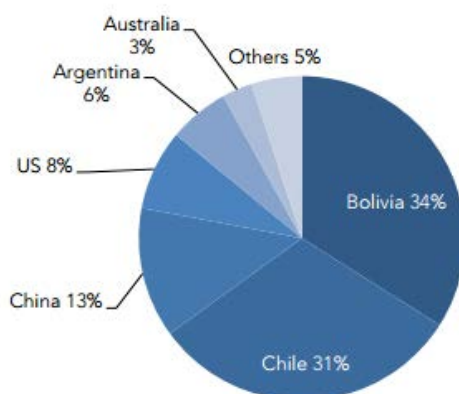
(2) It was considered the resources that were measured and indicated as published by mining companies.

(3) According to Según USGS (2013) US resources amount to 5,5 Mt. Notwithstanding, the deposits that were considered and the parameters used on this calculation are unknown.

(4) Estimated resource published in Roskill (2013).

Source: Cochilco 2013.

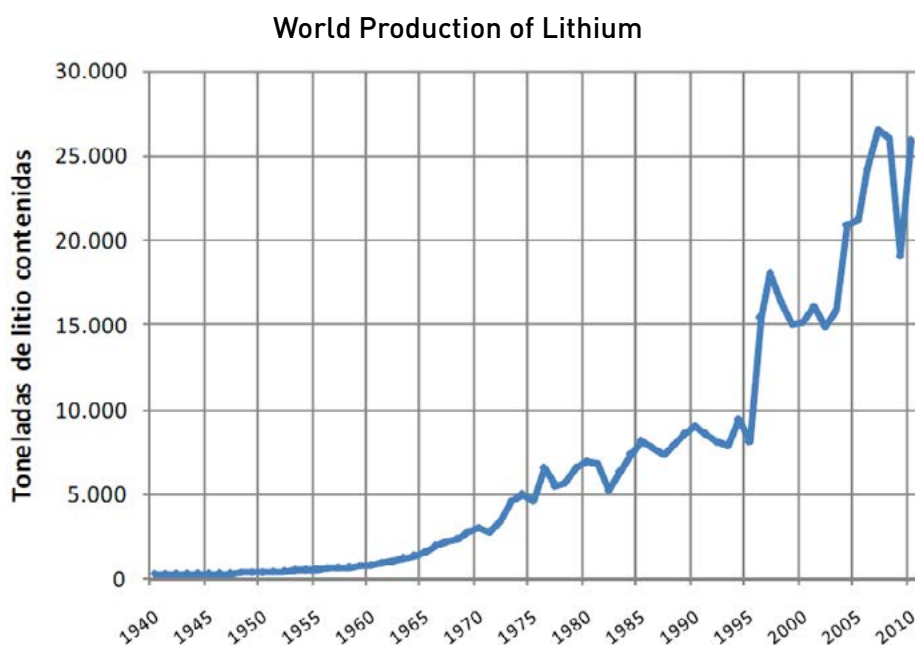
Lithium reserves by country



Source: Fox-Davies 2013.

Although the methodologies and accounting parameters are used differently, since there are distinctions of the models according to the companies or agencies that carry out the surveys, the fact is that Bolivia, Chile and Argentina own large percentage of the world's reserves of lithium in the Year of 2013. The image below ratifies this argument, in which South America would have approximately 71% of the lithium reserves, with Bolivia with 34%, Chile with 31% and Argentina with 6%.

Since the use of lithium has intensified on a commercial scale, its world production has increased exponentially, and has been further intensified since the 2000s, as shown in the graph below.



Source: Lagos 2011

However, international lithium prices - which are published by major producers and traded directly between buyers and final users with industry groups and governments, with no terminal market and virtually no spot market for third parties - is not keeping up with this high rate of world production growth. As the world's production increases, lithium carbonate prices register oscillations and a decoupling with their production.

Evolution of lithium carbonate prices (1953-2008)



Source: Libertad y Desarrollo 2012.

The behavior of prices between 1953 and 2009 should be noted. Between these years, the price of lithium increased only by less than 20% than the United States CPI (Libertad y Desarrollo 2012). That is, international prices show a weak growth in current dollars, and even drop when considering the base-year of 2008.

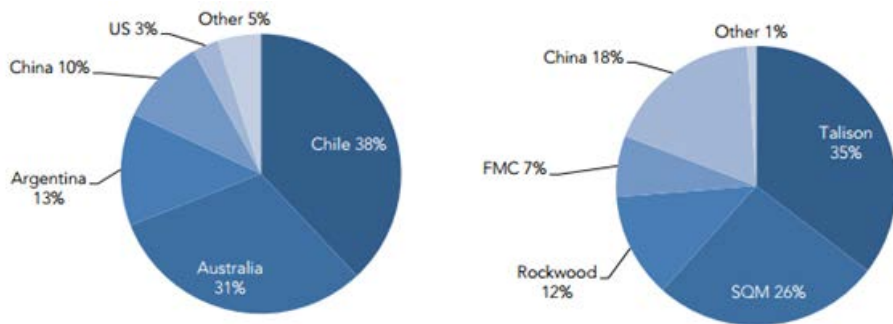
In the early 1990s, the average lithium carbonate prices were \$4,000/t, decreasing to \$1,600/t for several years, especially when Chile's SQM - Sociedad Química y Minera de Chile S.A.- entered the market in the mid-1990s. From the 2000s, as demand increased, the price of lithium gradually increased to a peak of \$6,500/t in 2008. In 2009, prices were driven by the global crisis, and since then, relatively stable at \$5,000/t. The forecast is that, in the coming years, prices will be stable, at approximately \$6,000/t, and forecasts of increase depending on the new market structure (Cormark Securities Inc. 2011).

From the graph above, five geopolitical facts can be presented as conclusions regarding international lithium prices: 1 – a change from a duopoly production of the lithium market to the mid-1990s, when SQM was introduced - which explains in part marked prices fall in the second half of the 1990s - and the Australian Talison in 2007; 2 – still in the 1990s, the large-scale development of resources in lower-cost salt flats, such as in Chile and Argentina, by SQM, Germany's Rockwood and the US FMC, modified the world's lithium supply by reducing the prices, including closing down operations in other parts of the world that had higher costs, such as the US,

Russia and China, and, in a certain extent, also explain the downward price curve in the mid-1990s; 3 – with the 2008 crisis, international prices decelerate the upward trend seen in the early 2000s with the increase in demand, with a slight reduction but, later on, its upward trend was resumed; 4 – from 2010 onwards, and in the médium and long term, the world trend will be of a strong increase in demand influenced by Asia, whose main supply will be from Australia - due to its geographical proximity -, Argentina, Chile and from new economically viable sources. In other words, the marginal cost of supply will be an important factor for the basis of international lithium prices in the coming years; and 5 since 70% of the world's ore reserves are in South America, with lower costs and higher purity, this set of three countries will play an important role in establishing prices.

Thus, in terms of global offer, four countries account for 92% of supply (Chile 38%, Australia 31%, Argentina 13% and China 10%) and four companies concentrate 80% of this supply (Talison 35%, SQM 26%, Rockwood 12% and FMC 7%), as shown in the image below.

Lithium supply by country (2011) and lithium supply by producer/company (2012)



Source: Fox-Davies 2013.

The Australian Talison Lithium is the world's largest lithium producer, supplying approximately 35% of the world's lithium market and the dominant high purity glass and ceramics industry, as well as being the main supplier of lithium carbonate for the Chinese market⁴. In South America, it has a

⁴ According to USGS data, the largest Australian mining company invested heavily in 2012 in order to double its capacity of production. The goal is to supply the growing Chinese demand for high quality spodumene for the production of chemical components. The estimated growth of the consumption of concentrates was estimated by 7.5% to 10% from that of 2011 and an

project under development in Salares 7, located in Region III, Chile (Cormark Securities Inc. 2011).

In 2014, the Chinese company, Chengdu Tianqi Industry Group Co. (Tianqi), a joint stock company leader in producing lithium-based chemicals, agreed to purchase Talison with the support of the Chinese government, holding 51% - the other 49% owned by Rockwood⁵. Since 1997, with the help of banks, government departments and other partners, Tianqi's economic aggregate has maintained a steady growth of 40% a year⁶. With ambitious plans to meet growing demand, the company is fast becoming a leading international company in new energy and new materials, among which lithium appears as one of its priorities.

In the salt regions, three companies stand out: the Chilean SQM (Sociedad Química y Minera de Chile SA), Germany's Rockwood Holdings (which includes Chemetall from Germany since 2004, Cyprus Foote from the US and SCL from Chile) and the American FMC Corporation. The SQM owns the largest market share in salares, with 26%, from its production in Salar de Atacama (Chile). Rockwood comes next with a 12% stake, from plants in the Salar de Atacama with Sociedad Chilena del Litio Ltda – SCL and Silver Peak in Nevada, United States. Third, the FMC, with operations in the Salar del Hombre Muerto (Argentina), representing 7% of the market. Of these companies, FMC and Rockwood use the largest portion of their lithium production internally for the production of value-added chemicals, leaving SQM the supply of the majority of lithium carbonate consumed directly by final users.

In January 2015, the North American Albermarle Corporation completed the acquisition of the German Rockwood Holdings⁷ in a cash and stock transaction worth approximately \$6.2 billion. This combination reflects the creation of one of the largest specialty chemicals companies in the world, with market leadership positions in a number of industries segments, including lithium.

The key-challenges for both countries and producer companies in the coming years should include: expansion projects for their plants to meet growing demand, reduction of operational costs (such as increased output,

intensification of the research and extraction in subsurface brines was noticed (United States 2013).

5 http://www.businesswire.com/news/home/20140528005569/en/Rockwood-Completes-Acquisition-49-Interest-Talison-Lithium#.VPSw2_nF8RE

6 <http://www.tianqigroup.cn/en/Index/aboutus.html>

7 <http://investors.albermarle.com/phoenix.zhtml?c=117031&p=irol-newsArticle&ID=2006949>

factory productivity and technological capacity), investment and development projects in old and new plants, updating of regulatory frameworks and jurisdiction in producing countries, updating of the market for acquisitions and mergers of companies, constant and quantified updating of the state of the global market for electric vehicles and observation of the world geopolitical environment related to the ore.

The lithium-producing companies boil down to the big four: in Chile and Argentina most of the global supply of lithium in saltwater with SQM, Rockwood and FMC accounts for 46% of total lithium production. Talison supplies 34% of total lithium production and a near monopoly (65%) of the production of lithium mineral (spodumene) (Cormark Securities Inc. 2011).

Regarding the global demand for lithium, total lithium consumption growth averaged 6.4% per year between 2000 and 2012. From 2012 to 2017, the annual average lithium consumption growth in the world should be approximately 11%, driven by demand for batteries, which grew on average 21% per year between 2000 and 2012 and is expected to grow 200% by 2017, reaching a market of US\$9 billion in 2015, with potential to exceed US\$50 billion by 2020 (United States 2012).

The Asian technology companies continue to invest in developing lithium operations in other countries to ensure a stable supply for their battery industries. China, Japan and South Korea are currently responsible for 85% to 90% of global lithium-ion battery production and 60% of world lithium consumption, with 24% of Europe and 9% of the United States. These three Asian countries, therefore, are generating a high growth of future lithium demand. In 2011, China became the main consumer, with 33% of the world's total consumption, with forecasts of consuming almost 50% worldwide in 2020 (United States 2012)⁸.

8 "Lithium battery production in China increased from units worth US\$2.1B in 2007 to units worth US\$5.4B in 2011. RIS have reported an annual demand growth forecast of 11% from 2011 to 2017, this being dependent on the uptake of hybrid electric vehicles ("HEVs") and electrical vehicles ("EVs")" (Fox-Davies 2013).

Lithium exports by destination country – 2012⁹

CARBONATO LITIO			CLORURO LITIO			HIDRÓXIDO LITIO		
País	Mill US\$	% Particip.	País	Mill US\$	% Particip.	País	Mill US\$	% Particip.
Corea del Sur	65,7	26,6	China	17,2	57,5	Bélgica	10,2	35,8
China	53,2	21,5	EE.UU.	11,6	38,6	EE.UU.	9,7	34,0
Japón	46,9	19,0	Francia	1,2	3,9	Corea del Sur	3,4	11,9
Bélgica	33,5	13,6	---	---	---	Singapur	1,0	3,6
EE.UU.	20,7	8,4	---	---	---	Argentina	0,9	3,3
Otros	27,0	10,9	Otros	0	0,0	Otros	3,2	11,4
TOTAL	247,0	100,0	TOTAL	30,0	100,0	TOTAL	28,4	100,0

Fuente: Cochilco 2013.

China has announced its intention to become a world leader in the manufacture of hybrids and electric cars, turning itself into a major player in the lithium market. Thus, in order to ensure strategic supply of non-renewable resources and to meet growing domestic consumption, the Chinese government established a sovereign fund, the *China Investment Corporation*, in 2007, with an initial portfolio of assets of 200 billion dollars, to support Chinese enterprises' initiatives for the acquisition of unexplored deposits and exploration projects in any part of the world. The Chinese State has supported foreign investment by Chinese enterprises through the implementation of regulatory frameworks for direct and indirect subsidy investments and by providing concessional financing in the form of credit lines and low interest rate loans through financial institutions owned by the State^{10 11} (Lagos and Peters 2010, 18). In addition, as part of its Five Year Plan (2012-17), the Chinese government will spend about US\$ 15 billion to further promote the development of electric vehicles by Chinese companies, with much of that investment

9 Among the main applications of basic products associated with lithium are: lithium carbonate (elaboration of compounds for Li-ion batteries, glass and ceramics, chemicals and adhesives), lithium chloride (air conditioning and aluminum applications) and hydroxide Lithium (lubricating greases and Li-ion batteries).

10 "Added to the acquisition of assets abroad, with the same purpose of securing the supply of these resources, Chinese companies were able to extend loans to investors of mining and hydrocarbon industries either/or generating long term supply contracts" (Lagos and Peters 2010, 18). This Chinese geopolitical strategy created some concerns regarding the possibility that China could control the flow of natural resources, gaining preferential access to production and enlarging its control of the extraterritorial industries of the world.

11 "Nowadays, the China Daily has a weekly European edition and, in May 2011, it published five pages, including the front one, dedicated to the issue of electric cars. The newspaper discussed the probable future demand for cars in China, mentioning the Ministry of Industry and Information Technology Industry interest in reaching, until 2020, more than 200 million vehicles registered, well above the 70 million ones of 2011. The government announced its commitment to spend nearly US\$ 15 billion in the next decade to boost the development of electric cars" (O'Neill 2012, 138).

focused on advanced lithium battery research (Klare 2012, 169).

American automobile companies have also set hybrid and electric car manufacturing goals as crucial to their long-term prosperity. In 2009, of the government's economic stimulus package, about US\$ 940 million was attributed to lithium-battery producers and their suppliers (Klare 2012, 169). As part of this stimulus, Rockwood received US\$ 28.4 million from the United States government for the expansion of its existing lithium carbonate plant in Nevada and to build a new lithium hydroxide plant in North Carolina¹².

In 2012, total exports of lithium compounds in the United States decreased slightly compared to 2011. About 52% of all US exports of lithium compounds went to Japan, 17% to Germany, and 7% to Belgium. Imports of lithium compounds into the United States decreased by 3% in 2012 compared to 2011. Of these, 59% came from Chile and 38% from Argentina (United States 2012).

The market for small batteries (calculators, computers, cameras, communication devices, etc.) is expected to maintain high levels of growth (10% per year), accounting for around 27% of world lithium consumption in 2012, a significant increase to previous years (15% in 2007 and 8% in 2002). The emerging market for large batteries for electric bicycles, hybrids and all electric vehicles is expected to grow substantially (up to 28% p.y.) by 2020, gaining greater market share. Electricity storage networks are also an emerging market for large lithium batteries, with applications for solar and nuclear reactors in the near future. Lithium salts are used intensively as fluids in concentrated solar power plants (CSP), which has a growth estimate of 1.5GW in 2010 to 25GW in 2020. Thus, the total demand for lithium in batteries (all types combined) revolves around 65% of total consumption by 2025 (Fox-Davies 2013).

Demand for lithium batteries

Application / Tonnes LCE	2011	2025	CAGR 2011-2025
Batteries for Portable Devices	30,416	111,176	9.7%
Batteries for Grid	500	7,500	21.3%
Batteries for Hybrid and Electric Vehicles	6,967	204,901	27.3%
Other Lithium Applications	91,400	174,994	4.7%
Total Lithium Demand	129,283	498,571	10.1%

Source: Fox-Davies 2013

¹² <http://www.carcelen.cl/upload/docs/Litio%20Amcham%20March%202011.pdf>

Several companies in the automotive industry are performing operations to supply their lithium demand for electric car batteries. The EVs capture will be the focal point of growth for the industry, where companies like Toyota, Nissan, Ford, GM, Tata Motors and Volkswagen are just a few. Toyota, for example, expects to increase its production of lithium batteries by up to six times, including establishing a joint venture with Orocobre in a brine project in Argentina (Fox-Davies 2013). Likewise, the Volkswagen Group, which starts these operations in 2012, has established partnerships with battery manufacturers to start mass production of the same (United States 2012).

It is noteworthy that the international projections regarding the essentiality of lithium for this new branch of technology are difficult to predict, besides specific characteristics of the batteries themselves, whose challenges need to be taken into account¹³. However, there have been a large number of government incentive programs worldwide to advance the development, production and use of electric and hybrid cars. Despite the short-term uncertainty regarding the growth of lithium batteries in the electric vehicle segment, it is believed that the reduction of carbon emissions by governments and consumers, as well as significant investments in new transport battery technology, will provide the growth of a significant future demand for lithium. However, there have been a large number of government incentive programs worldwide to advance the development, production and use of electric and hybrid cars. Despite the short-term uncertainty regarding the growth of lithium batteries in the electric vehicle segment, it is believed that the reduction of carbon emissions by governments and consumers, as well as significant investments in new transport battery technology, will provide the growth of a significant future demand for lithium.

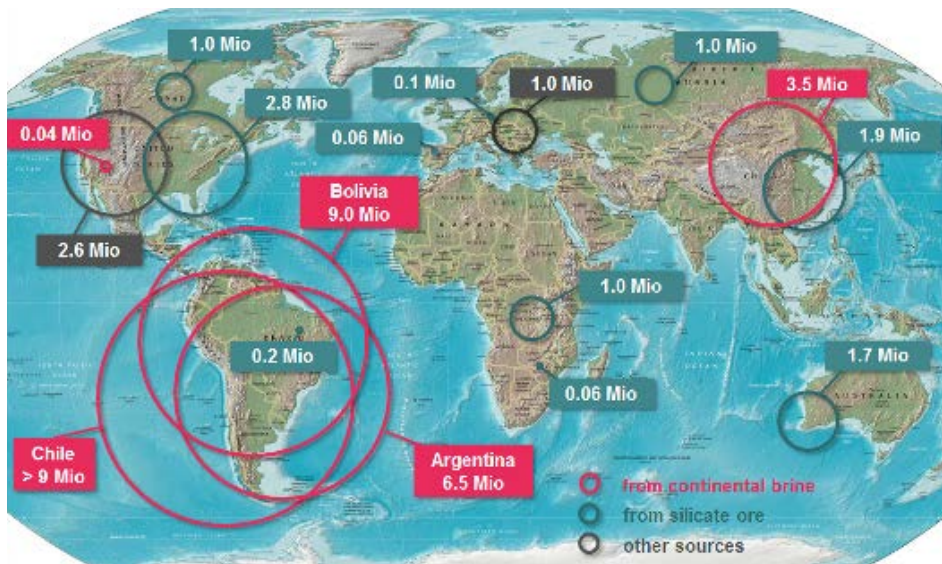
In this way, lithium possibly forms part of one of the changes in the world energy matrix, whose dimension is still uncertain, given that the substitution of oil as the main strategic resource is not yet evident and will persist in the medium term (Palacio 2012, 11). In an optimistic scenario, the electric car would take center stage and could, according to its supporters, break the dominance of oil transport, generating a positive environmental impact and

13 "Batteries still have to be smaller, weigh less, charge faster and last longer with a single charge. They also need to prove that they can last longer despite continuous loads and recharges. They will have to show that problems of 'thermal leakage' - destructive overheating - will not happen. [...] And the cost must decrease substantially [...] Infrastructure is the second challenge. The current automotive system could not function without the vast network of gas stations built over many decades. A new fleet of electric cars will need a network of similar recharging stations" (Yergin 2014, 727). Among other factors, it could add to the lack of standardization in the size of EV and PHEV car batteries and the cost Relatively acceptable to be a mass product, not a niche product.

helping to reduce pollution by offsetting the carbon emissions that precipitate climate change, since the electricity that makes the electric car work can be generated from several sources, and may or may not be petroleum of them. In addition, it could offer a response to the increase in the fleet of automobiles from one to two billion and represent a totally alternative route to the global energy system. “The result will have a huge impact both in terms of economy and in terms of geopolitics” (Yergin 2014, 712).

With lithium carbonate being one of the lowest cost and most relevant components of a lithium-ion battery, the main issue to be addressed is the safety of lithium supplies from different geographic sources. Thus, the high demand for lithium at the beginning of the 21st century encouraged the prospection and exploration of 90-120 new reserves, distributed in more than 11 countries, as shown in the figure below.

Worldwide distribution of lithium reserves (in million tonnes)



Source: United States 2014.

Although at first glance the geographical division of lithium in the world encompasses all continents, its concentration in absolute terms is predominantly located in South America, but specifically in the Andean region of the continent, the so-called “lithium triangle”.

In this region, the feeling of isolation determined by its peripheral location in the southwestern portion of the continent, by highly hostile top-

ographic and climatic environments (Kelly 1997, 67) and the distance from neighboring states and access to the sea, are geopolitical characteristics of the triangle. The isolation does not translate into security or the lack of interest of multinational companies and foreign countries, who are trying to reach their feet in the region. Also, according to Klare (2003,41), another worrying factor regarding the supply of vital materials, such as lithium, would be the fact that their location is shared between three countries and in neighboring regions, where in a small space they have different three different jurisdictions.

Triangle of Lithium in South America



Source: own elaboration, from site map <http://triangulodelitio.com/>.

Distribution of companies in the triangle of lithium



Source: <http://www.talisonlithium.com/sfimages/salares/salares-map.jpg>.

Yet, it is also reiterated that “the location of the so-called lithium triangle is a disadvantage since the geographic concentration of lithium production is going to exacerbate the tense geopolitical relations between Latin Americana and the US” (Tahil cited in Palacio 2012 , 27). In other words, despite the geographical difficulties, the triangle is one of the most promising lithium fields in the world, both because of its concentration in a relatively small space and because of its availability and purity that are superior in this region. This leads to long-term planning, as promoted by the main stakeholders; of these, all four major lithium companies in the world have a portion of exploration in the region, as can be seen in the image below.

Thus, the region that corresponds to the salares (salt regions) of Hombre Muerto, Atacama and Uyuni, the so-called *triángulo del litio*, or *Saudi Arabia of lithium*¹⁴, is considered highly strategic for the new stage of capitalist accumulation and for the reproduction of its mode of production. This new South American ABC, therefore, is part of a new competitive world pressure that tends to be further accentuated by the increase in the world demand for the resource.

In geopolitical terms, it appears that South America has generally been embedded in world competitive pressure where some regions, such as the lithium triangle itself, “must become international ‘zones of fracture’, and there may arise conflicts and rebellions” (Fiori 2014, 161). In addition, the geopolitical study of *the oro gris* (gray gold) allows us to analyze the construction of different national strategies, public policies, institutions and regulations of the three countries with reservations in South America - Argentina, Bolivia and Chile -, their internal and international disputes and the connections between internal and external actors, connecting the national, regional and global perspectives.

For a Geostrategy of the lithium ABC

One must understand, analyze and use geopolitics as “a strategic and normative knowledge that evaluates and redraws one’s own geography from some specific, defensive, or expansive power project” (Fiori 2014, 141). These power projects should seek to leverage regional development in South America anchored in a political symbiosis (progressive and autonomous), economic (productive, commercial and technological), social (reduction of regional asymmetries and inequalities) and geopolitical (international political and economic expansion).

Thus, it is verified that the viability of a geostrategy of the lithium ABC is one of the pillars of a regional integration project focused on strategic natural resources. However, it should be noted that, in pursuit of this geostrategy, these states must systematically “disregard” the rules, institutions, and coercions of markets and all the great centers of power that are against their political-economic emancipation, going against the “institutional established order and the great geopolitical agreements on which it is based” (Fiori 2014, 276). By prioritizing joint geostrategic interests that, although unilaterally, are at first contradictory - as in the case of the geostrategic conception of Argentina directed towards the Atlantic, of Bolivia without access to the sea

14 http://www.forbes.com/fdc/welcome_mjx.shtml

and of Chile facing the Pacific, for example - can become a cohesive element of changing their relative positions within that system.

Nowdays, it can be seen that the strategies related to lithium in the three countries are different. In Argentina, companies and the state boost industrialization with private capital, which is questioned by the residents directly affected; in Bolivia, the strategy is based basically on the form of financing of the state project, proposing its control by the state; and in Chile decisions to allow private participation in the exploitation of lithium are limited to the scope of the state - but not controlled by it - with a class between the government and the opposition political parties (Palacio 2012, 17).

It can be seen that in Argentina and Chile there is a predominance of foreign capital, a situation similar to the extraction of other strategic metals. These capitals, which have been investing more and more in the last 15 years and are positioned in specific areas, now have practically all the proven lithium reserves. In addition, most of these extractive companies have direct links with automotive or highly lithium-demanding companies.

A different case is found in Bolivia, where a policy of corporate alliances with popular organizations and other social subjects is implemented, in which the government situates itself in the debate in a position to the left of its neoliberal critics, giving legitimacy to its discourse before the national projects. However, neighboring nations do not share the thinking of economic independence that prioritizes resource-bearing nations. They end up undermining Bolivia's sustainable development opportunities in the region by offering large amounts of lithium to foreign miners at a much lower cost than Bolivian, since the basis of Argentina's mineral exploitation model and in Chile it embraces the old capitalist patterns of exploitation of natural resources, "in which profits accumulate in the hands of the holders of capital, while the exploited region is degraded, it does not develop and its workers live in absolute misery" (Wright 2010).

As can be seen in the specific case of Bolivia, the reaffirmation of lithium for "energy sovereignty" and as a "strategic resource" - in this case also for Chile - manifests itself in different dimensions: control of the actual exploitation of resources, extracted volumes and possibly exported, investments in exploration and transport infrastructure; the sharing of profits from the activity; utilization of resources obtained from economic and social development projects, as well as the quest to stimulate new productive chains based on an endogenous industrialization of lithium.

It is observed that the global geostrategy of lithium is in full phase of accumulation and concentration of capital, ratified by the acquisitions, fusions and joint ventures of several companies of the branch. This fact does

not exclude South America from this process, where these companies have operations and control a large part of the region's lithium reserves and production, in accordance with the strategic plans of its foreign parent companies. At the same time, the conclusion that, in the near future and with full production, Argentina, Bolivia and Chile will manage the lithium market, it leads to a discussion about strategic planning based on this resource.

The regional economic development can not be understood and explained in isolation or from unique and exclusively endogenous factors. As Fiori (2014, 37) states, "economic development followed strategies and followed paths that were designed in response to major systemic challenges of a geopolitical nature". Aligning coalitions of interest, class or government, a power bloc that responds to these external challenges through strategies and policies of long-term economic strengthening, that calls for changes "in the rules of management of the world system and in its hierarchical and unequal distribution of power and wealth" (Fiori 2014, 35).

For Medeiros (2013, 157-158), a national strategy - and, from the present work, concomitantly regional - is called "nationalism of natural resources", which encompasses a political dispute involving power over resources and energy security of producers and consumers. Medeiros affirms that the control and coordination of natural resources must be carried out by the state in a state strategy of development and reconstruction through nationalization of natural resources that engenders political and fiscal autonomy for states in relation to private and international interests, involving complex geopolitical challenges. Thus, this strategy would be based on the "exploitation of industrial possibilities along the value chain of natural resources" (Medeiros 2013, 164), although with great challenges, such as the "great dependence on its unstable prices, its structural financial vulnerability and the constant challenges created by technical progress" (Medeiros 2013, 165).

Among the other challenges, we can mention the "weakness of the connections between capital accumulation, technical progress, structural change and institutional evolution" (Medeiros 2013, 150). In other words, a natural resource-based development can generate a particular social structure of accumulation that can block structural change from the moment that economic growth can be achieved without new technological structures not modifying the macroeconomic problems that dominate the economic policy agenda, the institutions and the state.

Bruckmann defends the need to think about cycles of scientific-technological innovation and economic cycles in relation to the use, transformation, appropriation and consumption of natural resources, allowing to evaluate the trends of mineral consumption in the world economy. Thus, according

to the author, it is currently a clash between two development models based on strategic natural resources:

one based on the planning and sustainable use of natural resources aimed at meeting the needs of the majority of social actors; and the other based on the violent and militarized exploitation and expropriation of these resources and the social forces and peoples that hold them (Bruckmann 2011, 198).

In this way, the search, planning and protection of strategic natural resources becomes one of the primary security functions of the state. Some scholars argue that export limits seek to encourage foreign firms to set up their high-tech manufacturing operations requiring rare earths in Chinese territory (Klare 2012, 158-159), thus establishing a virtuous cycle for the country's poorest regions, where the largest reserves are located. That is to say, if such control over resources and export restraint were adopted as a joint policy of the three countries, the positive consequences might resemble those of the Chinese initiative.

As Kelly (1997, 159) points out, "major domestic groups have come to recognize that without South American integration, local economies could be exposed to a global 'marginalization'". In other words, cooperative and unifying orientation in the form of integration, the realization of autonomous and sovereign regional blocs are presented as a practical way for the new reality of the region in international relations. In fact, internal cooperation, rather than conflict, emerges prominently in contemporary South American geopolitics.

Conclusion

In the present work geopolitics was the method used for studying the international political economy of the South America countries, focusing on strategic natural resources, specifically lithium.

It is well known that even if we go to South American peripheral geopolitical studies, the world's great centers of power also make systematic prognoses about geopolitics in South America and the world, and undoubtedly geopolitical shocks are present in the international arena. The accumulation of power and wealth lies at the heart of the matter, and so understanding the geopolitical configurations of the region is fundamental.

In sum, the set of five proposals outlined below covers guidelines for a geopolitics of strategic natural resources in the region. Thus, in the specific case of lithium, these initiatives should be discussed jointly by the three countries, thus conforming a regional geopolitics of lithium:

- *Regional security planning and resource protection*: strategic security of natural resources should be part of a regional project, with state technical agencies, particularly the armed forces, obliged to defend these new natural sources in native soil. This will be all the more important when the lack of energy, water, raw materials and food on the world stage worsens. From this hypothetical international scenario, a vital objective is the intensification of the South American armed forces, within the framework of the South American Defense Council of Unasur, in order to have a dissuasive-strategic capacity;

- *Endogenous industrialization policy*: the geopolitics of lithium in the region provokes the need to elaborate a regional lithium industrialization policy that moves the production of rechargeable batteries of portable electronic devices and electric cars from Southeast Asia to South America. This policy should be planned continentally, determining which productive sectors of the South American system could gain international competitiveness, transforming them into sectors of collective interest of all the countries that conform the area of integration, appropriating scientific and technological research in relation to the mineral and developing its entire cycle, from mining to local industrial development, achieving an industry with high added value;

- *Participation in the establishment of international prices*: once the region has a large concentration of the world's reserves of strategic resources, it has ample capacity for negotiation and international price formation. Since Argentina, Bolivia and Chile control almost all lithium reserves, the three nations could set up an organization similar to that of oil-producing countries, with the capacity to take measures that in the future, will influence the regulation of metal prices;

- *Effective national public governance of natural resources*: such prerogative involves regulatory, fiscal, macroeconomic management, strategic planning, formulation and implementation of public policies. Thus, countercyclical mechanisms should be institutionalized in the face of the inherent volatility of the international prices of primary products exported by the region, increasing the progressiveness of the state's participation in farm income - especially in the cycles of high prices - in order to develop mechanisms to ensure efficient public investment of income derived from the exploitation of natural resources in education, health, infrastructure, innovation and technological development, as well as their equitable distribution among social groups and levels of government;

- *Measuring environmental and social impact*: to manage and effectively measure the socio-environmental conflicts that inevitably arise during the development of the natural resource sectors, calculating compensation rates, environmental recovery strategies and reducing negative externalities.

Managing natural resources is a dynamic process and requires careful monitoring. Information and knowledge are fundamental sources of policy and decision making, so it is imperative to create tools to move in that direction. The continuing and systematic research is needed to deepen the study and knowledge of the various dimensions that involve the use of natural resources as a basis for the integral development of the region.

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ABSTRACT

This article investigates the hypothesis that lithium is one of the most strategic natural resources, whose world reserves, quantitatively and qualitatively, are concentrated in the South American region. Thus, this article presents a geopolitical analysis of lithium in order to define geostrategic possibilities for South America.

KEYWORDS

Geopolitics; Lithium; South America.

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