51º CONGRESSO BRASILEIRO DE GEOLOGIA
13 A 17 DE OUTUBRO DE 2024
BELO HORIZONTE - MG
Centerminas Expo

Belo Horizonte, 17 de Outubro de 2024

SERVIÇO GEOLÓGICO DO BRASIL

Scenarios and Perspectives of Rare Earths in Brazil

Lucy Takehara

Summary

- Introduction
- Geological Context
- Brazilian Potential
- Current Scenario
- Future Perspectives
- Challenges

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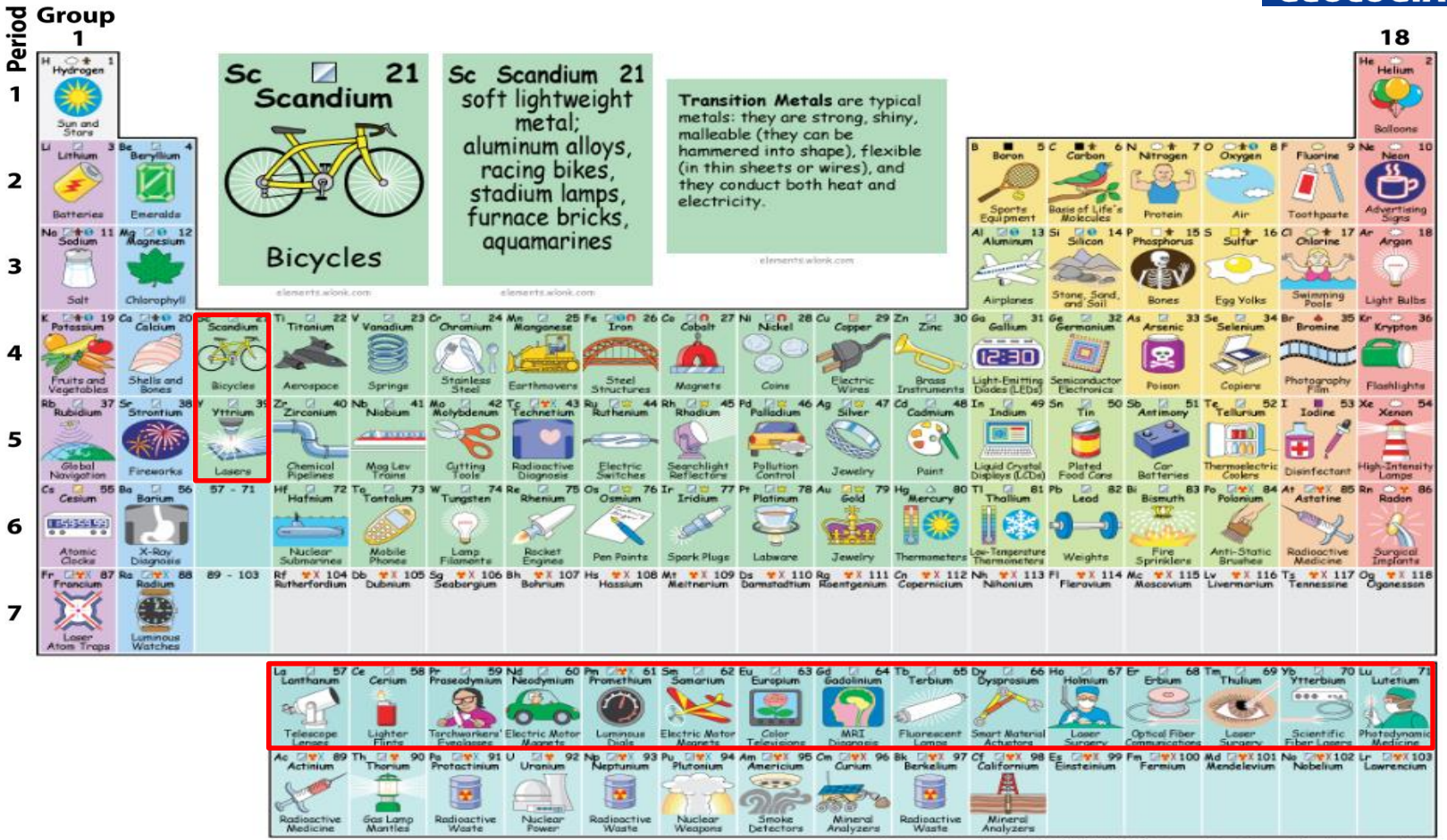
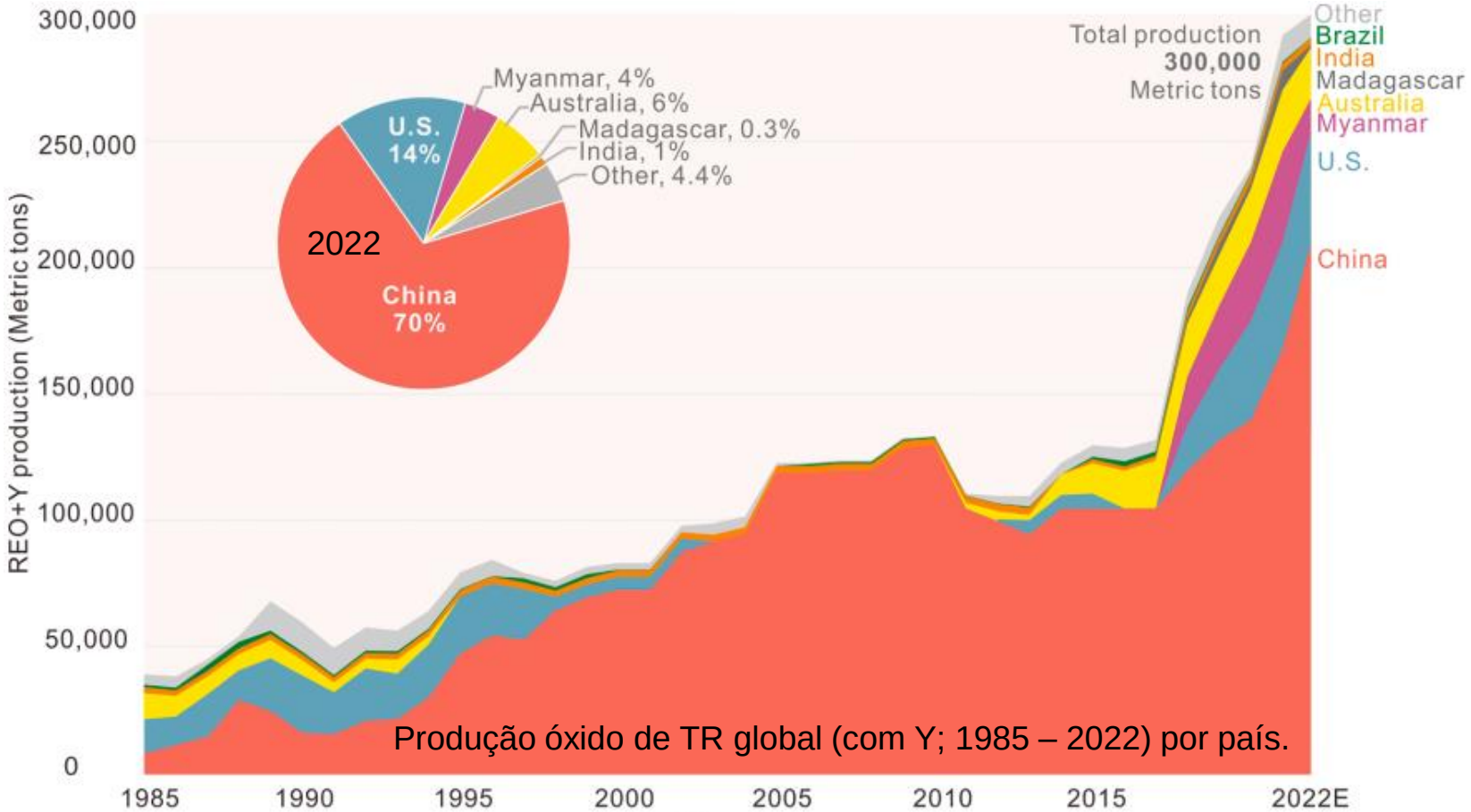
Introduction

What are rare earths?



https://www.rareelementresources.com/rar

Introduction

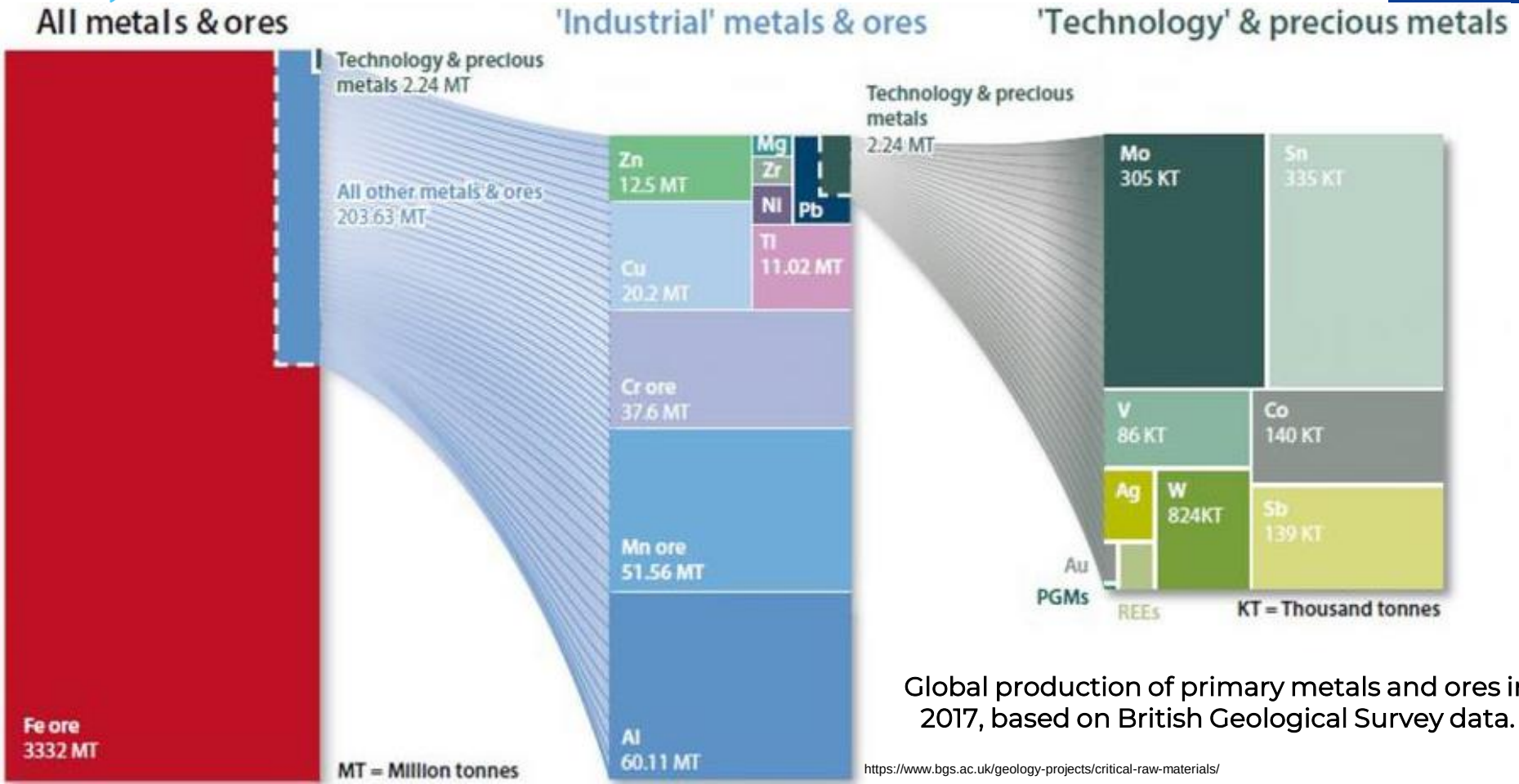


Produção óxido de TR global (com Y; 1985 – 2022) por país.

https://www.sciencedirect.com/science/article/pii/S0169136823001439

(valor estimado)

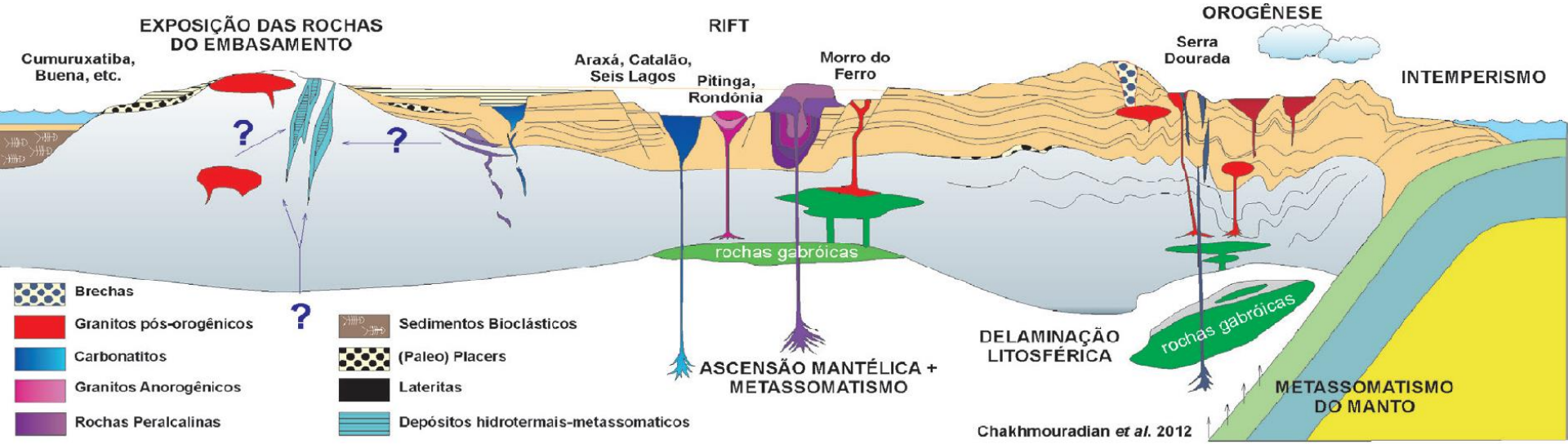
Introduction



Global production of primary metals and ores in 2017, based on British Geological Survey data.

https://www.bgs.ac.uk/geology-projects/critical-raw-materials/

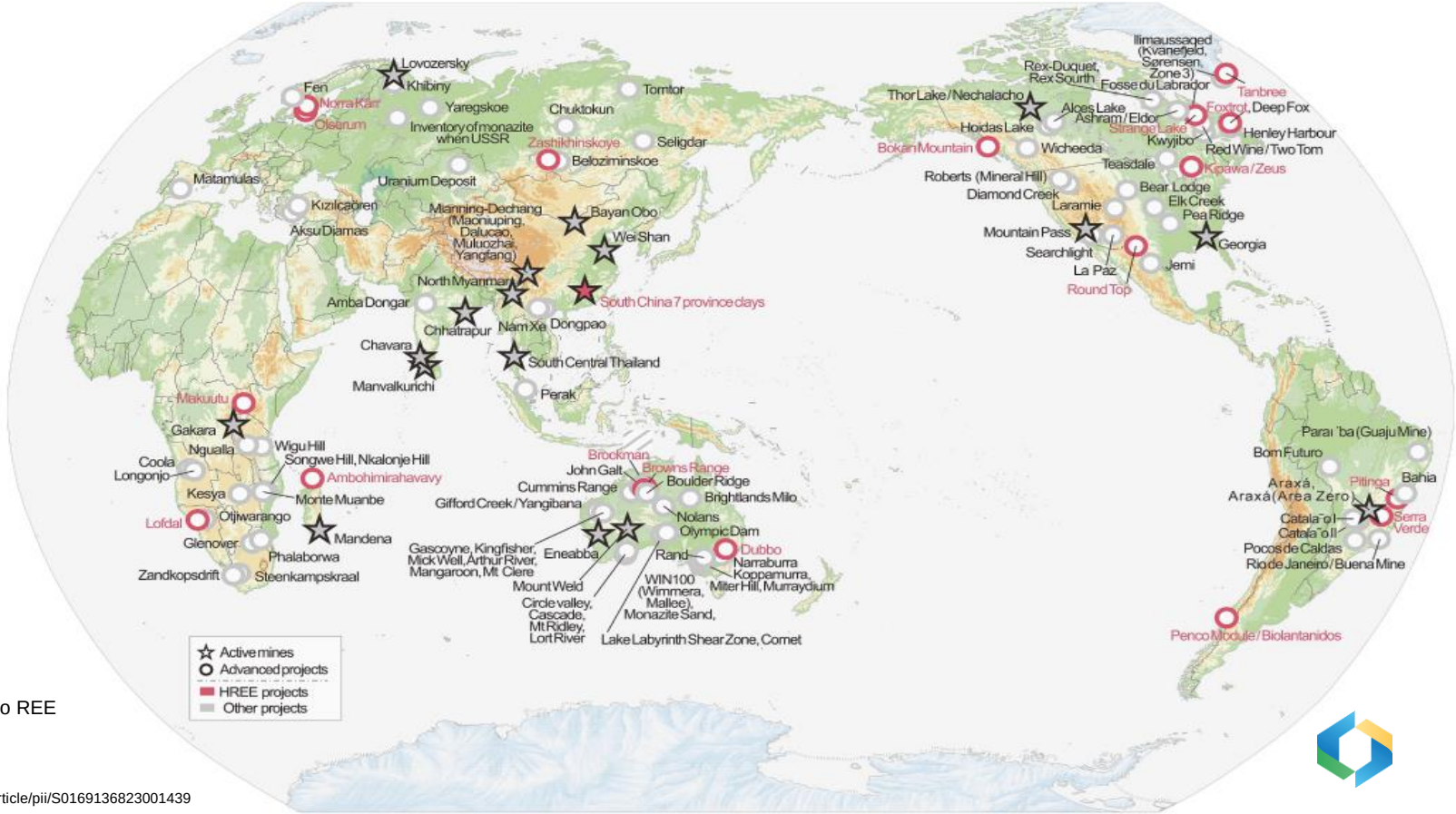
Geological Context



Takehara 2015 (modif. CHAKHMOURADIAN; WALL, 2012).

Geological Context

Global Distribution of Heavy Rare Earth Projects

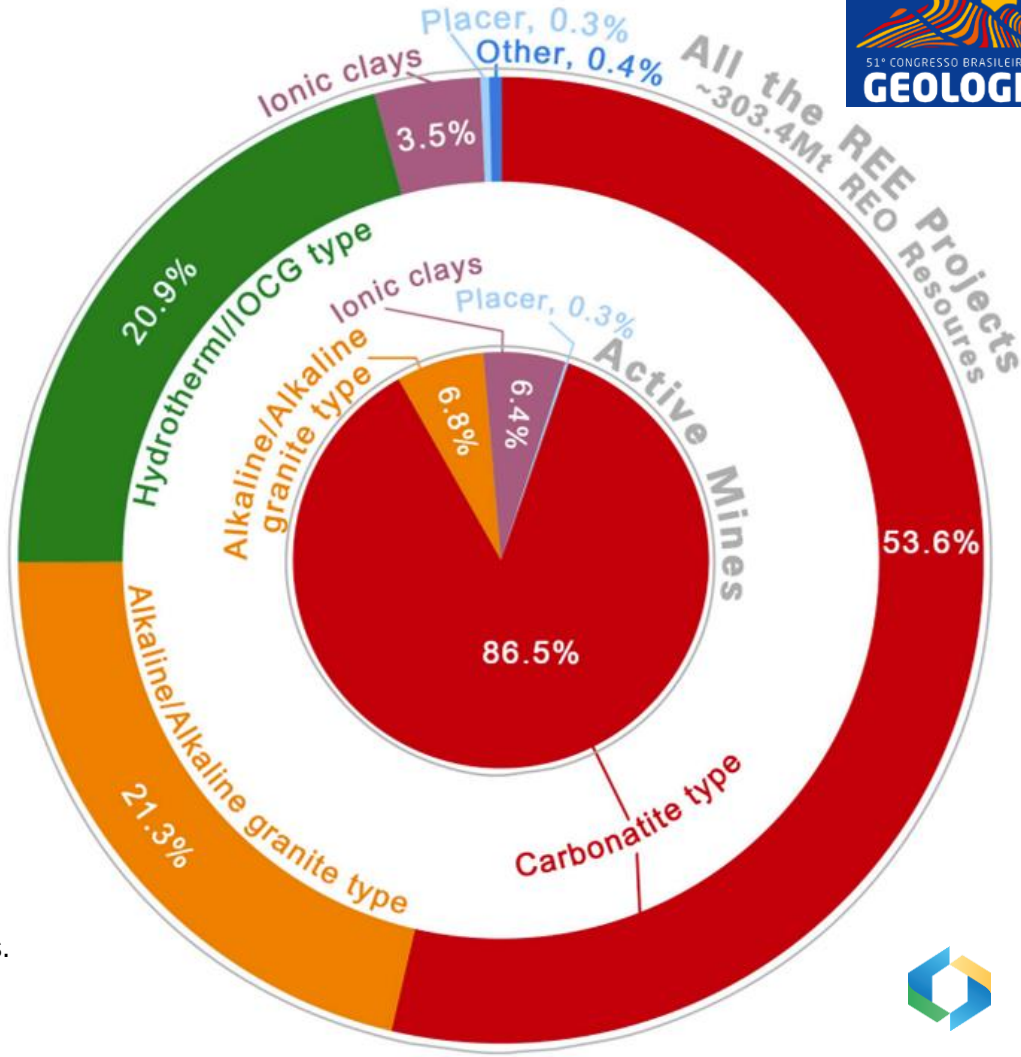


* % HREE more than 20% do REE

https://www.sciencedirect.com/science/article/pii/S0169136823001439

Geological Context

Proportion of TR resources by types of deposits



Outer circle: all TR projects

Inner circle: active mines

Note: Proportion of resources and not the number of projects.

https://www.sciencedirect.com/science/article/pii/S0169136823001439

Brazilian Potential

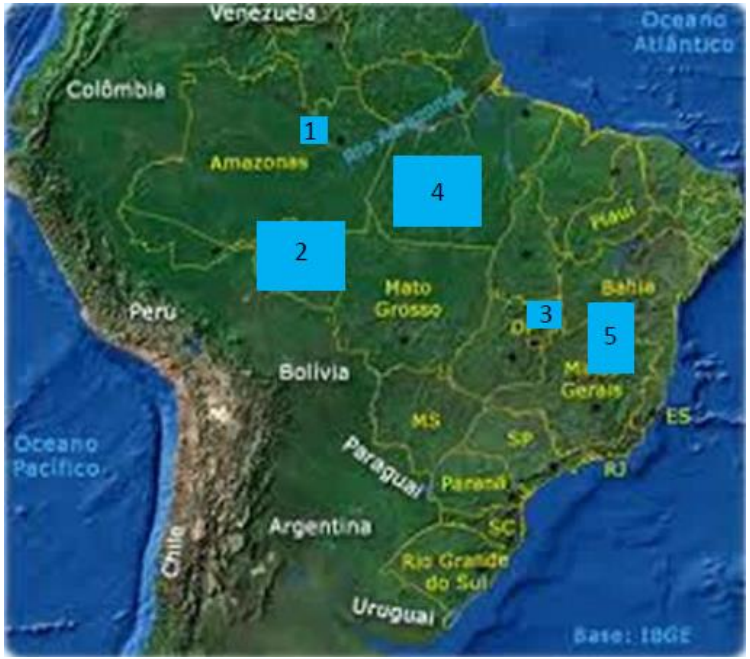
Measured and estimated reserves for REE in alkaline bodies

Deposit	REE_2O_3	P_2O_5	TiO_2	Nb_2O_5	Others
Araxá (MG)	14,20 Mt @ 3,02% (CBMM) 7,73 Mt @ 2,35% (CODEMIG) 6,30 Mt @ 5,01% (Cut-off 2%) (Mbac Fert.)	210 Mt @ 10%	191 Mt @ 21,9% (cut-off 15%)	462 Mt @ 2,48%	51 Mt @ 7,26 $BaSO_4$
Barra do Itapirapuã (SP)	2,4 Mt @ 1,29%				P, F e Pb
Catalão I (GO)	78,9 Mt @ 8,67%	250 Mt @ 10,48%	339,4 Mt @ >10%	19 Mt @ 1,8%	35,9 Mt @ 17% (vermiculita)
Catalão II (GO)	25 MT @ 0,98%	400 Mt @ 9,5%		13,5 Mt 1,35%	
Poços de Caldas (MG)	7 Mt @ 2,89%				26,8 mt U_3O_8, 25 mt MoO_2, e 172,4 mt ZrO_3, Th, Zn, Al
Seis Lagos (AM)	43,5 Mt @ 1,5%				Nb, P, Fe, Mn, Ti
Tapira (MG)	? Mt @ 1 a 10%	744 Mt @ 8,35% (cut-off 5%)	191 Mt @ 21,9%	113 Mt @ 0,9%	
Maicuru (PA)	?	200 Mt @ 15%	5 Bt @ 20%		
Salitre (MG)	?	852 Mt @ 10,7%	694,3 Mt @ 17,5%	166 Mt @ 0,73%	
Serra Negra (MG)	?	228 Mt @ 10%	200 Mt @ 27,68%		

Brazilian Potential

Measured and estimated reserves for TR in granitic bodies

Deposit	REE_2O_3	Ta_2O_5	Others
Pitinga (AM)	2Mt @ 1% Y	175 Mt @ 0,02 %	Criolita 9Mt @ 31,9% Na_3AlF_6
Serra Verde (GO)	379Mt @ 0,12%		



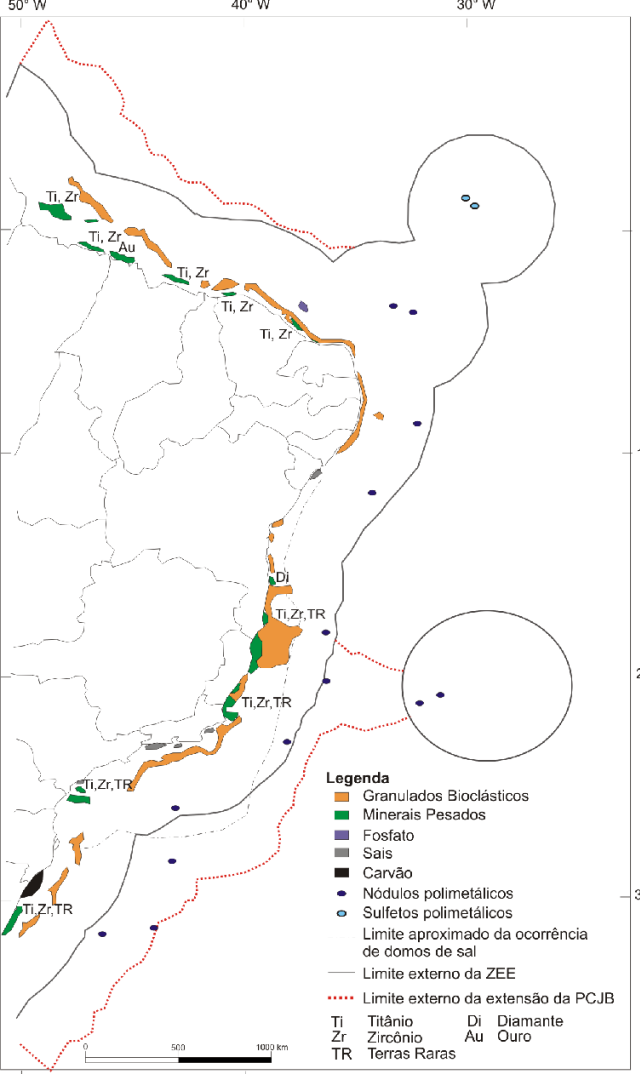
Botelho, 2024

Others deposits:

1. Pitinga
2. Rondônia Tin Province
3. Tin Province of Goiás
4. Southwest of Pará and Carajás
5. Granites associated with the Evolution of the Espinhaço Supergroup

Brazilian Potential

Estimated resource for monazite in placers



Monazite was explored until the 1990s in Bahia, Espirito Santo and Rio de Janeiro, whose monazite reserves were distributed:

- RJ – 76%
- BA – 15%
- ES – 9%

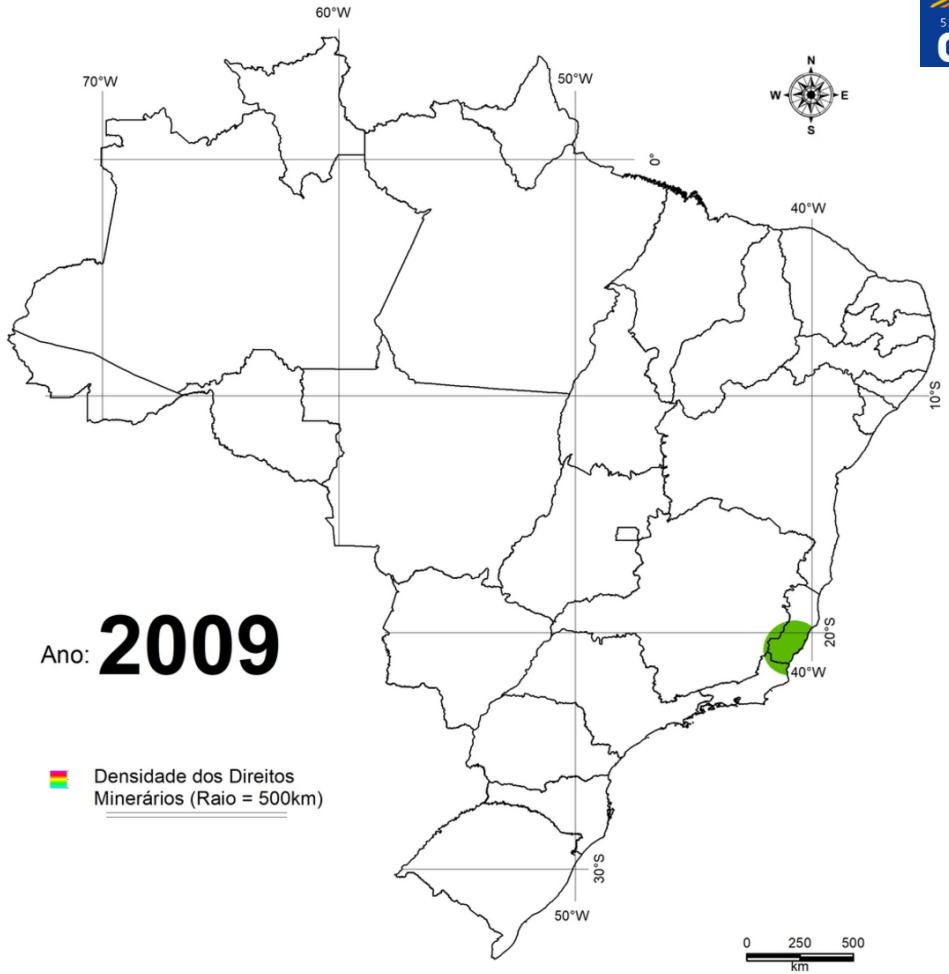
Brazil has known reserves of ~ 140.21 thousand tons, associated with heavy minerals (ilmenite, zircon, rutile, mainly).

https://www.gov.br/anm/pt-br/centrais-de-conteudo/publicacoes/serie-sustentabilidade/plataforma-continental-mapa

Current Scenario

Density of Mining Rights

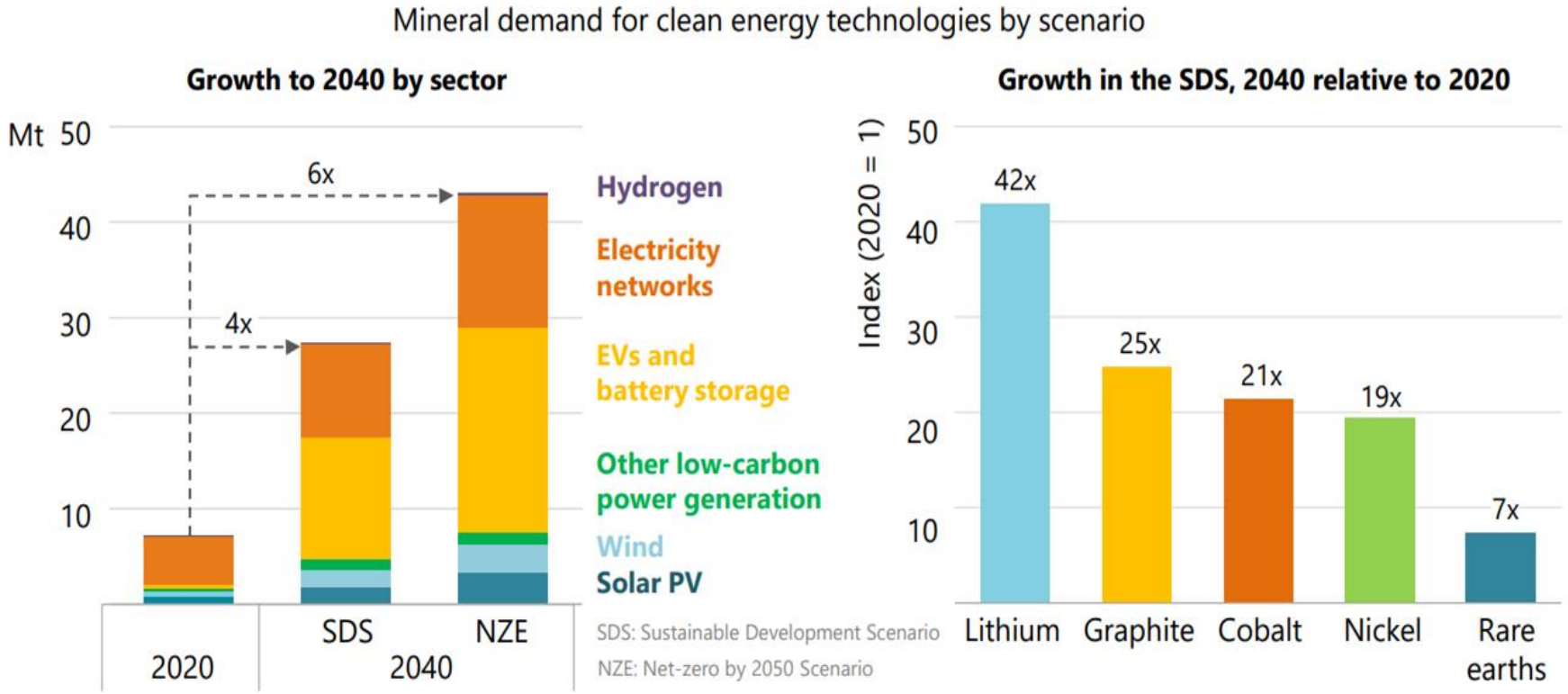
(2009 a 2023)



Current Scenario

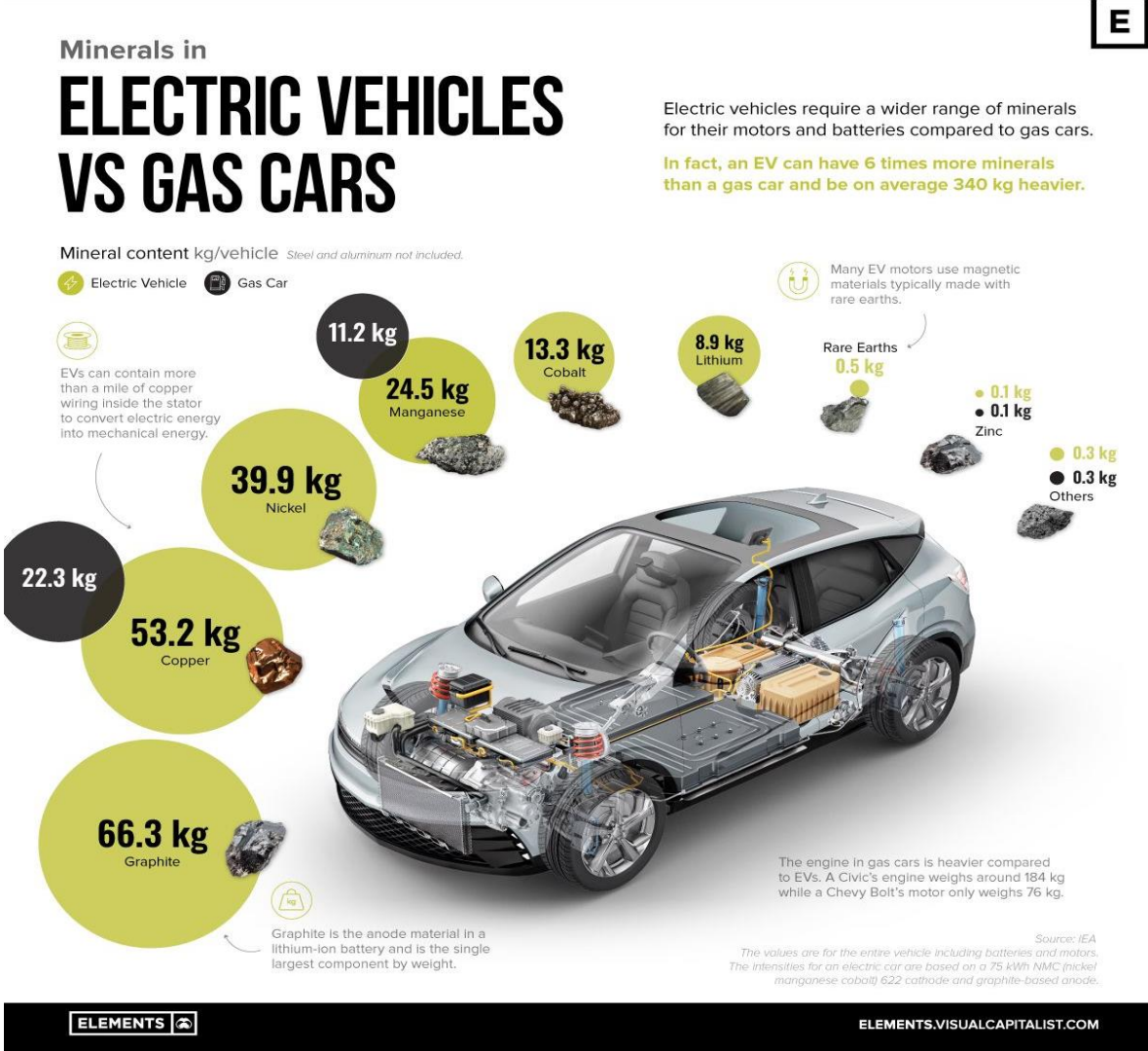
Companies that published resource or area acquisition reports

Future Perspectives



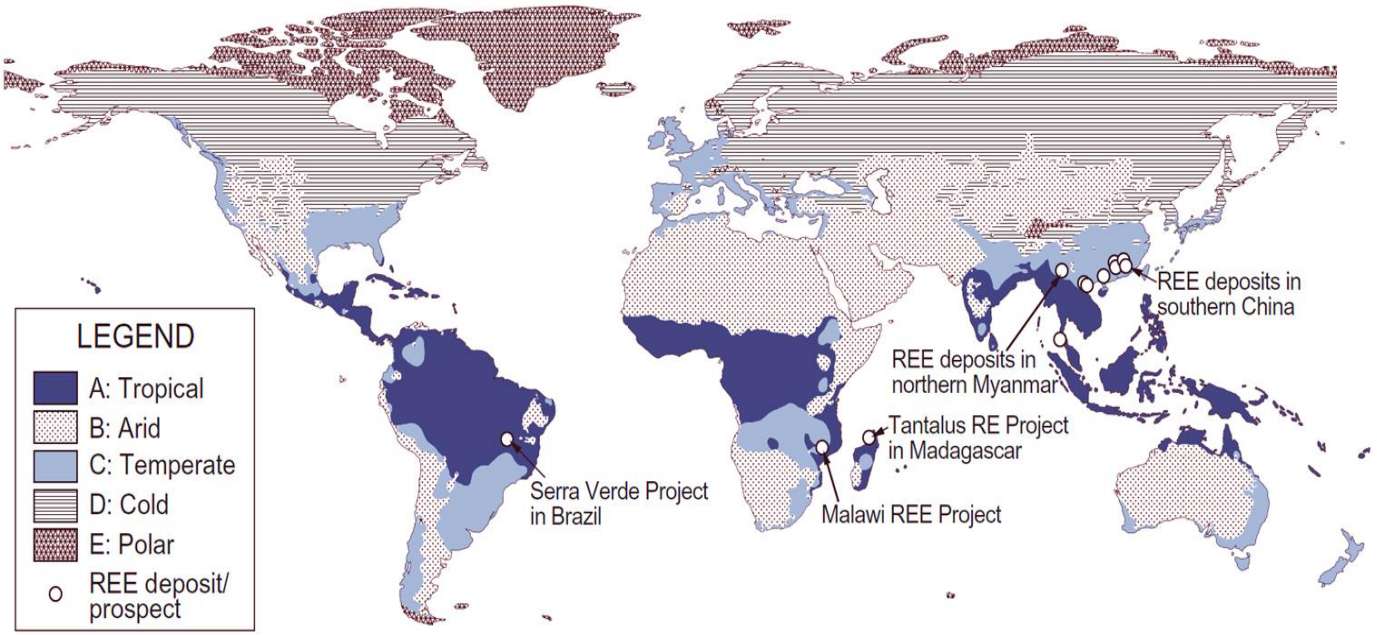
https://iea.blob.core.windows.net/assets/9d6f9b13-c478-41c6-9ffe-6a05f3ab73ef/Criticalmineralslaunchslides.pdf

Future Perspectives

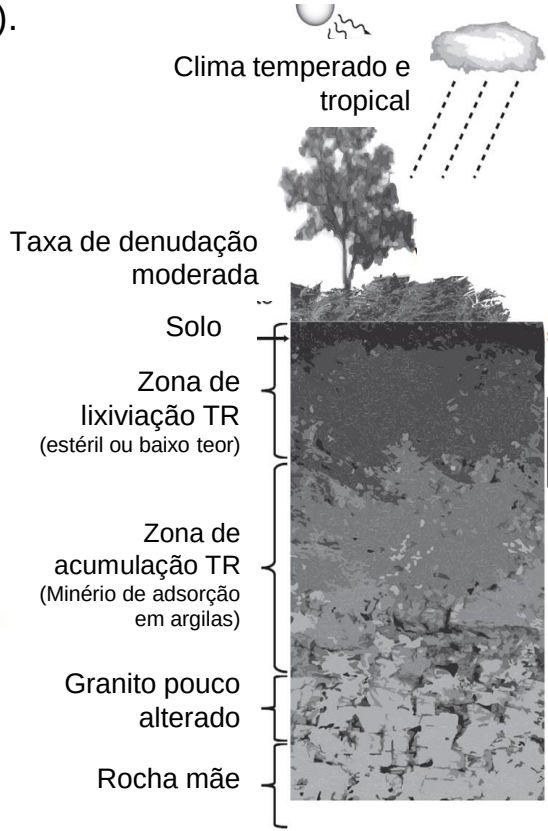


Future Perspectives

World map of the Köppen-Geiger climate classification (Mod. Peel et al., 2007).
Ionic adsorption type TR deposit and some research projects.

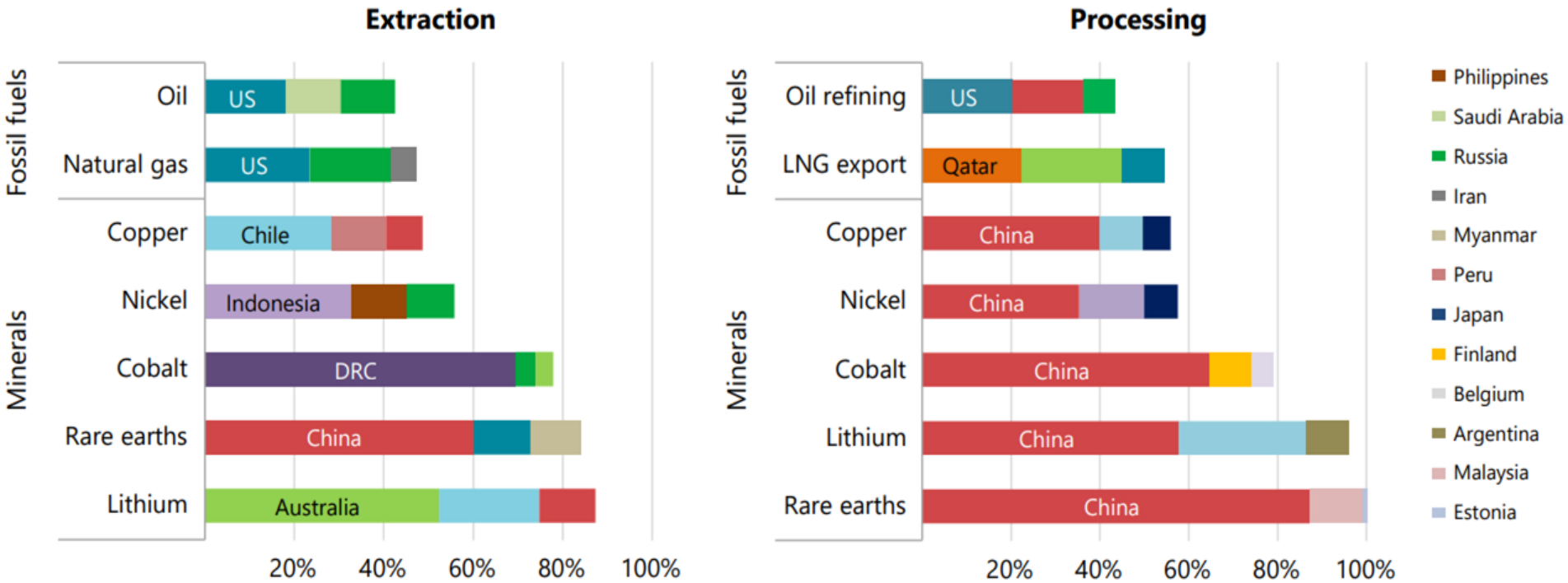


Sanematsu & Watanabe, 2016



Challenges

Share of top three producing countries in production of selected minerals and fossil fuels, 2019



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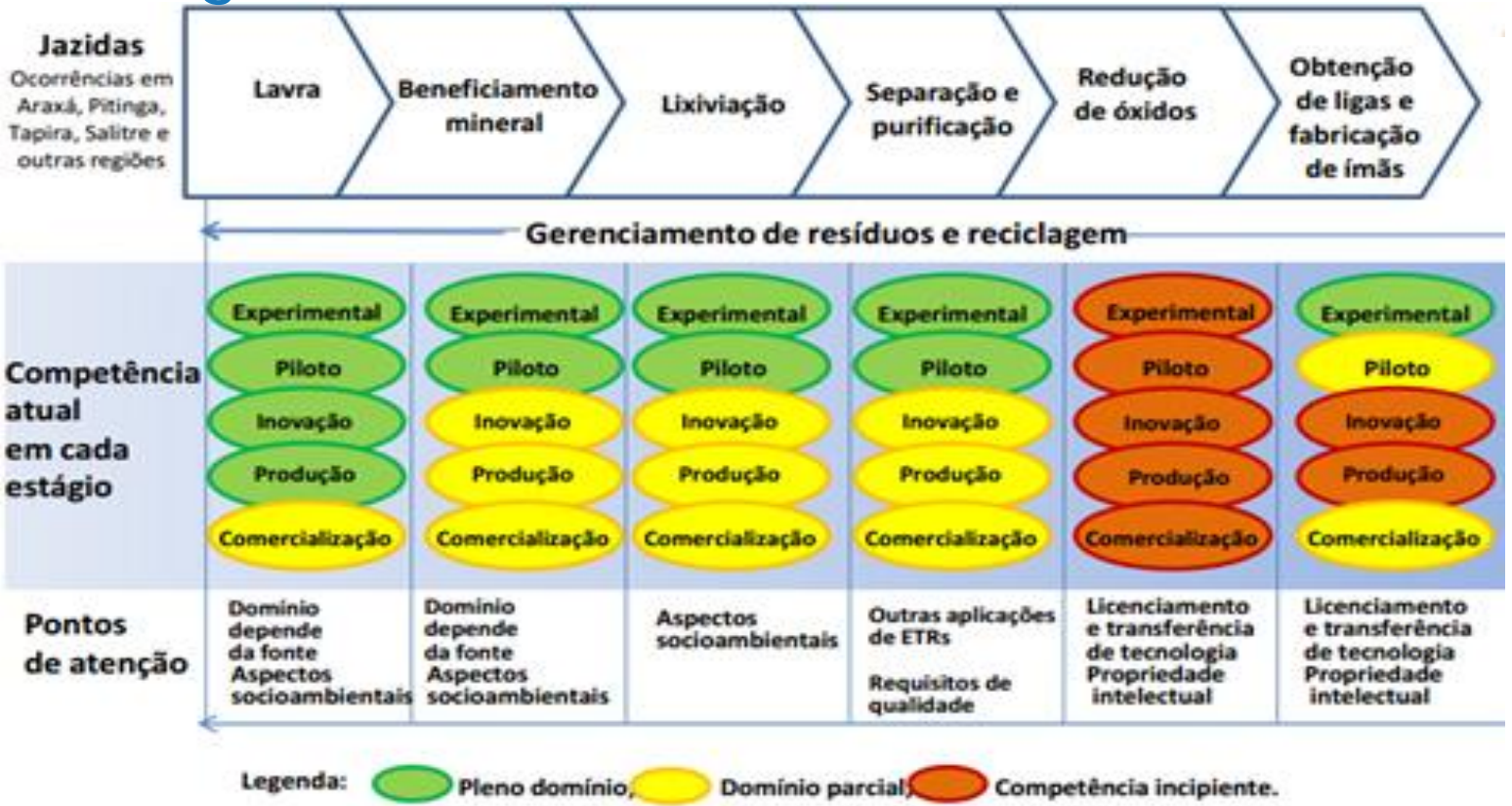
Challenges



Uso industrial

Heider, 2018

* The production chain is highly complex and involves several risks (financial, geological, technological, market, operational, political and environmental).

https://www.inthemine.com.br/site/a-evolucao-das-terras-raras-no-brasil/

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OBRIGADA!

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