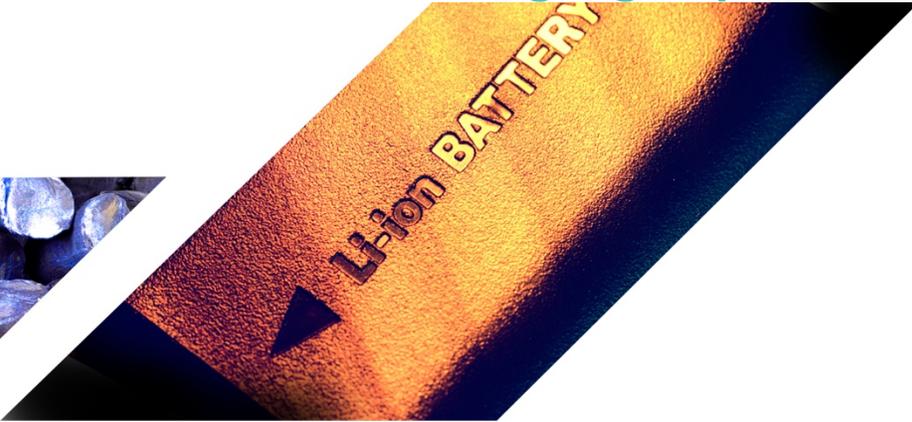




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BATTERY & CRITICAL METALS
Inside the Accelerating
Global Race for Lithium

BATTERY & CRITICAL METALS

LITHIUM DEMAND SET FOR 20+ YEARS OF RAPID GROWTH

Soft, light, and silvery white, lithium is an energy dense, battery component superstar. It's vital to the global energy transition, and it's the focus of a high-stakes race for economic dominance in this new age of green tech.

Lithium demand projections are universally robust. McKinsey & Company forecasts global lithium demand to increase 20% annually to 2030. Tesla suggests the company will need 1,000 kilotons of lithium carbonate equivalent (LCE) per year by 2030, or x16 its demand in 2022ⁱ, and leading battery analysts, Benchmark Minerals, see even greater growth all the way to 2050. By the IEA's estimate, the sector needs up to 50 new mines in less than a decadeⁱⁱ – a big ask considering the supply side dynamics.

Lithium is a common metal. The challenge is finding sufficient concentration and size in supportive jurisdictions. When lithium was a minor product, the world was content to rely on just two geographic regions for the bulk of supply: the brine mines of South America and the hard rock mines of Australia. That dominance is coming to an end.

Many of the world's economies are deploying massive financial incentives to grow their own domestic supply of critical metals, with lithium at the top of the list. Countries like Zimbabwe, Ghana, Canada, China, and the US have substantial deposits, and it's estimated up to 65% of new supply will come from emerging lithium districtsⁱⁱⁱ outside of the current lithium heartlands.

With the incredible lithium price gains of 2021/22, during which battery-grade lithium hydroxide hit an all-time high \$82,225/tonne, and the dramatic fall to near US\$18,500 in 2023, both experts and newcomers to the sector wonder if attractive entry points still exist.

The Oregon Group has drawn upon decades of experience in the markets, spoken to lithium experts, and analyzed projects and jurisdictions.

Buckle up. For investors, the next few years for the industry look less like Formula 1, than a film from the "The Fast and Furious" franchise. But, for the survivors, the end will be worth the ride.

"In 2022, 52% of lithium supply came from just five companies... [we] predict these companies' share will decline to 36% by 2032 as smaller firms grow and new ventures emerge."

Allan Pedersen, Principal Analyst, Lithium, Wood Mackenzie

"Lithium's dominant demand segment is also its fastest growing – a dynamic rarely encountered even in bull markets."

Anthony Milewski, co-founder of The Oregon Group

"More lithium will be needed in 2030 than was mined between 2015 and 2022."

Benchmark Mineral Intelligence

What's in this report

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LITHIUM DEMAND

"Lithium's largest demand segment is also its fastest growing – a dynamic rarely encountered even in bull markets."

Fulfilling a prediction made by Goldman Sachs in 2015, lithium really has become the new gasoline. While lithium does have other end uses, these segments are dwarfed by electric vehicles and energy storage. As the global energy transition trend continues to power forward, analyst consensus is for strong, long term growth.

For anyone still wondering why lithium ion batteries supplanted legacy battery tech so quickly, it's because of higher energy density, lighter weight, longer charge retention and an absence of charge memory (no need to discharge fully before recharging).

Such impressive characteristics have resulted in a battery that can power an electric vehicle (EV) for hundreds of miles on a single charge. Larger versions are also being deployed to improve efficiency and resiliency in power grids that utilize large amounts of renewable energy, such as solar and wind. Essentially, battery banks store power during periods of excess generation and release it to the grid when renewable generation drops. With nations installing renewable energy at an incredible rate, the future of energy storage is far greater than anyone could have imagined even a few years ago.

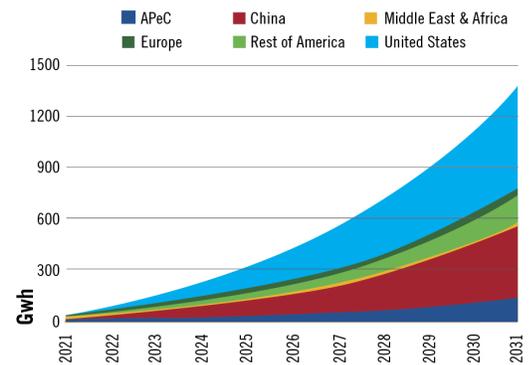
However, the reason for the breathtaking lithium demand curve is EV adoption.

According to the International Council on Clean Transportation, a combination of government incentives for automakers and consumers, design improvements and manufacturing efficiencies mean that EVs will reach price parity with gasoline cars "in the 2023-2025 timeframe".

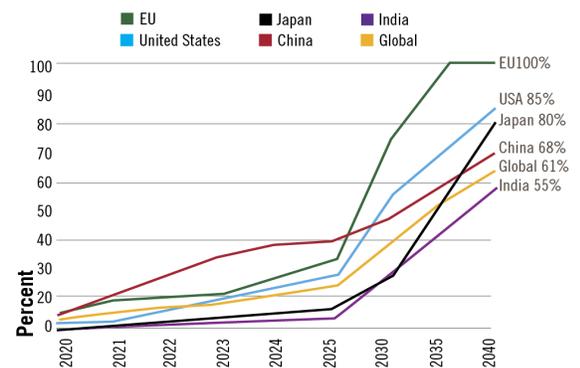
Rates vary from region to region, but global new EV sales are already at 13%, and expected to hit a whopping 55% by 2030.^{vi}

What this ultimately means is that lithium's dominant demand segment is also its fastest growing – a dynamic rarely encountered even in bull markets.

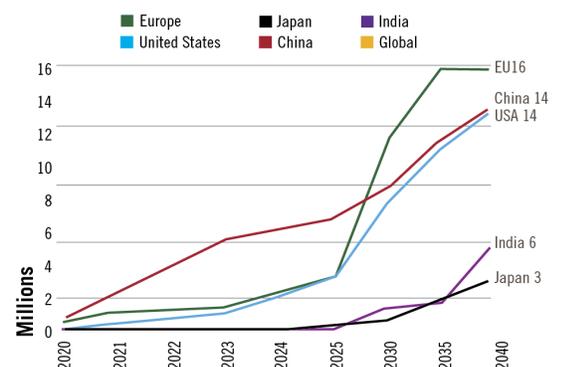
Energy Storage Forecast 2021 – 2031^{iv}



EV Sales Forecast (ratio of new vehicles)^v



EV Sales Forecast (total sales)^{vi}

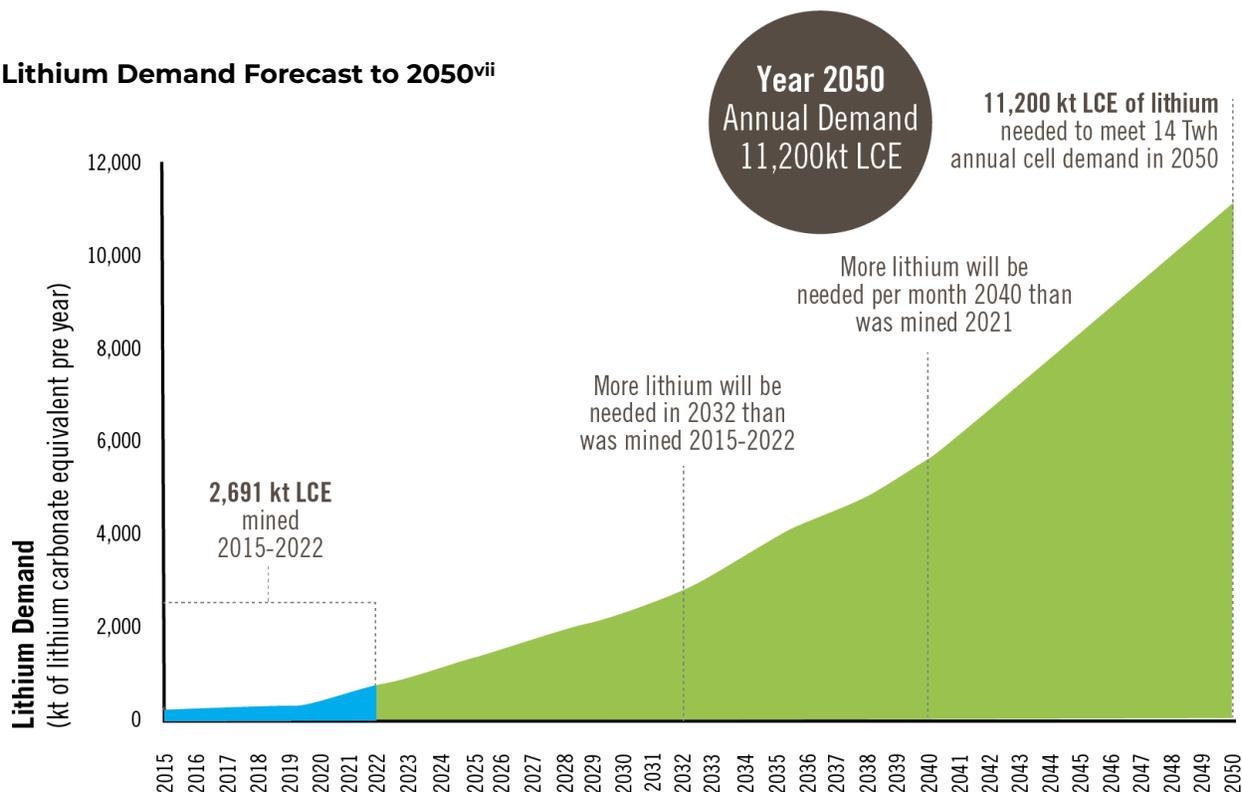


While it should be acknowledged that a lot of research is being conducted into competing battery chemistries, the reality is that lithium ion will continue to be the dominant technology for many years to come, so what does all of this mean for the demand curve?

"As the EV market approaches what automakers call the "tipping point" for organic growth, the lithium market, more than ever, represents a compelling investment case."

The following forecast from Benchmark Mineral Intelligence, the leader in market intelligence for the battery and EV supply chain, shows what strong, long term growth could look like for lithium.

Lithium Demand Forecast to 2050^{vii}



Source: Benchmark Lithium Forecast

The macro opportunity may look similar to that linear upward momentum when we look back in 2050, but the micro opportunities will look anything but linear.

Lithium short-term oversupply, de-stocking, competition over supply chain dominance, retrenchment in major energy transition industries, interest rate rises, inflation, tightening government spending, shifting public sentiment — all mean we are entering one of the most challenging few years for the lithium industry.

However, as the EV market approaches what automakers call the “tipping point” for organic growth, the lithium market, more than ever, represents a compelling investment case.

LITHIUM SUPPLY

In any industry, the process of meeting rapid growth in demand is fraught with challenges, and lithium is no exception. Analysts point to a minimum of 50 new mines and over US\$116 billion needed in cumulative CapEx^x before the end of this decade to meet demand expectations.

But, with ESG, low prices and geopolitics playing an increasing role in the critical metals supply chain, successfully meeting lithium demand is going to be problematic to say the least. More than ever, jurisdiction should be a key consideration for any investor seeking a lithium position.

Primary and Secondary Supply

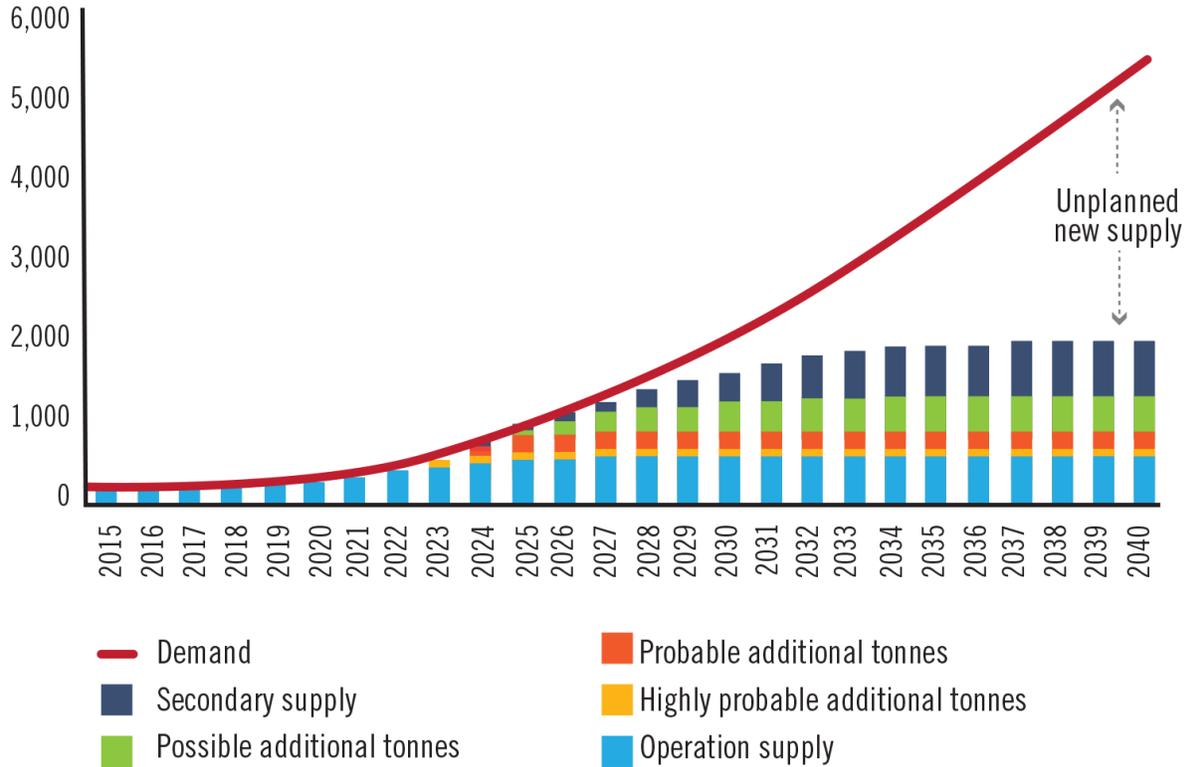
Mining (primary supply) is responsible for the vast majority (94% in 2022) of global lithium supply.^x Two types of mining currently dominate the sector: hard rock and brine.

In simple terms, hard rock mines are more capital intensive but typically have much higher grades and can more easily produce lithium hydroxide, which commands higher prices than lithium carbonate produced by brine mines.

Brine mines have lower CapEx requirements and typically longer production life compared to hard rock but are lower grade. They can be used to create lithium hydroxide, similar to the output from hard rock mines, but this requires an expensive conversion process. Additionally, brine characteristics can vary significantly in concentration and chemical composition, both from one mine to another and within a single resource. Lithium is traditionally extracted from the brine using massive evaporation ponds – less expensive to operate than hard rock processing but increasingly considered an environmental issue. A number of miners are now looking at Direct Lithium Extraction (DLE) technology which extracts a higher quality of lithium from brine without the need for evaporation ponds, salt piles, and lime plants. It's worth noting that DLE has yet to be commercialized to a significant degree outside of China.

Secondary supply (Recycling): The lithium recycling industry provided just over 6% of global lithium supply in 2022^{xi} but is not yet capable of operating at scale. EV batteries are large and flammable, creating a more significant technical challenge compared to lead acid batteries. And the EV market has not reached the point at which mass recycling makes commercial sense. However, analysts widely believe that the recycling industry will adapt and grow in line with the projected, robust rate of EV adoption, with China leading the way. Ultimately, recycling could reach up to 19% of total lithium supply by 2030.^{xii} While the growth rate may seem concerning to mining investors, the sheer scale of expected lithium demand means that the supply side needs all the help it can get just to keep up.

Lithium Demand vs Supply Forecast to 2040^{xiii}



Permitting, ESG & Politics

Current lithium production is highly concentrated. In fact, in 2023, Australia, Chile, and China between them were responsible for over 90% of global production.^{xiv} With governments around the world now aware of lithium’s importance, a major supply shake up is underway due to the rising tide of geopolitics and ESG.

While we cover these in more depth in the Big Trends section of this report, it is important to note the following: typically, supply dominance of this scale does not change quickly. However, lithium finds itself facing a unique confluence of circumstances.

The governments of South America – home to the world’s largest brine mines – are increasingly seeking a greater share of the profits from lucrative resources such as lithium. In fact, in April 2023, Chile announced plans to nationalize its lithium industry. At the same time, projects in those same countries are facing stronger resistance from communities because of environmental issues. And while South America struggles to grow its lithium industry, countries like the US, Canada, and Australia – all of which have significant reserves – are incentivizing explorers, developers and miners, with the goal of establishing strong, reliable lithium production in a pivot away from Chinese supply chains. And, in Africa, new supply is being opened up.

Price Outlook

In the second half of 2020, following two years of oversupply, lithium prices took off, peaking at an incredible and ultimately unsustainable level. Government incentives in China and throughout the EU aggressively stimulated consumer purchases of EVs and, as a result, lithium demand quickly outstripped supply.

A price correction from the record breaking peaks of 2022 was inevitable. High prices meant low-grade assets became viable, for example, lepidolite mines with government subsidies in China, as well as a search for technological alternatives by companies and consumers to reduce costs.

But, as the next generation EVs roll out, demand growth has continued, setting the stage for major supply expansion. Only this time, the latest major price correction now threatens the viability of new projects. For example, in Australia, junior miners are halting operations until conditions improve.^{xv}

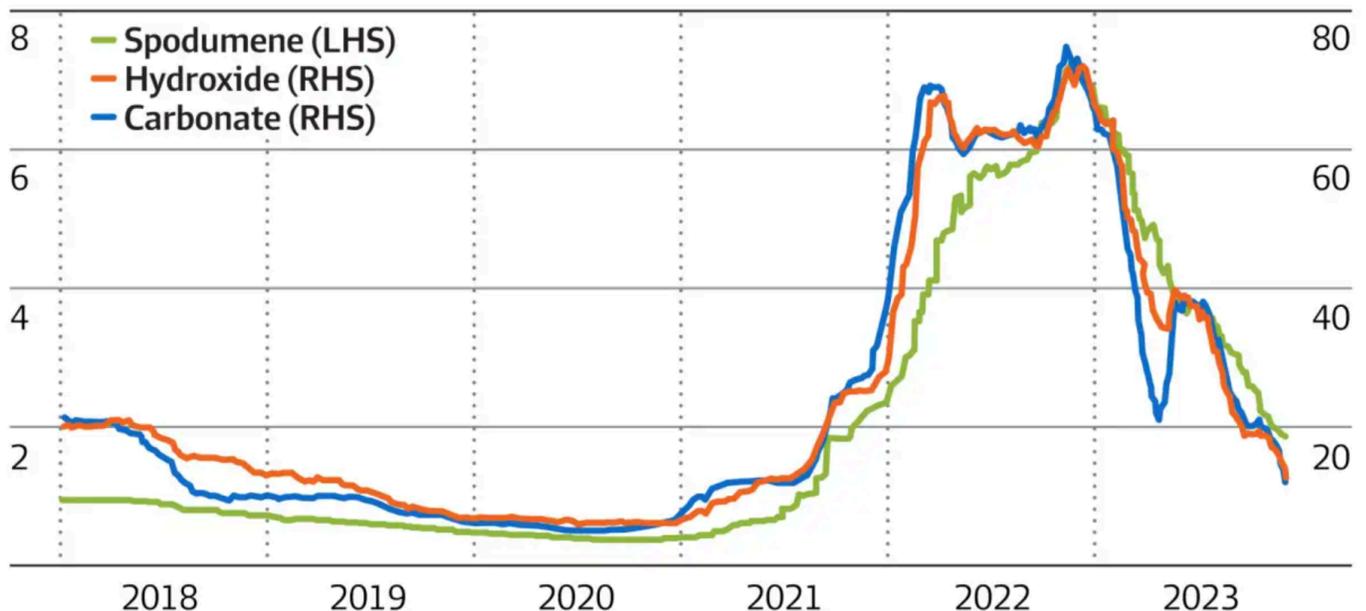
In The Oregon Group's opinion, the market remains tight in the medium- to long-term, and subject to volatility, particularly with a view to price spikes. Exact timing will depend on subsidized lepidolite production in China and levels of global inventories, but barring any serious geopolitical risk that will bring it forward, we believe the market is near the firing of the starting gun from mid- to late- 2024.

Goldman Sachs suggests a sustained slowdown in EV adoption, alongside extraction efficiencies, mean a surplus and bearish market in 2024. We would not disagree, certainly for the first half of 2024, but in the race to net-zero targets in 2030, the strength of the current headwinds to new supply could see prices rising higher and staying higher for longer.

To push our Fast and Furious analogy: the drops will be sharp, the blind corners tight, and the highs steep. You just have to first, pay attention to the slow character build up to get your position right. If not, the falls will be dangerous.

"In The Oregon Group's opinion, the market remains tight and subject to volatility, particularly with a view to price spikes."

Lithium Prices 2018- 2023^{xvi}



THE BIG TRENDS

Top Dogs and Underdogs: The fragmentation of an industry

By 2030, global lithium-ion battery capacity is forecast to rise by 500%^{xvii} to 5,500 gigawatt-hour (GWh), and as each new factory comes online, lithium demand will jump, again and again. What makes this growth story different is that China and Asia Pacific are far from the only growth drivers. North America's battery cell capacity is on track to expand up to 10-fold by 2030, while Europe, growing even faster, expects up to 20% market share in the same timeframe. By the end of the decade, China's market share is expected to fall from 90% to 69%.^{xviii} Why are we talking about the fragmentation of the demand side? Because the same thing is happening on the supply side.

As we've mentioned, just four countries (Australia, Chile, China, and Argentina) currently produce over 90% of the world's lithium, and one (China) controls about 60% of global lithium processing.

Under normal circumstances, countries looking to break this stranglehold would face a daunting uphill climb. After all, exploration and development is costly – especially in today's inflationary environment. Jurisdictional hurdles, including local ESG factors, a premium on technological expertise, and challenging mining codes, can result in long delays for miners at every project stage.

However, the wind of change is blowing. South America's co-called "Lithium Triangle" is caught up in a trend common to developing nations. With so much demand, the governments of these countries are increasingly looking at ways in which profits can be shared with the host country, especially with increasingly frequent labor unrest. As we've mentioned, Chile, the second largest lithium jurisdiction in the world, has already announced nationalization plans. More may follow. So, many Western investors are seek alternate jurisdictions.

Alarmed by China's dominance in much of the green tech and energy transition supply chain, the US, Canada, and Europe, have also embarked on an aggressive program of development. Thanks to a variety of government-led financial incentives, battery megafactory construction and supporting supply chains are advancing rapidly. While mining has been slower to respond, the wheels are now turning with increasing speed.

The US Inflation Reduction Act (IRA), Canada's Critical Minerals Strategy and Clean Technology Plan, and the EU's Critical Raw Materials Act, are the high profile examples, but there are plenty of others at a state and provincial level, and the auto industry itself is taking direct action. For example, in 2023, General Motors announced a \$650 million investment into Lithium Americas to develop its Thacker Pass mine in Nevada.^{xviii}

As part of these programs, lithium exploration and development has exploded in regions that, just a few years ago, were all but ignored.

However, the West is not going to have a monopoly on new mines. Permitting, even in Western nations with pro-mining governments, have long suffered from convoluted permitting processes and resistance from campaigners who feel lithium extraction comes with prohibitive environmental and social impacts. Plans to open lithium mines in Europe have been mired in regulatory issues and protests.

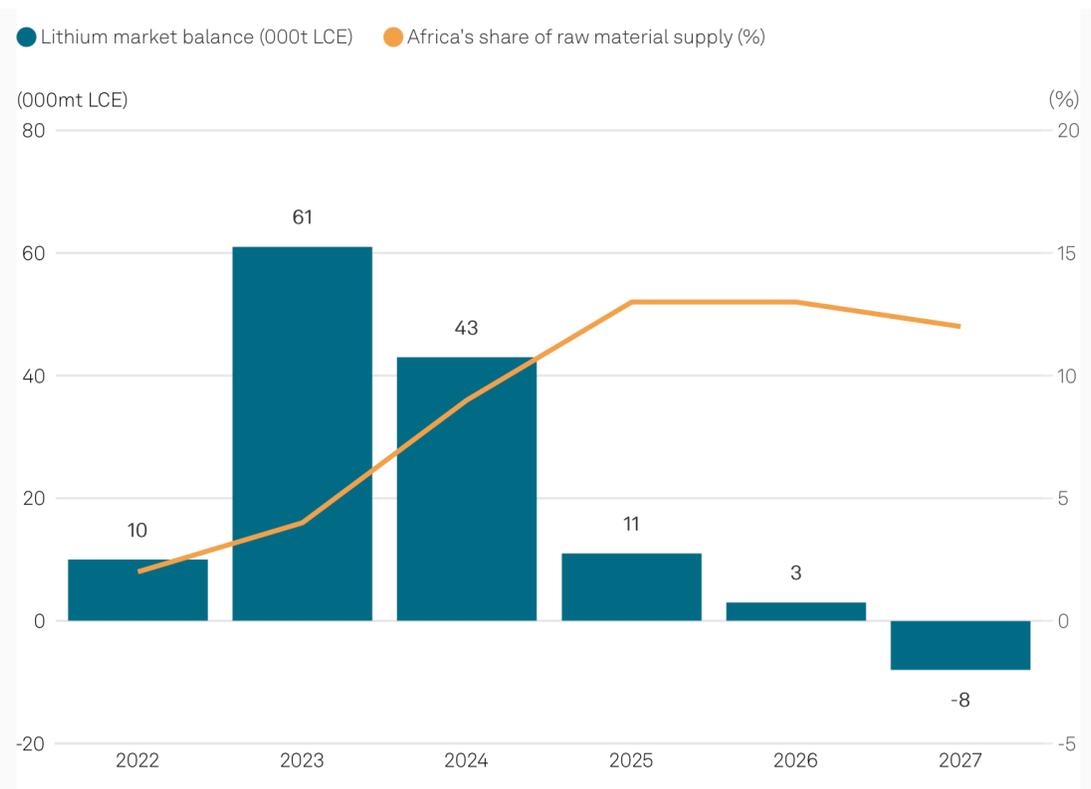
For example, the Barosso mine, in Northeastern Portugal, was expected to begin producing lithium for EV batteries in 2020 but only recently commenced the licensing phase. With governments bending their will towards securing lithium supplies, we expect these barriers to be overcome, but the delays mean that jurisdictions with more streamlined permitting and less local resistance, have risen in prominence. This includes countries such as Zimbabwe, which has the largest lithium reserve in Africa and the sixth largest lithium reserve in the world.

The dominance of lithium supply resting in the hands of just four countries is about to face it's biggest challenge.

And perhaps the biggest challenger is Africa.

S&P Global Market Intelligence estimates supply from the continent to increase more than x24 between 2022 and 2027, to become the third largest lithium producing region by 2027.^{xviii} Investment by China and increasingly interest by Western companies. Deposits, permitting, infrastructure build out, dollar economies, and geography all support the interest.

Africa's share of global lithium supply ^{xx}



The Oregon Group believes that the fragmentation of lithium's supply side represents a compelling opportunity for investors. The speed and scale at which demand is growing means a huge number of mines will be needed, and jurisdictions that facilitate rapid development may offer particularly attractive upside.

INVESTING IN LITHIUM

The investment case for the lithium sector is clear: robust, long term growth on the demand side, and a supply side struggling to keep ahead of volatile prices.

Investment options and associated upside are invariably linked to risk tolerance. You can look at an ETF for direct exposure to lithium prices but you'll have no control over the plays included in the basket. You can pick up a position with a producer which will benefit from existing cash flow but will also have potentially major challenges if operating in jurisdictions like South America. You can also look at developers and explorers. This last group is the highest risk, but with lithium's supply side in such a dynamic state, we feel it is where the biggest potential rewards are likely to be found.

What follows are examples of each category.

Lithium ETFs



Horizons Global Lithium Producers Index ETF

TICKER: HLIT, PRIMARY EXCHANGE: TSX

The first of the Canadian ETFs to provide direct exposure to lithium mining companies.



Global X Lithium & Battery Tech ETF

TICKER: LIT, PRIMARY EXCHANGE: NYSE

ETF listed in the US that has exposure to a basket of mining companies and battery tech/manufacturing companies.



Amplify Lithium & Battery Technology ETF

TICKER: BATT, PRIMARY EXCHANGE: NYSE

BATT is designed to be a convenient, transparent way for investors to get exposure to revenue generating companies in the lithium battery sector.

PRODUCERS & DEVELOPERS



Albemarle

TICKER: ALB, PRIMARY EXCHANGE: NYSE

One of the largest lithium producers in the world, although not exclusively a lithium player. Albemarle also produces bromine and provides processing and chemical services for big pharma.



Pilbara Minerals

TICKER: PLS, PRIMARY EXCHANGE: ASX

Australian hard rock lithium producer that began commercial production in 2019. Currently pursuing multiple expansion projects.



Lithium Americas

TICKER: LAC, PRIMARY EXCHANGE: TSX

Development stage, US-listed company with advanced assets in the US and Argentina.



Standard Lithium

TICKER: SLL, PRIMARY EXCHANGE: TSX.V

Lithium developer with an advanced US lithium brine asset and proprietary DLE tech.



Premier African Minerals

TICKER: PREM, PRIMARY EXCHANGE: AIM

Near-term production stage company with hard rock lithium deposit in Zimbabwe.

THE OREGON GROUP PROJECTIONS

In our opinion, lithium demand is set for more than 20 years of growth, all the more so because of the recent pull back from the price highs of 2022.

Pricing will struggle in the immediate-term, but be increasingly tight over the long-term, as the speed of EV adoption ensures high demand, putting a substantial floor on prices.

Some investors are already working to take advantage of this limited window of low prices and looking to set their position early. For example, mining billionaire Gina Rinehart is building a significant multi-billion dollar stake in lithium operations in Australia.

Outside of the established players, the fragmentation of lithium's supply side will continue to open up exciting investment entry points, particularly in Africa. As the market becomes more fully aware of the problems facing South America's lithium triangle, and the West's push to diversify supply chains, we believe the rush into other jurisdictions will become even more intense.

Current low prices offer a discount window. Just make sure you have enough fuel (charge!) for the ride.

Bottom Line

The growth curve for lithium will steepen as EVs gain further parity with gas vehicles and production continues to grow year on year. Lithium supply – part of the global race for critical metal supply that will last for at least two decades – will struggle to keep during the medium to long term, and a new world order of lithium jurisdictions will emerge. Price volatility will eventually settle at a level high enough to continue incentivizing supply required over the long term.

SOURCES

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