Cracking the Climate-Conscious Hard Commodities Code: Discovering Their True Value

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Introduction

Time continues to pass, temperatures keep climbing, and more energy companies are embracing clean technology. At the same time, the automotive industry is introducing new renewable energy vehicles. Each day brings new changes and challenges. In this fast-paced climate transition, how long can our traditional equity valuation methods keep up? Especially for hard commodities, which are at the forefront of climate-related risks, could we find a way to help them adapt to these changes?

In this AI-driven world, it’s tempting to toss everything into a machine learning “black box”. However, that approach seems too "simplistic" for the complexities of hard commodities. We still need traditional statistics and numbers to understand the fundamentals. That’s why I’ve divided this project into three sections, which you’ll see in the upcoming slides.

First, we’re exploring the **sustainable growth rate**—yes, that small lowercase 'g.' Are you ready?

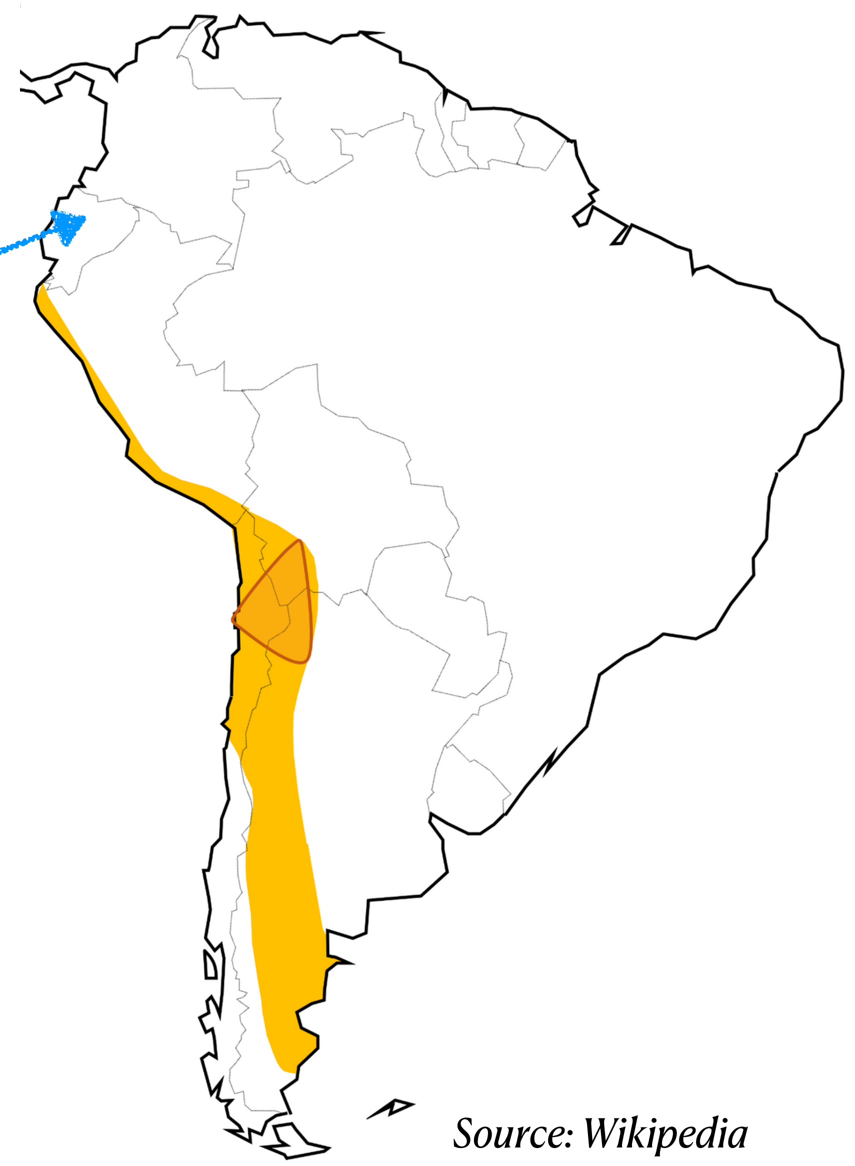
Catalogue

1.1 The Sustainable Growth Rate

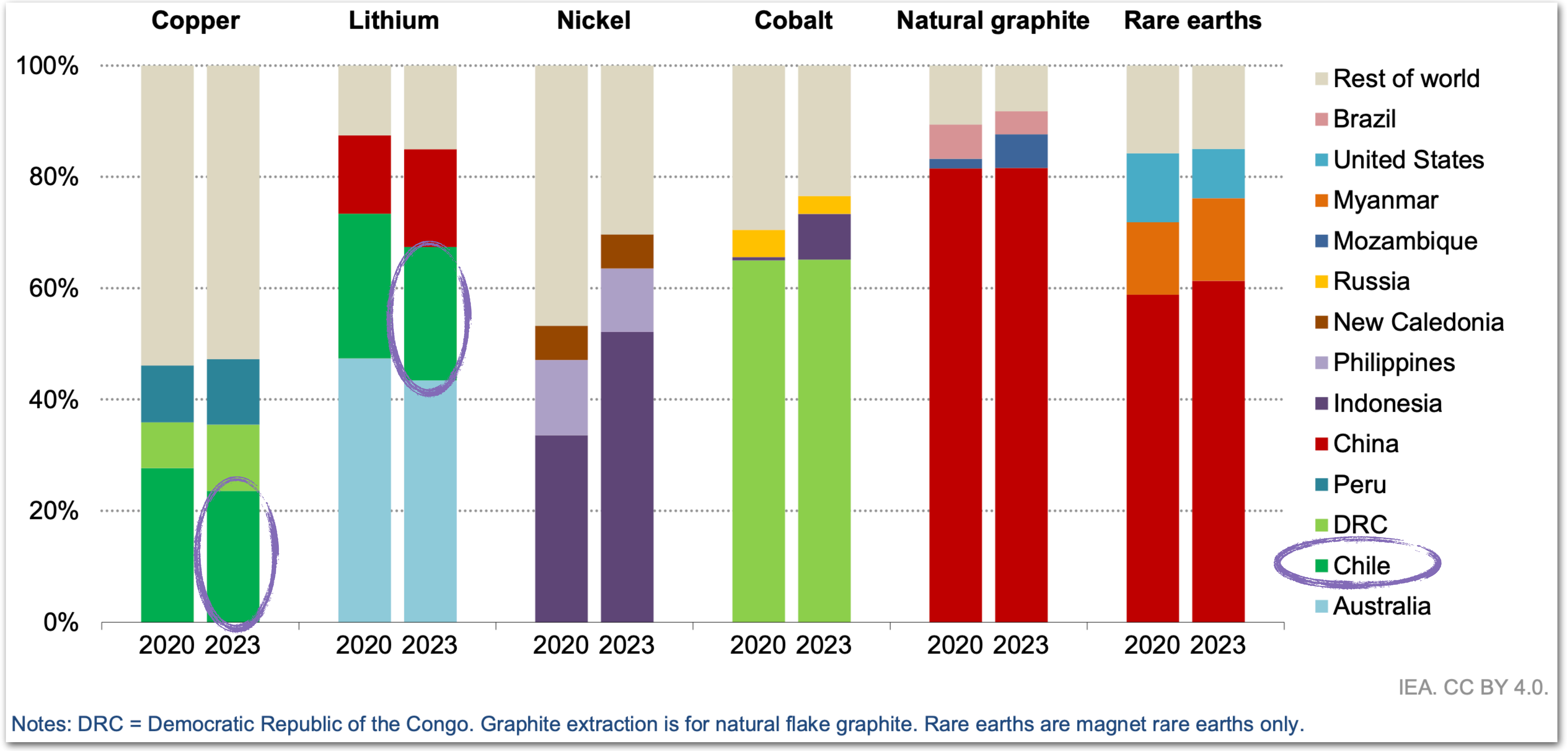
When the traditional valuation of hard commodities collide with climate change, how could we realign with sustainable growth dynamics?

Methodology

- **Data Used and Selection**
  - Country: *Chile*
    - holds a leading position in global mining production
  - Critical Minerals: *Lithium & Copper*
    - Chile, a top copper producer and pivotal in the "lithium triangle"
  - Beginning Year (Demand v.s. The sustainable growth rate): 2030 & 2035
    - Assess the impact of starting years on sustainable growth rates, anticipating future tech advancements influencing demand.
  - Data Base: *IEA 2024 Global Critical Minerals Dataset*
- **Analysis Methods**
  - Mathematical Analysis
  - Time Series Analysis
- **Limitations**
  - IEA database predicts from 2030 to 2050 with a 5-year interval
  - 7-year gap between base year (2023) and first prediction (2030) may affect accuracy and reliability of subsequent analyses.



Source: Wikipedia

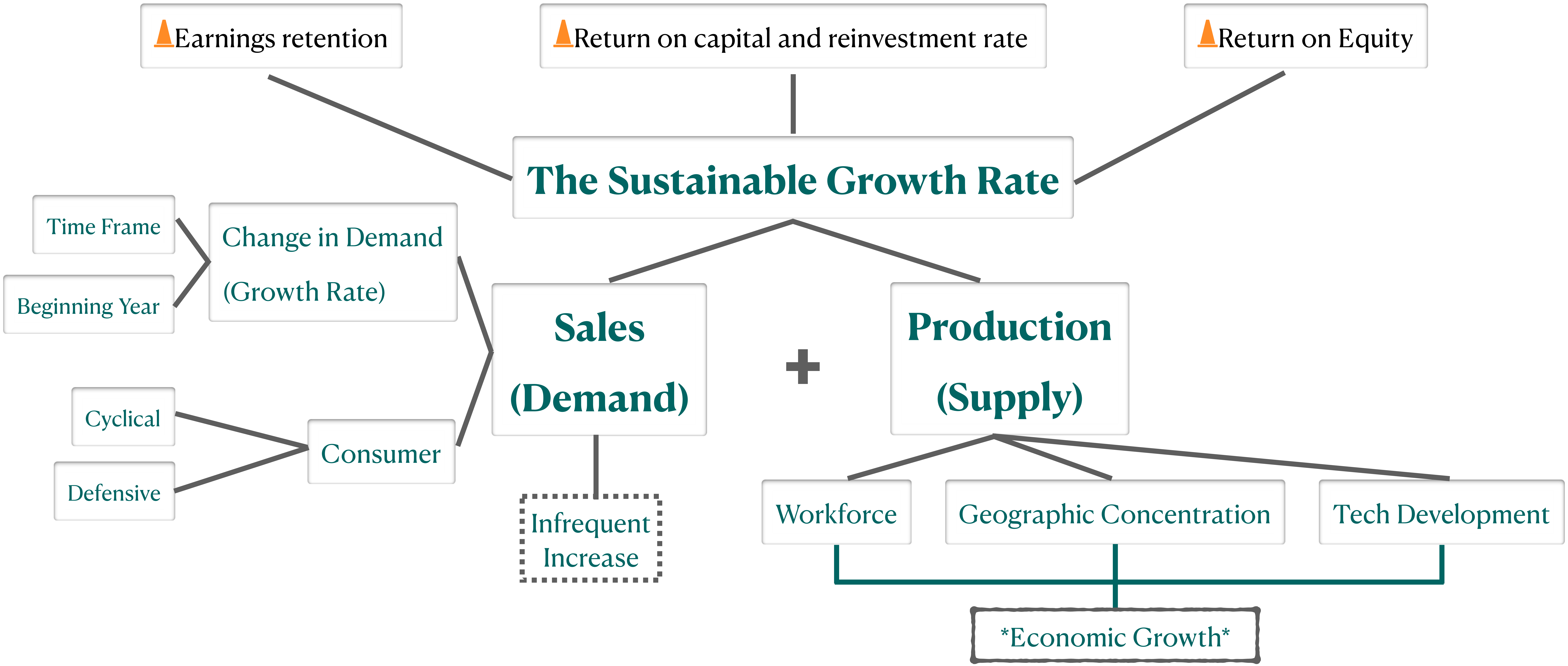


Source: IEA 2024 Global Critical Minerals Outlook

Key Findings

- The mining sector's stability could be undermined by young workers' disinterest and stagnating labor productivity, posing risks for Chile's future lithium and copper supply chains, emphasizing the considerable role of a stable workforce in maintaining sustainable growth rate projections.
- The *geographic concentration* of raw material exports, such as those from Chile, raises *Scope 3 emissions* from maritime transport, underscoring the necessity of accounting for these concealed costs in sustainable growth rate calculations
- *Strong demand does not ensure sustainable growth rates,* as determining compounded growth requires careful consideration of time frame and beginning year, especially in climate-sensitive sectors (E.g. hard commodities), with noteworthy implications for equity valuation when combined with metrics like FCFF and dividends.
- The pronounced *demand surge,* followed by a hard commodity cooldown during the climate transition, emphasizes the necessity of *excluding* such spikes in forecasting long-term growth rates, often influenced by infrequent factors like policy shifts. Accounting for potential future *technological advancements* is crucial when compounding growth rates from the subsequent period.
- Distinguishing between *cyclical and defensive demand* in hard commodities is required for accurate growth projections.

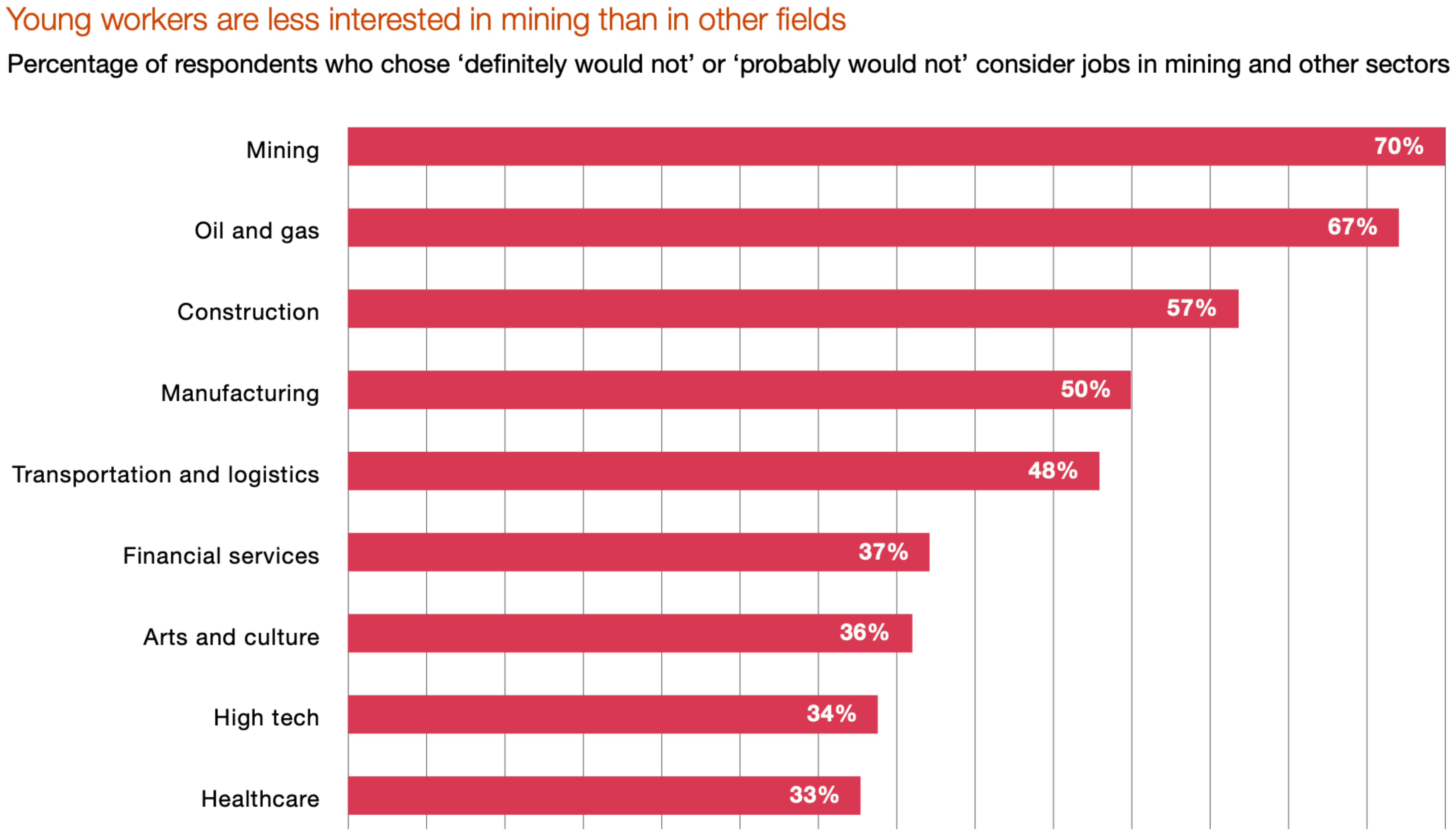
Concept Diagram



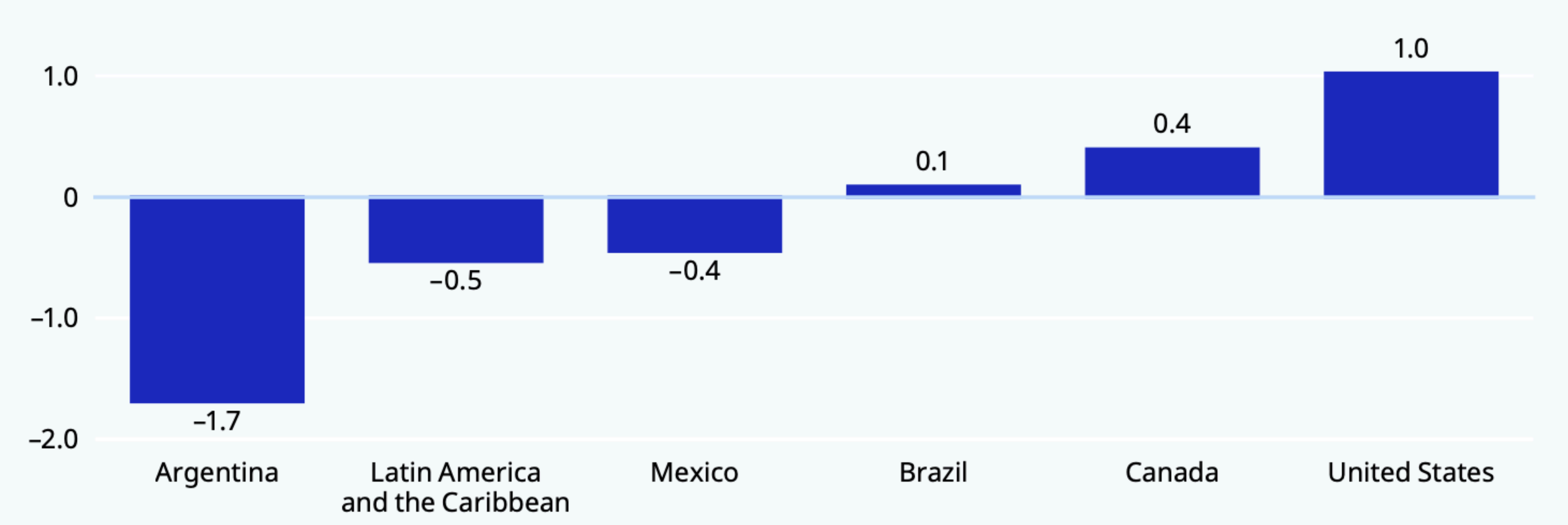
Workforce: Dynamics

A Challenge to Future Supply Stability

- According to PwC's 2023 Mining Report, mining ranks high on the list of jobs young workers are least interested in. Additionally, the ILO's 2024 World Employment and Social Outlook indicates stagnating labor productivity growth in Latin America and the Caribbean.
- The mining sector's stability could be undermined by young workers' disinterest and stagnating labor productivity, posing risks for Chile's future lithium and copper supply chains, emphasizing the considerable role of a stable workforce in maintaining sustainable growth rate projections.



Source: PwC, The Era of Reinvention (2023 Mine Report)



Source: ILOSTAT, ILO modelled estimates, November 2023.

Geographic Concentration

The Hidden Cost of Scope 3 Emissions

- Geographic concentration affects sustainable growth rates via Scope 3 emissions from upstream and downstream activities, highlighting the need to account for hidden costs.
- The GHG Scope 3 calculation method for sea transport (distance-based) reveals that a greater weight of raw materials compared to refined materials, coupled with longer delivery distances, correlates with increased emissions.

Emissions from sea transport

= Σ (*quantity* of goods purchased (tonnes)

× *distance* travelled in transport leg

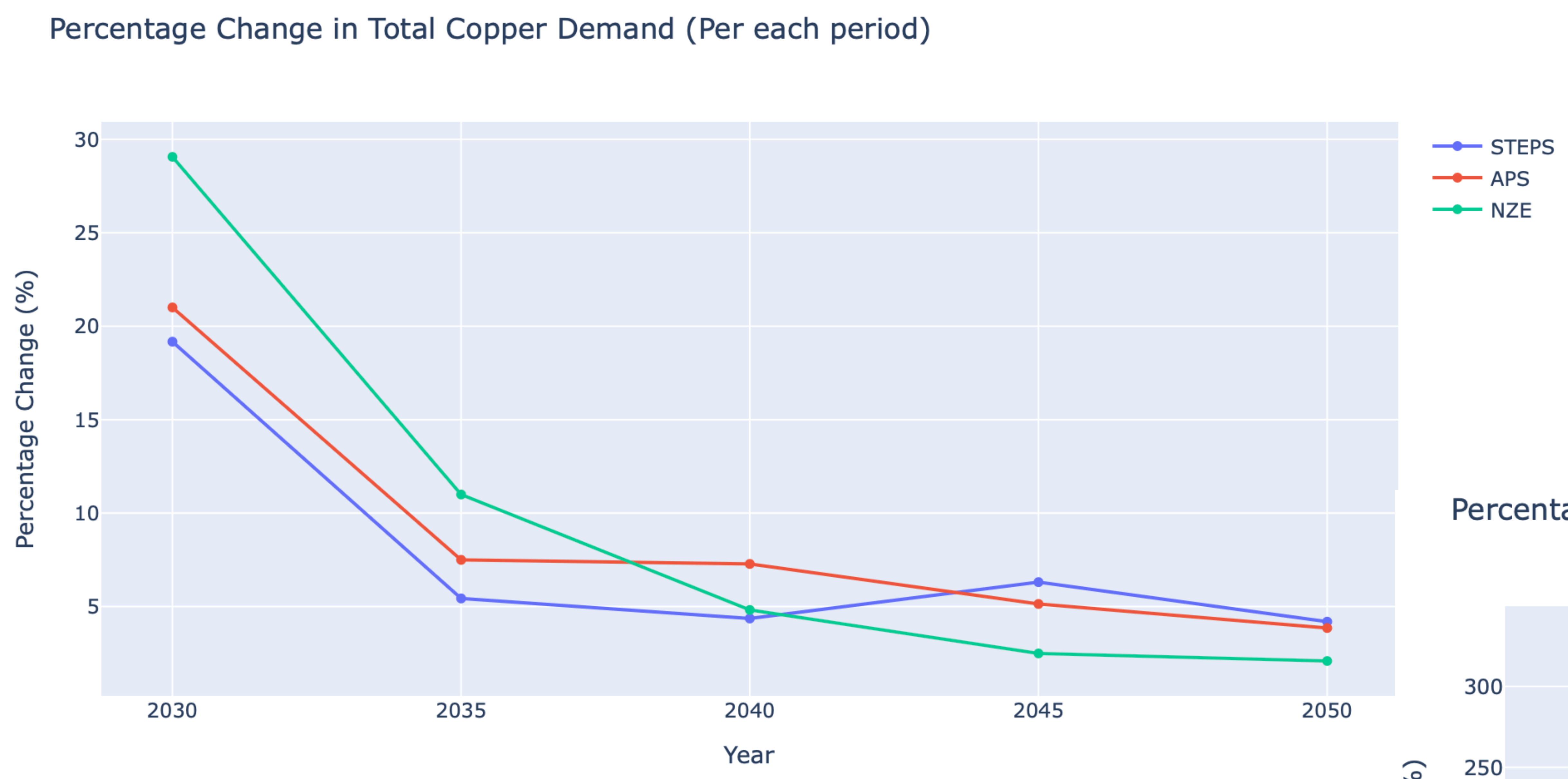
× emission factor of transport mode or vehicle type (kg CO2e/tonne-km))

Source: GHG Technical Guidance for Calculating Scope 3 Emissions

Source: Example export routes from Chile, illustrating Scope 3 emissions by transport distances

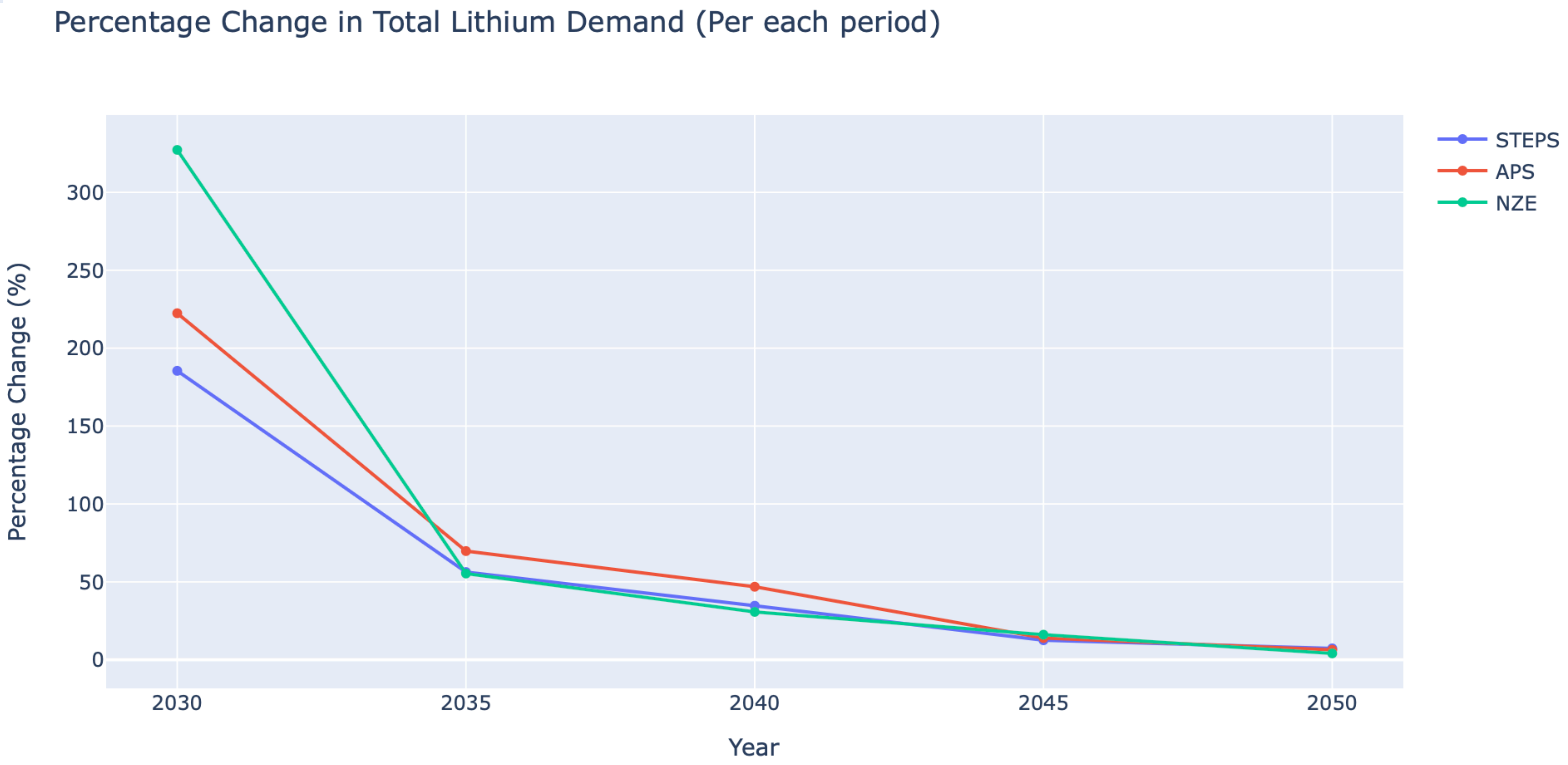
Demand v.s. The Sustainable Growth Rate

The pronounced demand surge, followed by a hard commodity cooldown during the climate transition, emphasizes the necessity of excluding such spikes in forecasting long-term growth rates, often influenced by infrequent factors like policy shifts.



- Stated Policies Scenario (**STEPS**)
- Announced Pledges Scenario (**APS**)
- Net Zero Emission by 2050 (**NZE**) Scenario

Source: IEA 2024 Global Critical Minerals Outlook



Note: *Full Analysis Report (GitHub Link)*

Demand v.s. The Sustainable Growth Rate

Distinguishing between cyclical and defensive demand in hard commodity is essential for accurately assessing growth projections, with cyclical demand linked to economic cycles and defensive demand, driven by essential infrastructure and renewable energy, potentially facing slower growth post-project completion.

Copper Demand for key energy transition (kt)

Original Data Source: IEA

Stated Policies scenario	2023	2030	2035	2040	2045	2050
Copper						
Total clean technologies	**6372**	**10542**	**11523**	**11984**	**12560**	**12967**
Other uses	19543	20341	21038	21997	23564	24671
Total demand	**25915**	**30883**	**32561**	**33981**	**36124**	**37638**
Share of clean technologies in total demand	*25%*	*34%*	*35%*	*35%*	*35%*	*34%*
Further Analysis						
% Change in Total Demand (Per each period)		19.17%	5.43%	4.36%	6.31%	4.19%
1a) Different Beginning Year, Same Time Periods						
Time Period (Year / Begining at 2030)		NA	**5**	**10**	**15**	NA
Long term compounded growth rate (g_L)		NA	1.060%	0.960%	1.050%	NA
1b) Different Beginning Year, Same Time Periods						
Time Period (Year / Begining at 2035)		NA	NA	**5**	**10**	**15**
Long term compounded growth rate (g_L)		NA	NA	0.860%	1.040%	0.970%
2) Different Time Frame, All else equal						
% Change in Total Demand (Same beginning year 2023)		19.17%	25.65%	31.12%	39.40%	45.23%
Time Period (Year / Begining at 2023)		7	12	17	22	27
Long term compounded growth rate (g_L)		2.540%	1.920%	1.610%	1.520%	1.390%
% Change in Growth Rate (Longest to shortest)						**-45.28%**

Announced Pledges scenario	2030	2035	2040	2045	2050
Copper					
Total clean technologies	**12231**	**14424**	**16127**	**16831**	**17439**
Other uses	19127	19285	20036	21189	22046
Total demand	**31358**	**33709**	**36163**	**38021**	**39485**
Share of clean technologies in total demand	*39%*	*43%*	*45%*	*44%*	*44%*
Further Analysis					
% Change in Total Demand (Per each period)	21.00%	7.50%	7.28%	5.14%	3.85%
1a) Different Beginning Year, Same Time Periods					
Time Period (Year / Begining at 2030)	NA	**5**	**10**	**15**	NA
Long term compounded growth rate (g_L)	NA	1.460%	1.440%	1.290%	NA
1b) Different Beginning Year, Same Time Periods					
Time Period (Year / Begining at 2035)	NA	NA	**5**	**10**	**15**
Long term compounded growth rate (g_L)	NA	NA	2.890%	1.950%	1.550%
2) Different Time Frame, All else equal					
% Change in Total Demand (Same beginning year 2023)	21.00%	30.07%	39.55%	46.71%	52.36%
Time Period (Year / Begining at 2023)	7	12	17	22	27
Long term compounded growth rate (g_L)	2.760%	2.220%	1.980%	1.760%	1.570%
% Change in Growth Rate (Longest to shortest)					**-43.12%**

Net Zero Emissions by 2050 scenario	2030	2035	2040	2045	2050
Copper					
Total clean technologies	**15046**	**18584**	**19478**	**19326**	**19239**
Other uses	18399	18539	19434	20556	21473
Total demand	**33446**	**37123**	**38912**	**39881**	**40713**
Share of clean technologies in total demand	*45%*	*50%*	*50%*	*48%*	*47%*
Further Analysis					
% Change in Total Demand (Per each period)	29.06%	11.00%	4.82%	2.49%	2.08%
1a) Different Beginning Year, Same Time Periods					
Time Period (Year / Begining at 2030)	NA	**5**	**10**	**15**	NA
Long term compounded growth rate (g_L)	NA	2.110%	1.530%	1.180%	NA
1b) Different Beginning Year, Same Time Periods					
Time Period (Year / Begining at 2035)	NA	NA	**5**	**10**	**15**
Long term compounded growth rate (g_L)	NA	NA	3.070%	1.780%	1.320%
2) Different Time Frame, All else equal					
% Change in Total Demand (Same beginning year 2023)	29.06%	43.25%	50.15%	53.89%	57.10%
Time Period (Year / Begining at 2023)	7	12	17	22	27
Long term compounded growth rate (g_L)	3.710%	3.040%	2.420%	1.980%	1.690%
% Change in Growth Rate (Longest to shortest)					**-54.45%**

- <u>Different Beginning Year, Same Time Periods</u>: Long-term sustainable growth rates, calculated from different starting years over the same time periods, show significant variance. This highlights the sensitivity of growth projections to initial conditions and market dynamics.

Demand v.s. The Sustainable Growth Rate

Strong demand does not ensure sustainable growth rates, as determining compounded growth requires careful consideration of time frame and beginning year, especially in climate-sensitive sectors (E.g. hard commodities), with noteworthy implications for equity valuation when combined with metrics like FCFF and dividends.

Lithium Demand for key energy transition (kt)

Original Data Source: IEA

		Stated Policies scenario					Announced Pledges scenario					Net Zero Emissions by 2050 scenario				
	2023	2030	2035	2040	2045	2050	2030	2035	2040	2045	2050	2030	2035	2040	2045	2050
Lithium																
Total clean technologies	**92**	**381**	**627**	**868**	**977**	**1041**	**442**	**794**	**1203**	**1372**	**1452**	**616**	**986**	**1308**	**1522**	**1573**
Other uses	73	90	109	123	138	155	90	109	123	138	155	90	109	123	138	155
Total demand	**165**	**471**	**736**	**991**	**1115**	**1196**	**532**	**903**	**1326**	**1511**	**1607**	**705**	**1095**	**1431**	**1661**	**1728**
Share of clean technologies in total demand	*56%*	*81%*	*85%*	*88%*	*88%*	*87%*	*83%*	*88%*	*91%*	*91%*	*90%*	*87%*	*90%*	*91%*	*92%*	*91%*
Further Analysis																
% Change in Total Demand (Per each period)		184.99%	56.14%	34.61%	12.61%	7.24%	221.40%	69.92%	46.83%	13.93%	6.37%	326.55%	55.26%	30.64%	16.07%	4.07%
1a) Different Beginning Year, Same Time Periods																
Time Period (Year / Begining at 2030)		NA	**5**	**10**	**15**	NA	NA	**5**	**10**	**15**	NA	NA	**5**	**10**	**15**	NA
Long term compounded growth rate (g_L)		NA	9.320%	7.710%	5.910%	NA	NA	13.890%	10.900%	8.080%	NA	NA	18.370%	11.750%	8.760%	NA
1b) Different Beginning Year, Same Time Periods																
Time Period (Year / Begining at 2035)		NA	NA	**5**	**10**	**15**	NA	NA	**5**	**10**	**15**	NA	NA	**5**	**10**	**15**
Long term compounded growth rate (g_L)		NA	NA	6.120%	4.250%	3.290%	NA	NA	12.500%	7.460%	5.350%	NA	NA	14.220%	8.480%	5.860%
2) Different Time Frame, All else equal																
% Change in Total Demand (Same beginning year 2023)		184.99%	344.98%	498.98%	574.51%	623.33%	221.40%	446.13%	701.90%	813.63%	871.81%	326.55%	562.27%	765.20%	904.20%	945.07%
Time Period (Year / Begining at 2023)		7	12	17	22	27	7	12	17	22	27	7	12	17	22	27
Long term compounded growth rate (g_L)		16.140%	13.250%	11.100%	9.060%	7.600%	18.150%	15.200%	13.030%	10.580%	8.790%	23.030%	17.060%	13.530%	11.050%	9.080%
% Change in Growth Rate (Longest to shortest)						**-52.91%**					**-51.57%**					**-60.57%**

- <u>Different Time frame, All else equal</u>: In the IEA's NZE scenario, lithium demand is projected to surge tenfold by 2050 from 2023. While plausible, this forecast faces substitution risks from hydrogen fuel cell vehicles.
- Notably, the growth rate reduction from the longest (27 years) to the shortest (7 years) period is more evident for lithium (60.57%) than for copper (54.45%) under the NZE scenario.

“Can you guess what key input I'm targeting next? Or perhaps you have some even better ideas”

From Author

Reference

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