LITHIUM VALUE CHAIN

ACF EQUITY RESEARCH

Lithium (Li) - Key Facts

- Li ranks 32nd in crustal abundance, 20ppm or 0.002% in the lithosphere, 28-30ppm in igneous and 53-60ppm in sedimentary rocks – recycling is particularly important.
- Li is the lightest metal (RAM 6.94), density (0.534 g/cm^3 – similar to pine wood) i.e. ideal for lightweight batteries.
- Li has the highest electrochemical potential of all metals providing high energy density for Li-Ion batteries.
- Li is also used in pharmaceuticals (bipolar disorder), high-performance alloys, glass and ceramics.
- Li is highly reactive and flammable, which makes it challenging to handle and transport.
- Li salts are hygroscopic – they readily absorb moisture from the air, critical for storage and handling.
- Li is extracted as a byproduct of geothermal generation.
- The price of lithium can be volatile, influenced by rapid shifts in supply/demand, tech advancements and regs.

Lithium (Li) - Value Chain

1. **Permitting, Exploration, Permitting, Mining & Extraction:** Mined primarily in Australia, Chile and Argentina. Direct Lithium Extraction (DLE) technology is emerging as efficient and environmentally friendly.
2. **Processing & Refining:** Once lithium is extracted, it is processed and refined into forms suitable (mostly) for battery manufacturers – impacting the purity and quality of the final product.
3. **Battery Production:** Lithium is transformed into functional lithium-ion batteries via cathode and anode manufacturing, electrolyte preparation and cell assembly.
4. **Recycling:** Lithium is recovered from used batteries through mechanical and chemical processes – reduces proportion of newly mined raw materials needed – it does not satisfy demand.
5. **Market Dynamics:** Li pricing (lithium carbonate) is influenced (dominated) by global demand for EVs and energy storage, regulatory and trade policies and technological advancements.

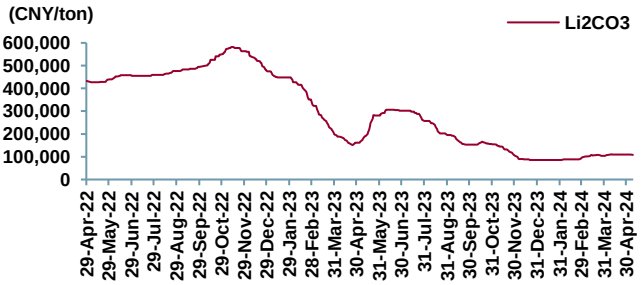
Lithium (Li) Mining Methods

Open-pit: Excavating large amounts of earth from surface mines to access and extract lithium-bearing minerals (e.g. spodumene).

Underground / Brine Extraction: Pumping lithium-rich sub surfaces brines to the surface, which are then stored in evaporation ponds.

Direct Lithium Extraction (DLE): Extracting lithium from brine using absorption techniques (e.g. ion exchange) to rapidly and efficiently remove lithium.

Lithium Carbonate 99%Min Spot Apr22 – May24



Source: UK Investing.

Applications of Lithium

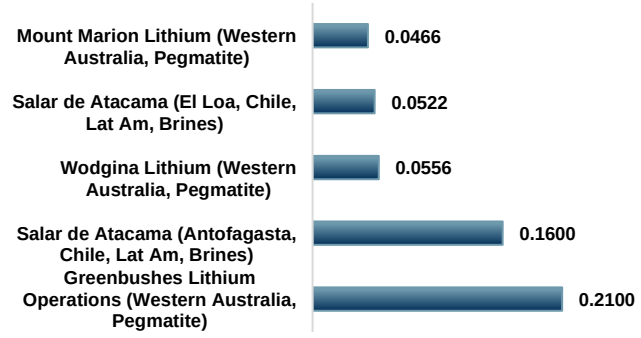
Batteries: Lithium is used in lithium-ion batteries for electric vehicles and energy storage systems.

Ceramics & Glass: Lithium compounds are used to enhance/improve strength and durability.

Lubricant Greases: Lithium stearate is used as a thickener in greases in automotive and industrials.

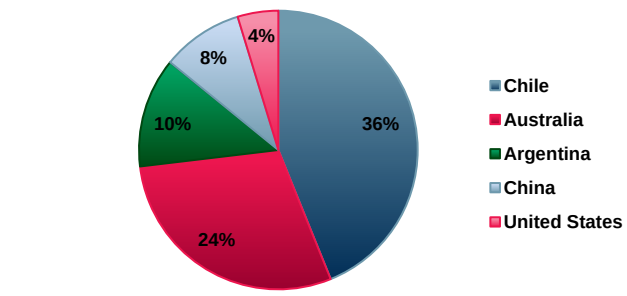
Medical: Lithium salts (lithium carbonate) are used in mood stabilizing drugs.

Top 5 Lithium Mines by Production 2023 (mtpa)



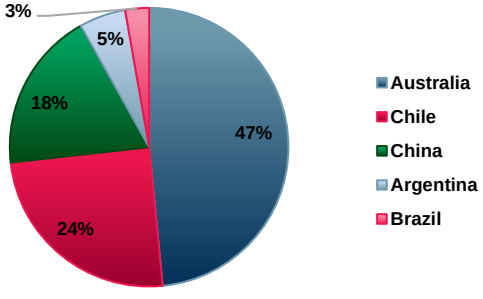
Source: Mining Technology, 2024.

Top 5 Countries - Lithium Reserves (tonnes)



Source: Government of Canada, 2022.

Top 5 Countries - Lithium Production (tonnes)



Source: Statista, 2023.