

lithium

Raw material profiles



Table 1: Development of supply and demand (2018).

Offer (2018)			
Production Germany	Mine Production: No Refined Production (Secondary): nb	Refined production: na Recycled content: na	
production worldwide	Mine production: 57,000 t	Refined production: nb	
Regional concentration of global mining production	Top 4 countries	Portion	country risk
	Australia	45%	1.58
	Chile	28%	1.01
	China	13%	- 0.31
	Argentina	11%	- 0.01
	Percentage of top 4 countries	97%	
	Herfindahl-Hirschman Index	3,084 (high)	
	Weighted country risk of funding (GLR 2018)	+ 0.96 (low)	
inventories worldwide	Probable Resources: 14,500,000 t		
Regional concentration of world reserves	Top 4 countries	Portion	country risk
	Chile	52%	1.01
	China	22%	- 0.31
	Argentina	14%	0.01
	Australia	11%	1.58
Entrepreneurial concentration of mining promotion	Herfindahl-Hirschman Index: nb		

Demand (2018)		
refinery consumption	Germany World	nb nb
Import Germany	Lithium carbonate (t)	5,980 tons
	Lithium hydroxide, oxide (t)	-
	Lithium chloride (t)	441t
	Mineral concentrates (t)	nb
	Lithium-ion batteries (pcs)	201.800.124
Export Germany	Lithium carbonate (t)	2,615
	Lithium hydroxide, oxide (t)	-
	Lithium chloride (t)	-
	Mineral concentrates (t)	-
	Lithium-ion batteries (pcs)	97.112.405
German producers and processors	Schott AG, BASF SE, VARTA AG, automobile manufacturers	
use	Most important application in the field of rechargeable batteries (e-mobility, e-storage for regenerative energies, 3C applications, power tools). Second most important branch of use: ceramics, glass-ceramics and glass. Other applications of lithium in the field of: lubricants, casting industry (continuous, moulding), polymers, air treatment, non-rechargeable batteries and electrolysis (aluminum). Highly specialized applications: electrical engineering (lithium niobate), nuclear technology (Li-6 isotopes), textile industry (lithium acetate, lithium hydroxide), cement industry (accelerator), fireworks (lithium nitrate), pharmaceuticals, chemical industry (organic lithium compounds) and water treatment (lithium hypochlorite).	
future technologies	Alloys for lightweight airframe construction, lithium-ion high-performance electricity storage for cars	
substitution	In modern lithium-ion batteries, lithium cannot currently be substituted due to its specific properties.	
particularities	Highest melting boiling point among the alkali metals. Highest enthalpy of hydration among the alkali metals. Very reactive. Highest standard potential of the base metals.	

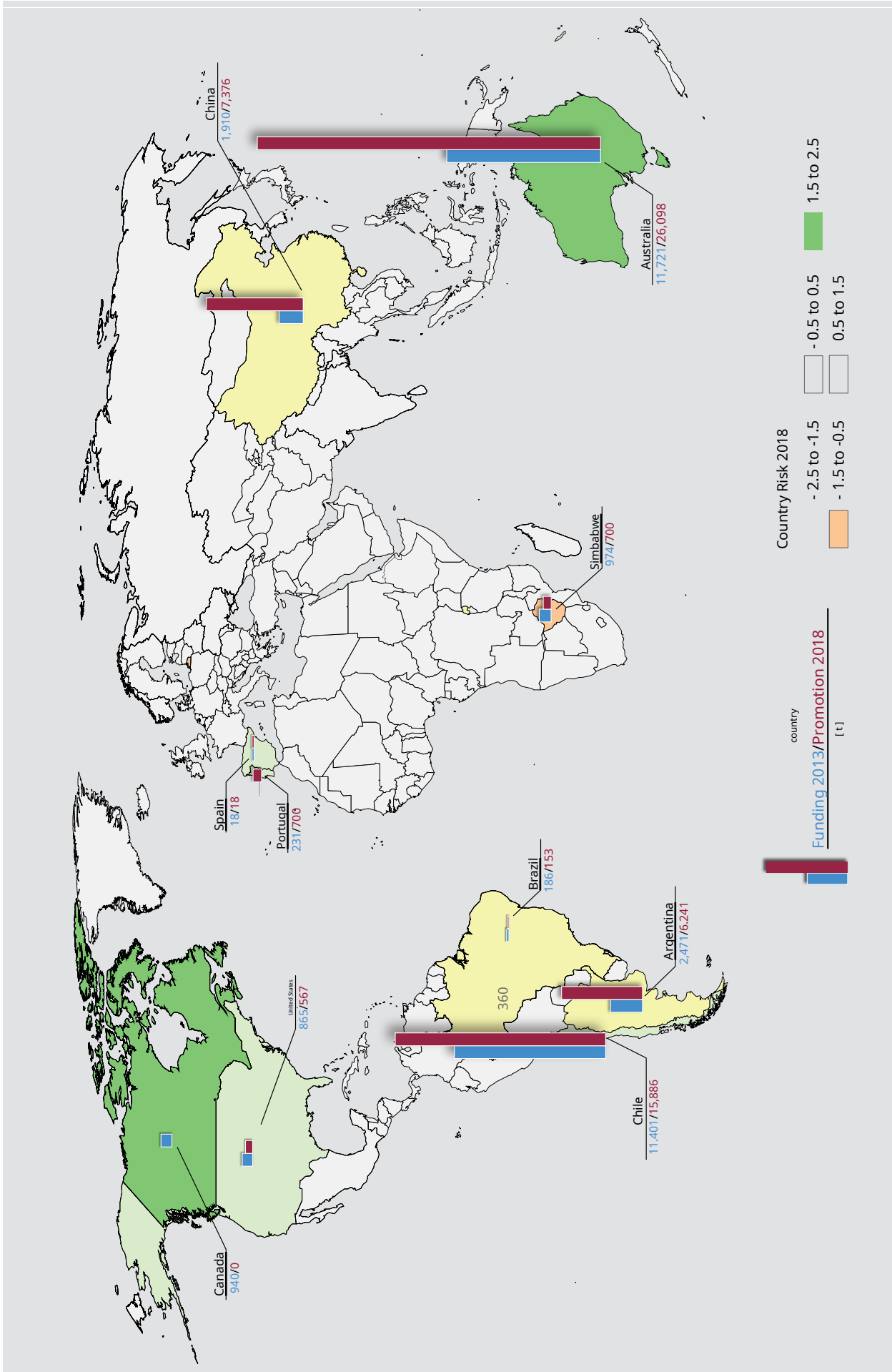


Fig. 1: Distribution of mining subsidies (as of 2018).

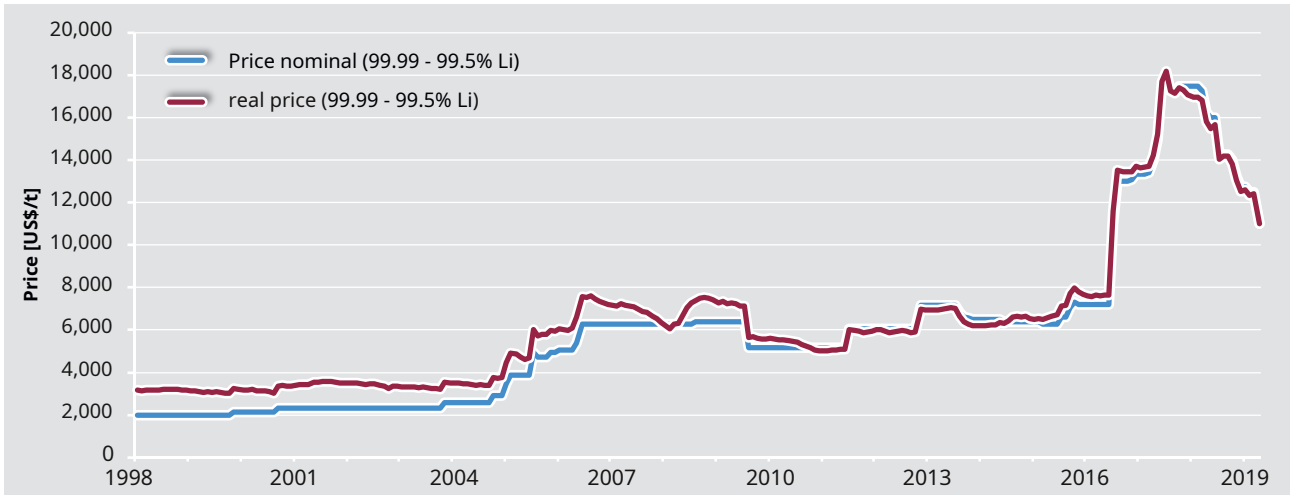


Fig. 2; price development.

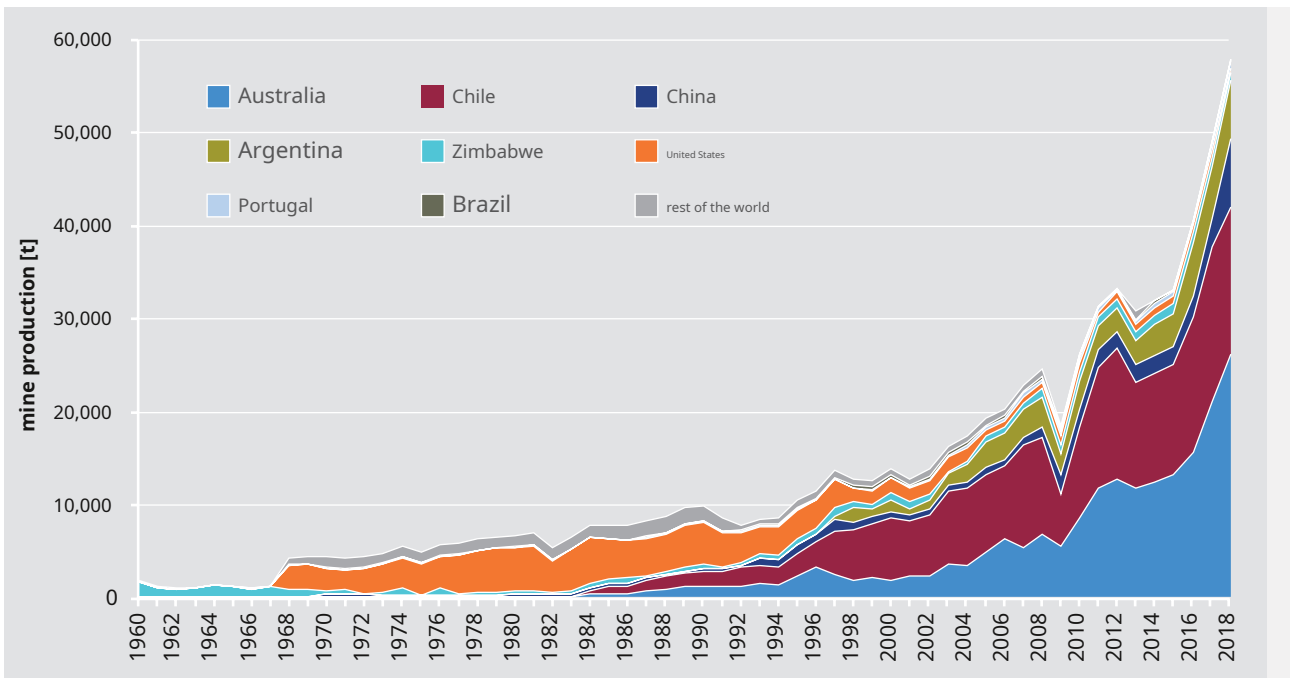


Fig. 3: Development of mining production.

Table 2: Mining production growth rates by country (as of 2018).

Average growth rates of mine production in %					
	1960 – 2018	1960 – 1984	1984 – 2018	1984 – 2009	2009 - 2018
Australia	21.7	32.9	14.3	12.7	18.9
Chile			11.5	11.2	12.3
Argentina	13.5	- 5.6	29.3	36.3	11.7
China			10.1	8.3	15.5
Zimbabwe	- 1.4	- 5.2	1.5	3.4	- 3.6
United States	16.1	57.0	- 6.2	6.4	- 5.7
Portugal			25.1	33.0	5.4
Brazil	6.5	6.2	6.7	13.1	- 9.3
rest of the world	- 4.0	8.4	- 11.8	- 5.6	- 27.2
World	6.2	6.4	6.1	3.6	13.5

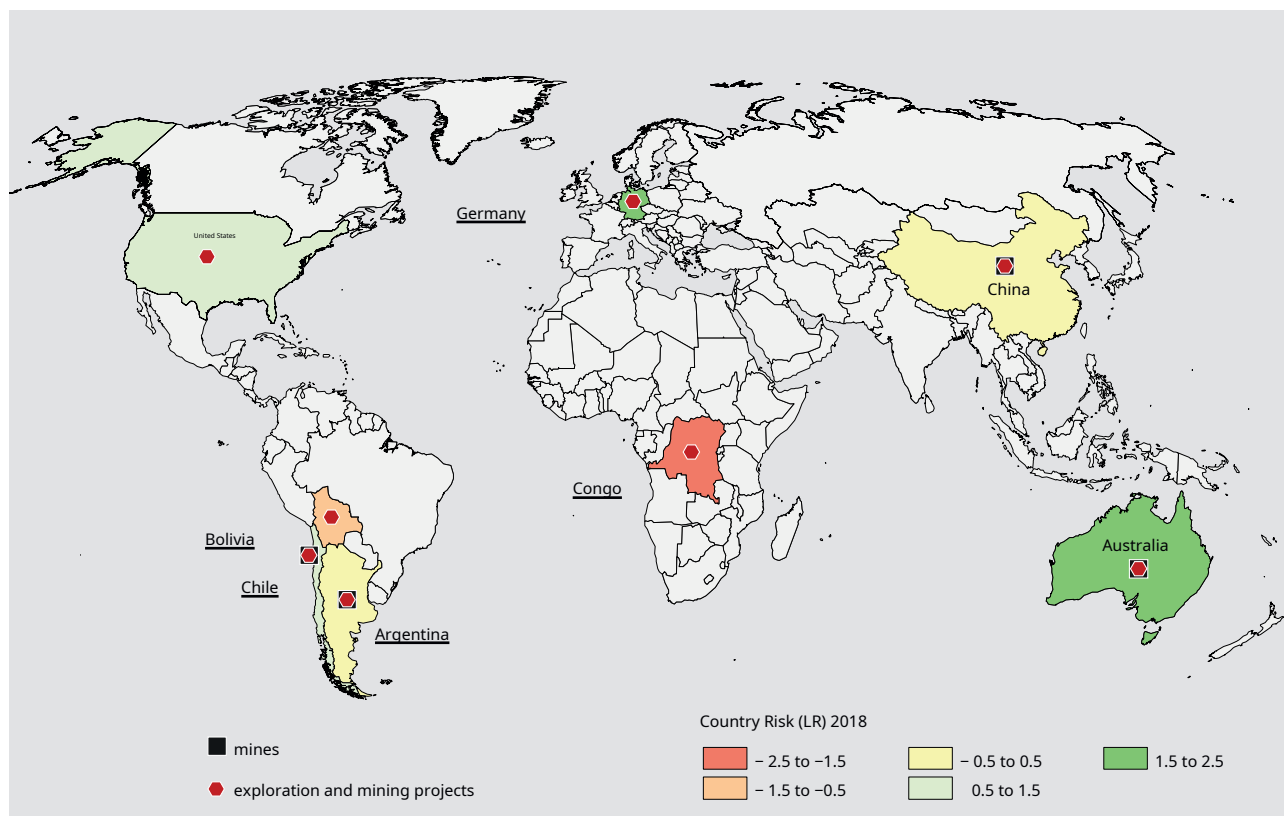


Fig. 4: Countries with the largest mines, exploration and mining projects (under construction or under economic assessment as of 2018).

Table 3: List of largest mines, exploration and mining projects (under construction or under economic assessment) in 2018.

Biggest Mines		
country	Surname	Ore reserves [t] reserves
Australia	Vodgina	825,920
	Greenbushes	799,008
	Pilgangoora	615,264
	Mt Cattlin	57,072
Chile	Salar de Atacama (SQM)	8,352,000
	Salar de Atacama (ALB)	556,800
China	Yichun	nb
Argentina	Salar de Hombre Muerto	835,200
Major exploration and mining projects		
country	Surname	Ore reserves [t] Reserves + Resources
Bolivia	Uyuni Salt Flat	18,096,000
Chile	Salar de Atacama (SQM)	8,352,000
United States	Bonnie Claire	5,352,840
Argentina	CauchariOlaroz	4,611,696
	Cuenca Centenario Ratones	1,853,958
Democratic Republic of Congo	Manono	3,071,680
China	Chaerhan Lake	2,598,400
Germany	volcano	2,479,106

glossary

Weighted country risk of funding	The weighted country risk of production (GLR) is calculated as the sum of the countries' shares in mine production multiplied by the country risk (LR). The weighted country risk usually ranges between +1.5 and -1.5. Values above 0.5 are considered low risk, between +0.5 and -0.5 the risk is moderate, and values below -0.5 are considered critical.
Herfindahl-Hirschman Index	The Herfindahl-Hirschman Index (HHI) is a key figure that indicates the entrepreneurial or regional concentration in a market. In the area of antitrust law, the index is used to prove the market dominance of providers. It is calculated by summing the squared market shares (in %) of all competitors. The index takes values between 0 and 10,000. In their "Horizontal Merger Guidelines", the US Department of Justice and the Federal State Commission define a market with an HHI below 1,500 as low and between 1,500 and 2,500 points as moderately concentrated. If the index is above 2,500, the market is considered highly concentrated. Further information at http://www.justice.gov/atr/public/guidelines/hmg-2010.pdf [as of May 26, 2020].
country risk	The World Bank evaluates the governance of more than 200 countries annually in a set of six indicators (Worldwide Governance Indicators, WGI). Evaluated are (1) voice and accountability, (2) political stability and absence of violence, (3) government effectiveness, (4) regulatory quality, (5) rule of law, (6) anti-corruption. The aggregation of the individual indicators results in the country risk (LR), which assumes values between +2.5 (theoretically best governance) and -2.5 (theoretically worst governance). Further information at https://info.worldbank.org/governance/wgi/ [status: 05/26/2020].
resources/reserves	Identified resources are proven, but not yet sufficiently explored, technically and/or economically unextractable quantities of raw materials. In the context of international reserve classifications, unidentified resources, so-called potentials, which exist from a geological point of view and with a certain probability, but have not yet been proven, are also taken into account. In the figures, the reserves are included in the quantities for the identified resources. A reserve is defined as the area of a deposit that has been explored with great accuracy and can be mined economically with current technical possibilities. Whether there is a reserve depends on the exploration status of the deposit, the raw material price and the state of the art. Further information at http://minerals.usgs.gov/minerals/pubs/mcs/2011/mcs app2011.pdf [status 05/26/2020].

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