

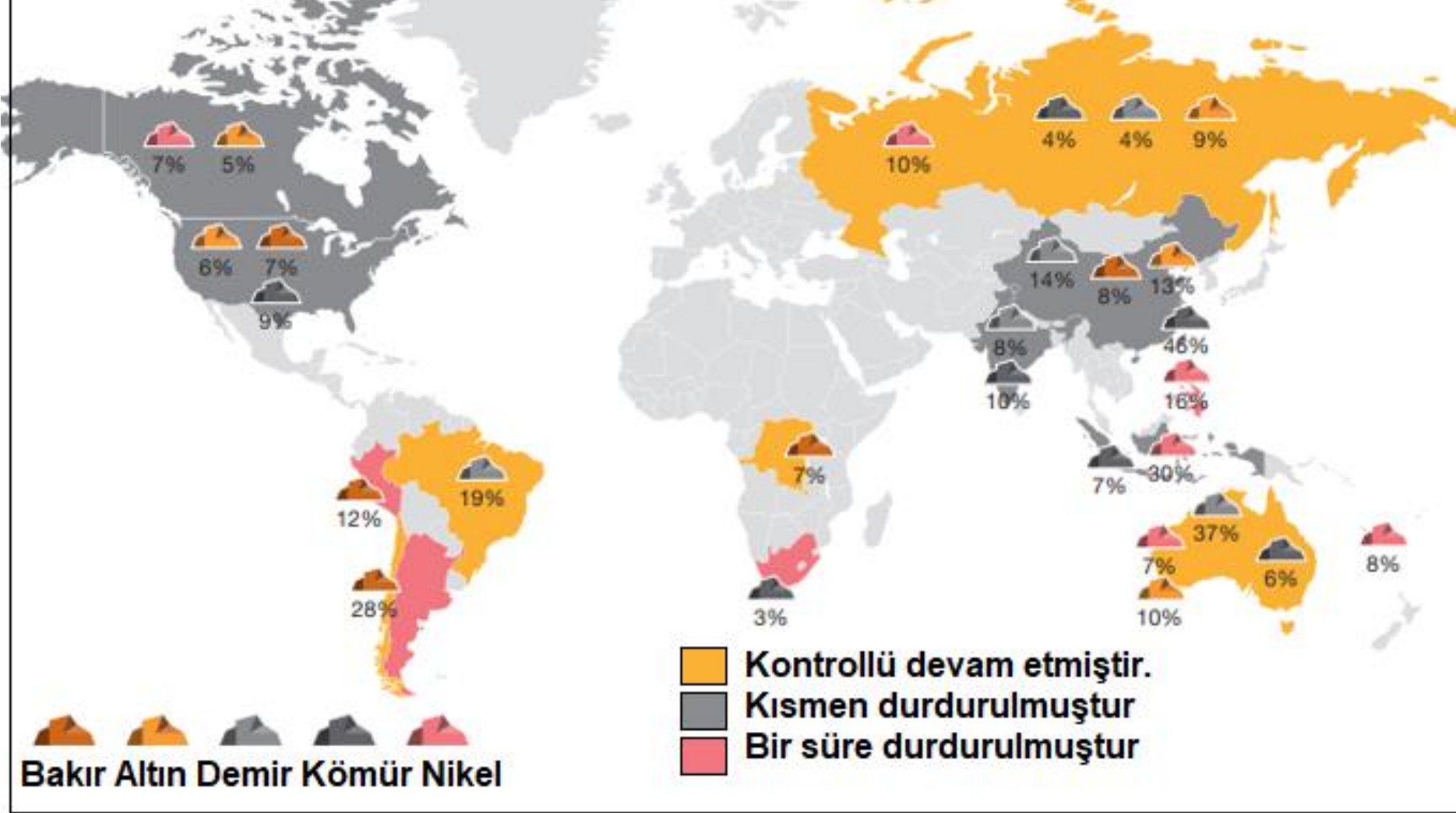
DÜNYADA MADENCİLİK VE MADENCİLİĞİN ÜLKELERİN SOSYA EKONOMİK YAPISINA ETKİSİ

Necati Yıldız
Maden Yük. Müh.



COVİT-19'UN MADENCİLİĞE ETKİSİ

Madencilik'e Covid-19'un etkisi



COVİT -19 ETKİSİ

Madencilik faaliyetleri de diğer sektörler gibi salgından olumsuz yönde etkilemiştir. Bazı şirketler ve ülkeler kendilerine göre bazı önlemler almışlardır.

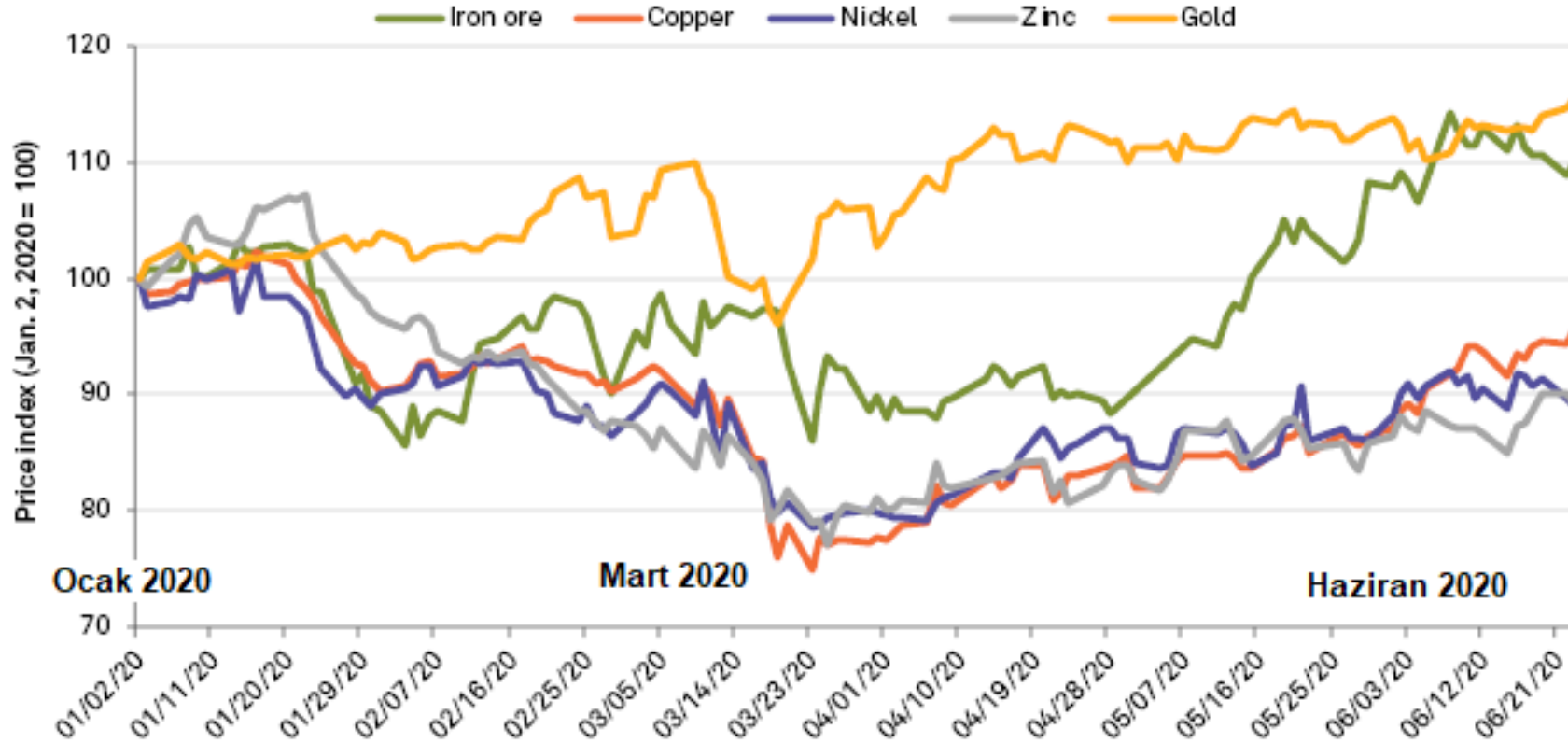
- Meksika'da tüm madenler,
- Peru'da antimuan, bakır ve çinko madenleri,
- Malezya ve Mozambik boksit madenlerinde üretim askıya alınmışlardır.
- Güney Afrika, tam bir kapatmanın ardından madencilik çalışanların sayısı % 50 düşürülerek sürdürülmüştür.

Bazı hükümetlerin madenciliği temel bir hizmet olduğunu ilan ederek üretimi devam ettirme çabaları içinde olmuştur

Bu süreçte Rio Tinto, BHP ve Anglo American şirketleri faaliyette oldukları ülkelere de bağlı olarak üretimde yavaşlatmışlar, “zorunlu olmayan yatırımlarını” askıya almışlardır.

Çin dünyaya kapılarını kapatmış, Çin maden ithalatı adeta durmuştur. Bu salgın döneminde metal fiyatlarında önemli düşüşler kaydedilmiştir.

Metal Fiyatları



Data as of June 23, 2020.

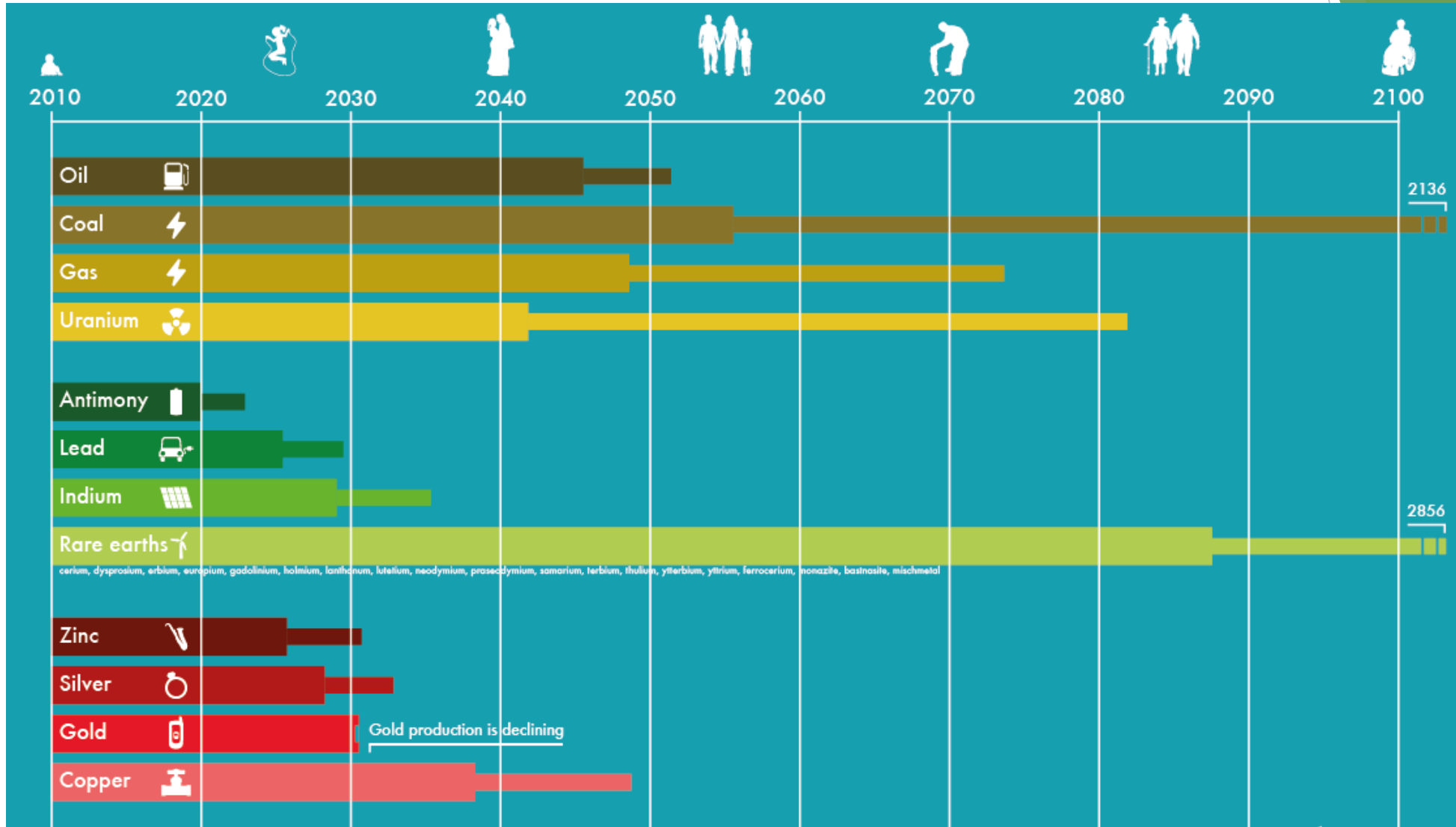
Precious metals prices are spot contributor, XAU, XAG, XPT, XPD.

Sources: S&P Global Market Intelligence; S&P Global Platts; Refinitiv; London Metal Exchange

Bu günlere geldiğimizde her ne kadar salgın sonlanmasa da şirketler mevcut üretimlerini sürdürmektedir.

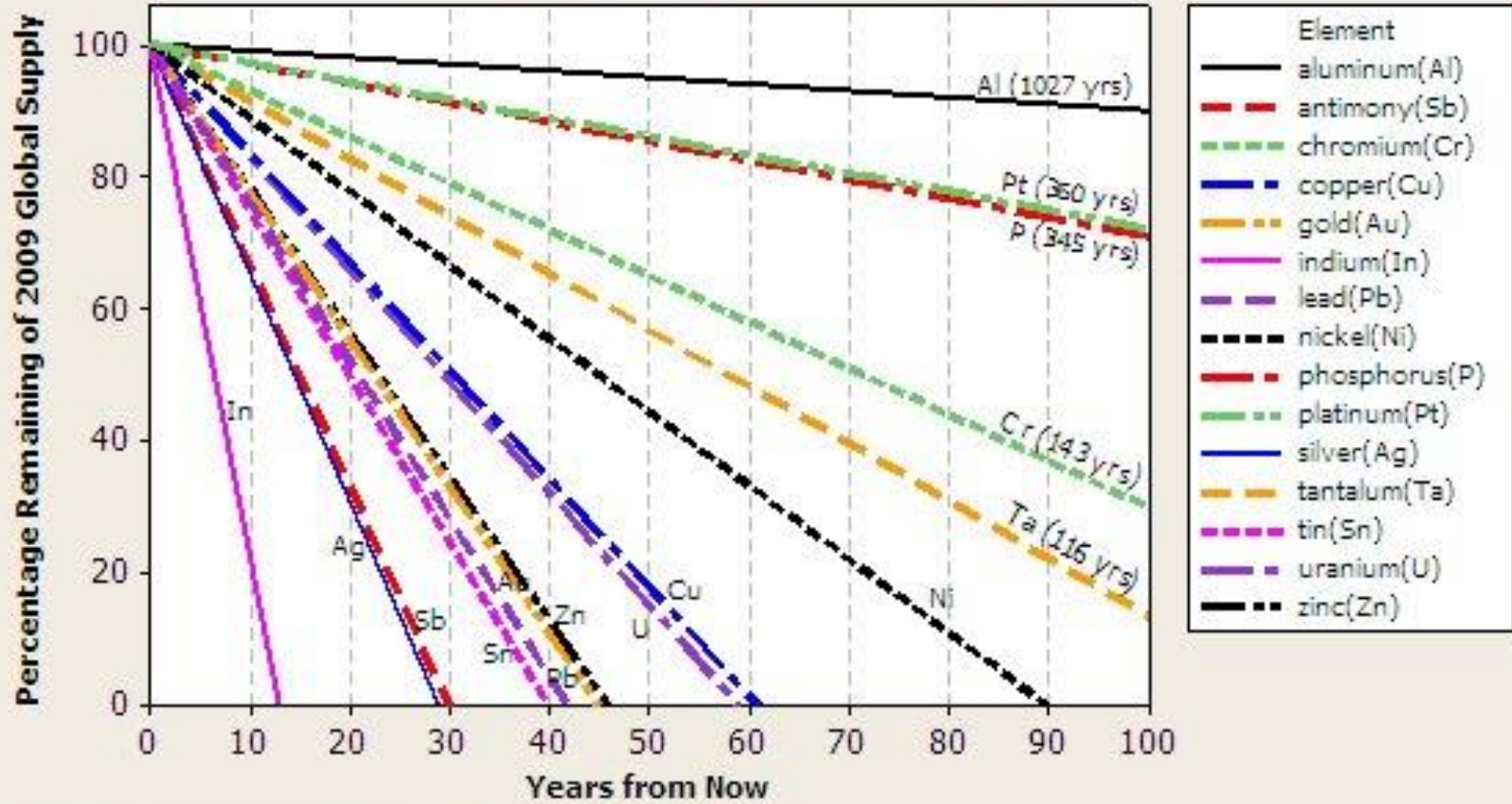
Mart ayının son günlerini yaşadığımız bu sürede virüsün giderek yayılma eğilimi göstermesi ve geleceğin belirsizliği şirketlerin yatırım konusundaki kararlarını etkilemektedir.

DÜNYADA MADENCİLİĞİN MEVCUT DURUM



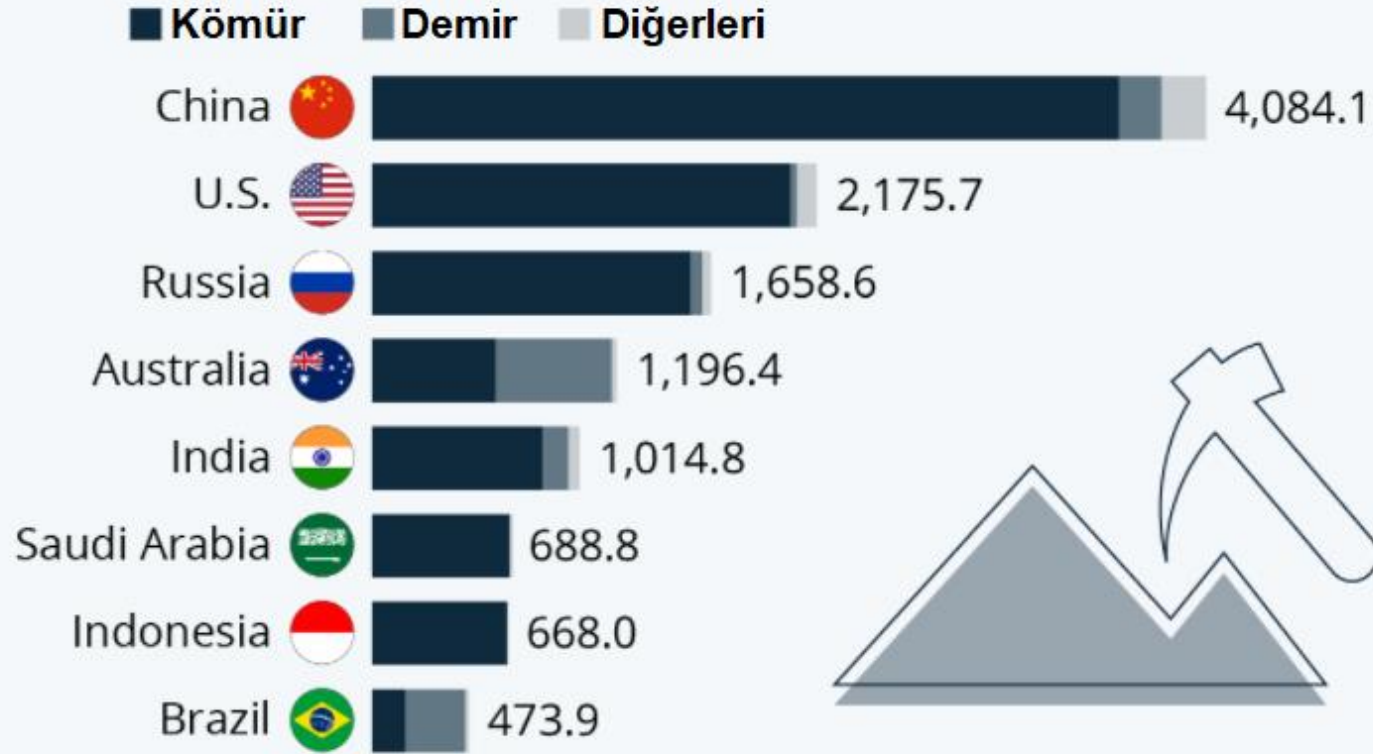
World's Natural Resource Depletion Forecast

(assuming today's global consumption rate)



www.CavemanForecaster.com

2018 yılı maden üretici ülkeler, x 1000 ton



* Including ferro-alloys

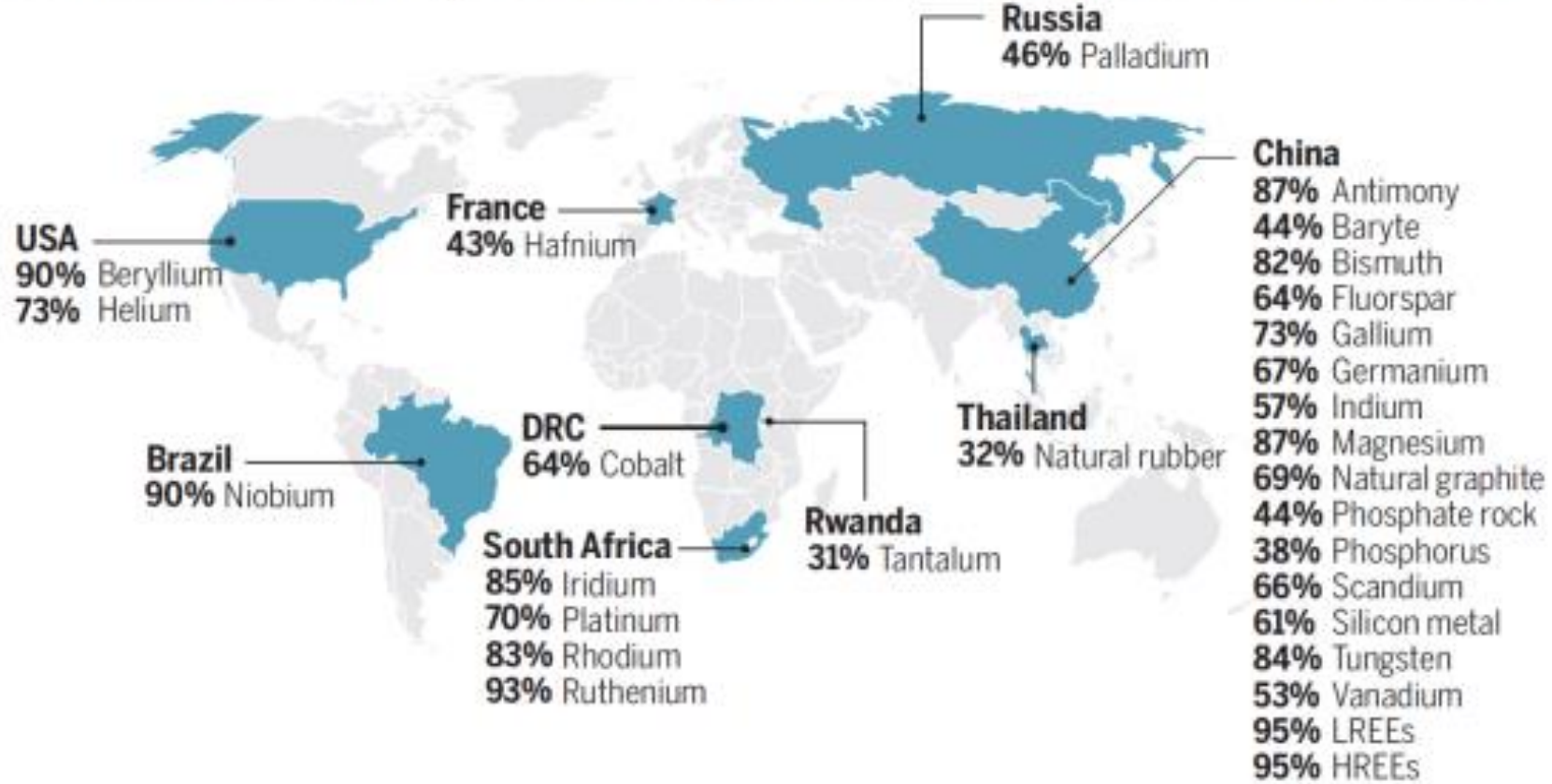
Source: International Organizing Committee for the World Mining Congresses

Önemli maden üreticisi ülkeler



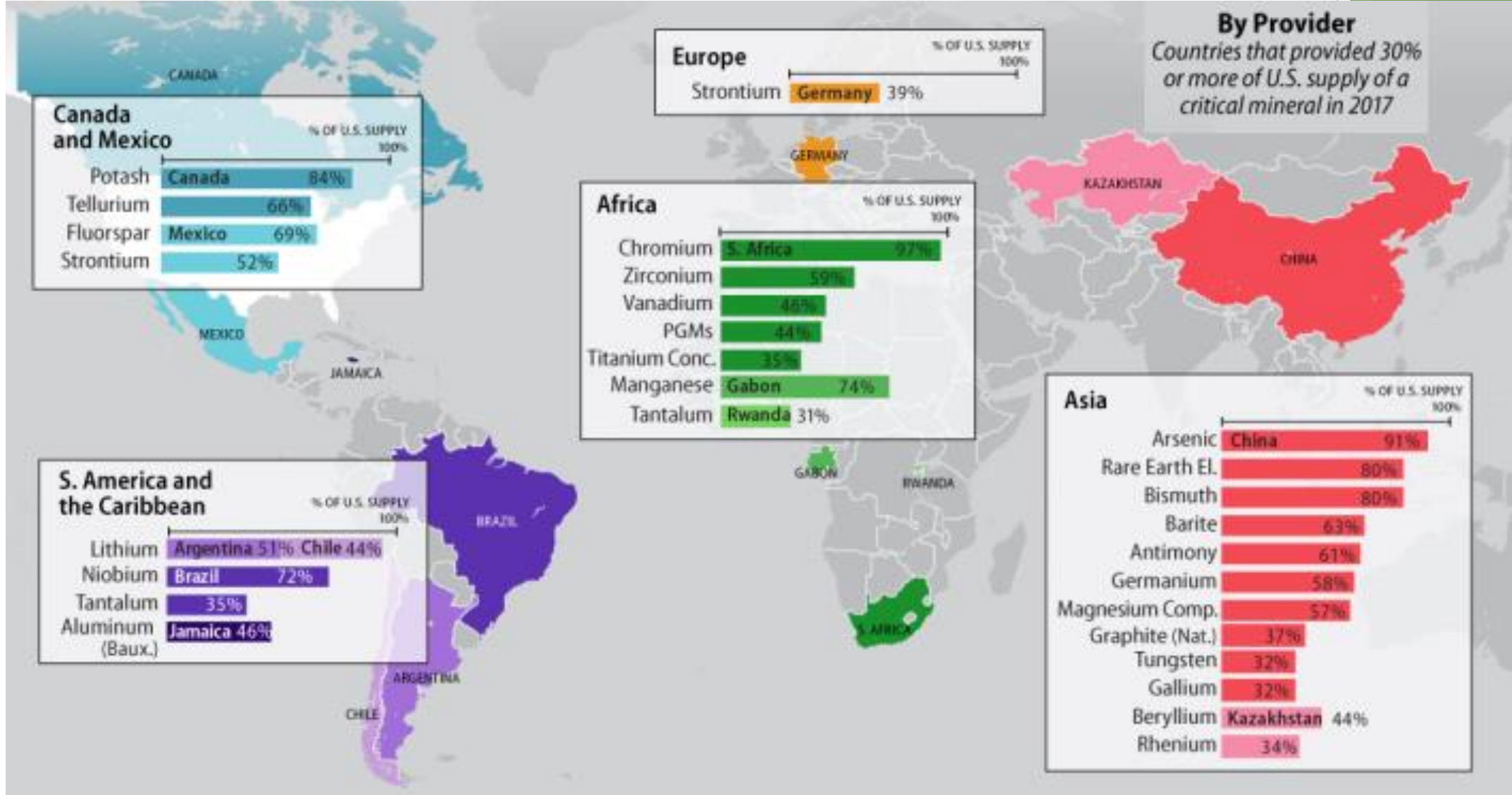
Önemli kritik hammaddelerin ülkelerdeki dağılım oranları

Countries accounting for the largest share of critical raw materials



DRC, Democratic Republic of Congo; LREEs, light rare earth elements; HREEs, heavy rare earth elements. Figure modified from European Commission, "Third list of critical raw materials for the EU of 2017" (European Commission, 2017); https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en.

ABD'nin %30'dan fazla gereksinimini karşıladığı kaynaklar



Avustralya



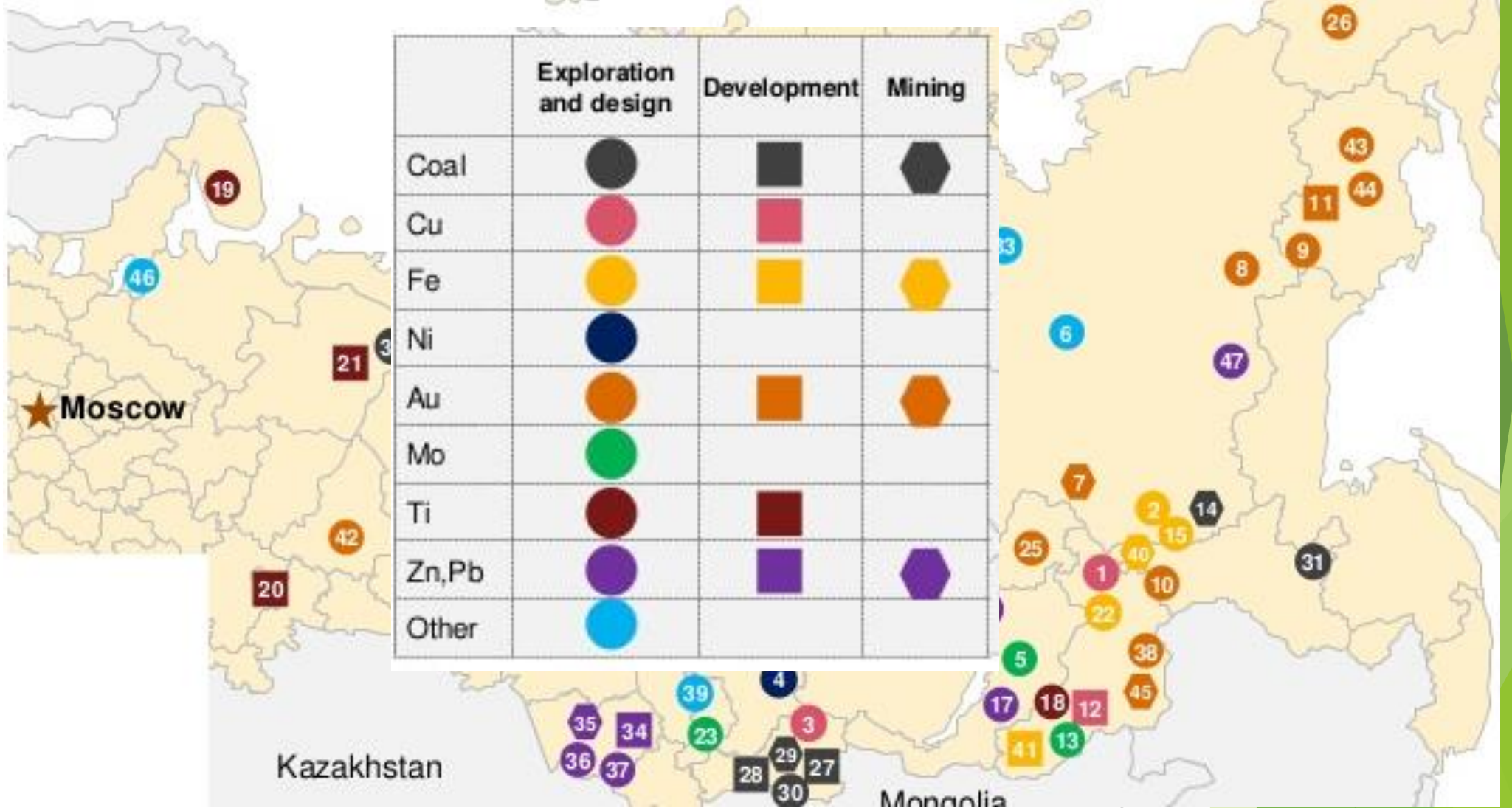
Afrika'da kaynaklar

Afrika



	Maden	Dünyadaki payı %
North Africa	Phosphate	32
West Africa	Bauxite	40
	Uranium	5
	Iron ore	4
Central and Southern Africa	Platinum	88
	Chromium	84
	Diamonds	60
	Cobalt	49
	Gold	40
	Uranium	13
	Copper	5

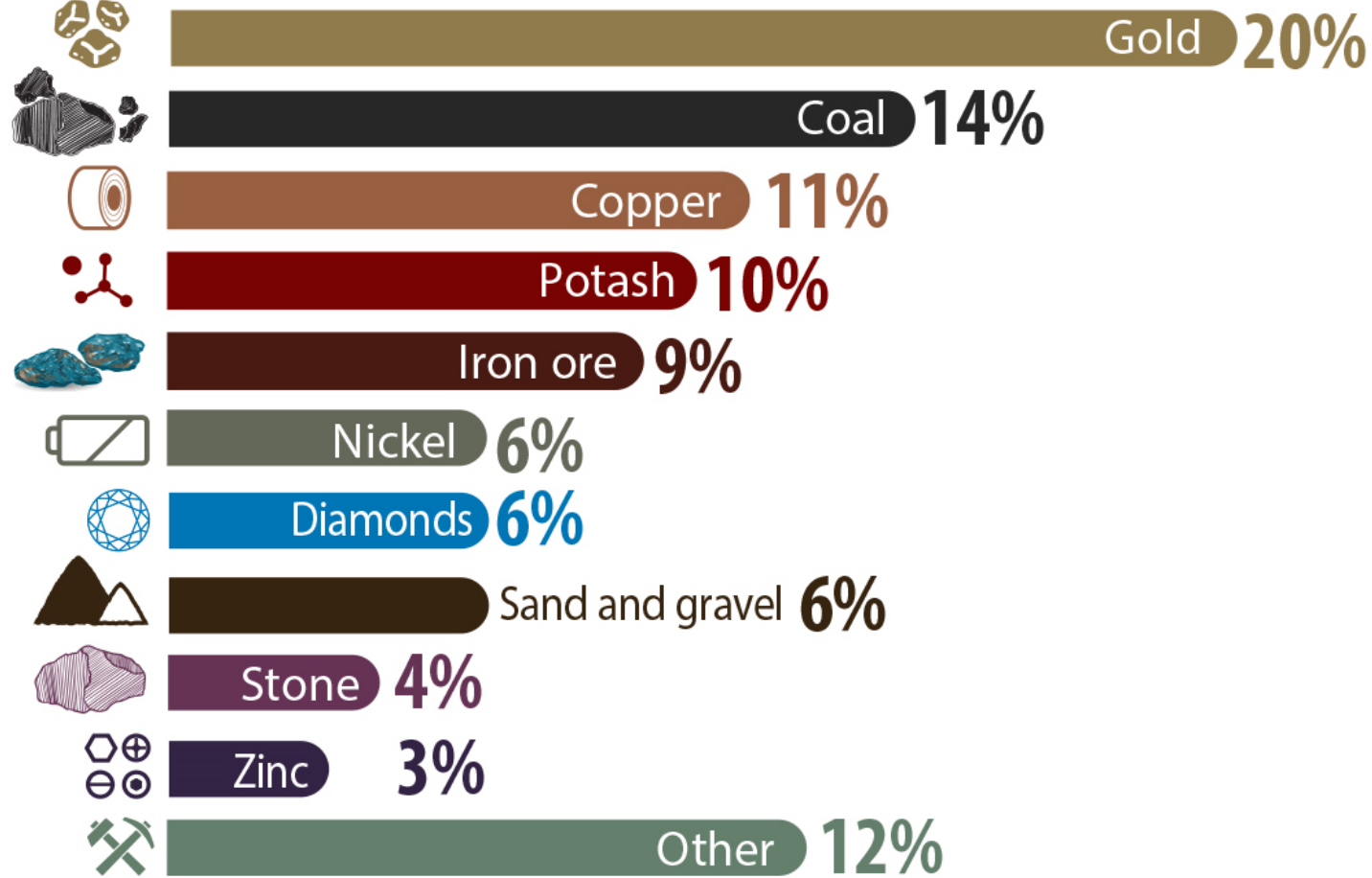
Rusya'da maden işletmeleri



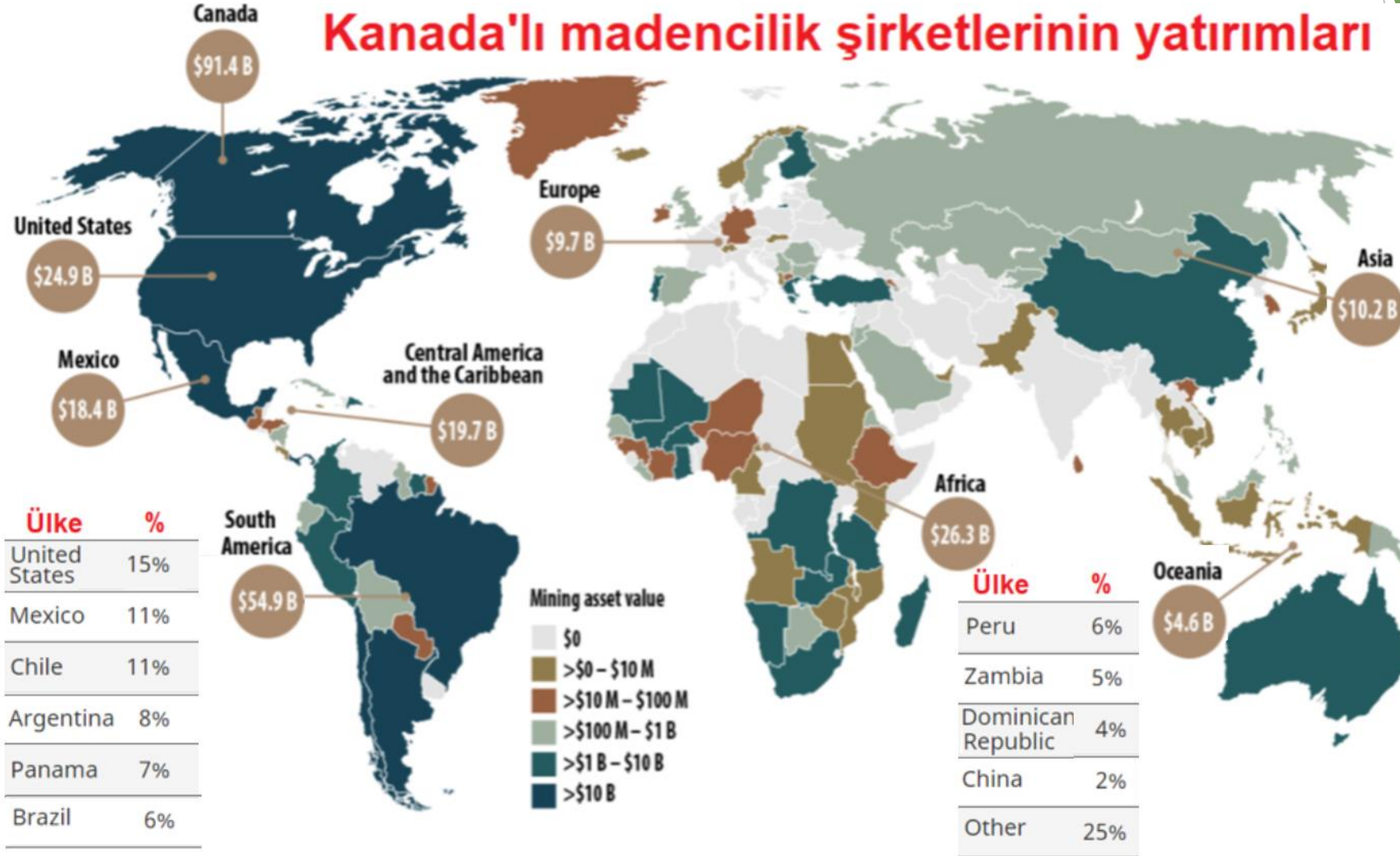
Kanada'da maden işletmeleri



Dünya madenciliğinde Kanada



Kanada'lı madencilik şirketlerinin yatırımları



Dünyada en büyük 10 madencilik firması

Chg 2020	Company	HQ	Operations	Market Value – end-2020 (\$) ▾
1.	BHP Group	Melbourne	Değişik	165.82B
2.	Rio Tinto	Melbourne	Değişik	142.30B
3.	Vale	Rio de Janeiro	Değişik	86.37B
4.	Fortescue Metals	Perth	Demir	55.72B
5.	Norilsk Nickel	Moscow	Değişik	50.77B
6.	Southern Copper	Phoenix	Bakır	50.34B
7.	Newmont Goldcorp	Denver	Altın	48.15B
8.	Anglo American	London	Değişik	45.20B
9.	Glencore	Baar	Değişik	42.46B
10.	Barrick Gold	Toronto	Altın	40.64B

En büyük 40 firmanın ülkeleri

8 Çin Halk Cumhuriyeti

6 Kanada

4 Güney Afrika

4 Rusya

40 firmanın uğraşları

10 adet altın

5 adet kömür

4 adet bakır



DÜNYADA Nadir Toprak Elementleri

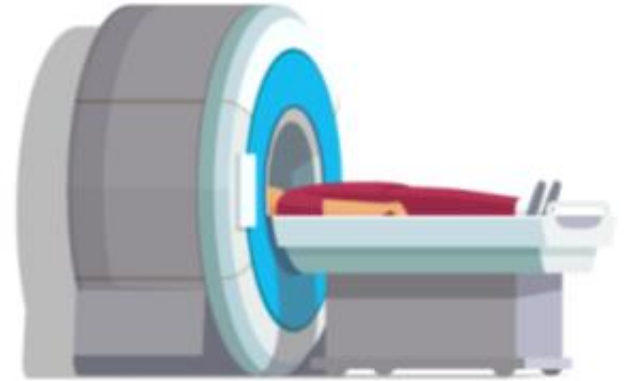
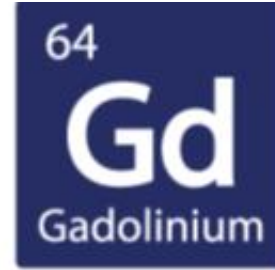
Yitriyum Grubu, ağır NTE		
Terbiyum	Tb	65
Disprosiyum	Dy	66
Holmiyum	Ho	67
Erbiyum	Er	68
Tulyum	Tm	69
Ytterbiyum	Yb	70
Lutetiyum	Lu	71
Yitriyum	Y	39

Seryum Grubu, hafif NTE		
Skandiyum	Sc	21
Lantanyum	La	57
Seryum	Ce	58
Praseodimiyum	Pr	59
Neodimiyum	Nd	60
Prometiyum	Pm	61
Samariyum	Sm	62
Europiyum	Eu	63
Gadoliniyum	Gd	64

1A			2A											3A	4A	5A	6A	7A	8A	
1 H hydrogen 1.008			4 Be beryllium 9.012											5 B boron 10.81	6 C carbon 12.01	7 N nitrogen 14.01	8 O oxygen 16.00	9 F fluorine 19.00	10 Ne neon 20.18	
3 Li lithium 6.94			12 Mg magnesium 24.31											13 Al aluminum 26.98	14 Si silicon 28.09	15 P phosphorus 30.97	16 S sulfur 32.06	17 Cl chlorine 35.45	18 Ar argon 39.95	
11 Na sodium 22.99			20 Ca calcium 40.08	21 Sc scandium 44.96	22 Ti titanium 47.88	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.69	29 Cu copper 63.55	30 Zn zinc 65.39	31 Ga gallium 69.72	32 Ge germanium 72.64	33 As arsenic 74.92	34 Se selenium 78.96	35 Br bromine 79.90	36 Kr krypton 83.79	
37 Rb rubidium 85.47	38 Sr strontium 87.62	39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.96	43 Tc technetium (98)	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3			
55 Cs cesium 132.9	56 Ba barium 137.3	*	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.9	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.5	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium (209)	85 At astatine (210)	86 Rn radon (222)			
87 Fr francium (223)	88 Ra radium (226)	**	104 Rf rutherfordium (261)	105 Db dubnium (268)	106 Sg seaborgium (271)	107 Bh bohrium (278)	108 Hs hassium (277)	109 Mt meitnerium (276)	110 Ds darmstadtium (281)	111 Rg roentgenium (289)	112 Cn copernicium (285)	113 Uut (284)	114 Fl flerovium (289)	115 Uup (288)	116 Lv livermorium (293)	117 Uus (294)	118 Uuo (294)			
Lanthanide Series*			57 La lanthanum 138.9	58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium (145)	62 Sm samarium 150.4	63 Eu europium 152.0	64 Gd gadolinium 157.2	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.0	71 Lu lutetium 175.0			
Actinide Series**			89 Ac actinium (227)	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium (237)	94 Pu plutonium (244)	95 Am americium (243)	96 Cm curium (247)	97 Bk berkelium (247)	98 Cf californium (251)	99 Es einsteinium (252)	100 Fm fermium (257)	101 Md mendelevium (288)	102 No nobelium (289)	103 Lr lawrencium (262)			



JET ENGINES



**MRI CONTRAST
ENHANCER**



F-35



415 kg

**Arleigh
Burke
DDG-51**



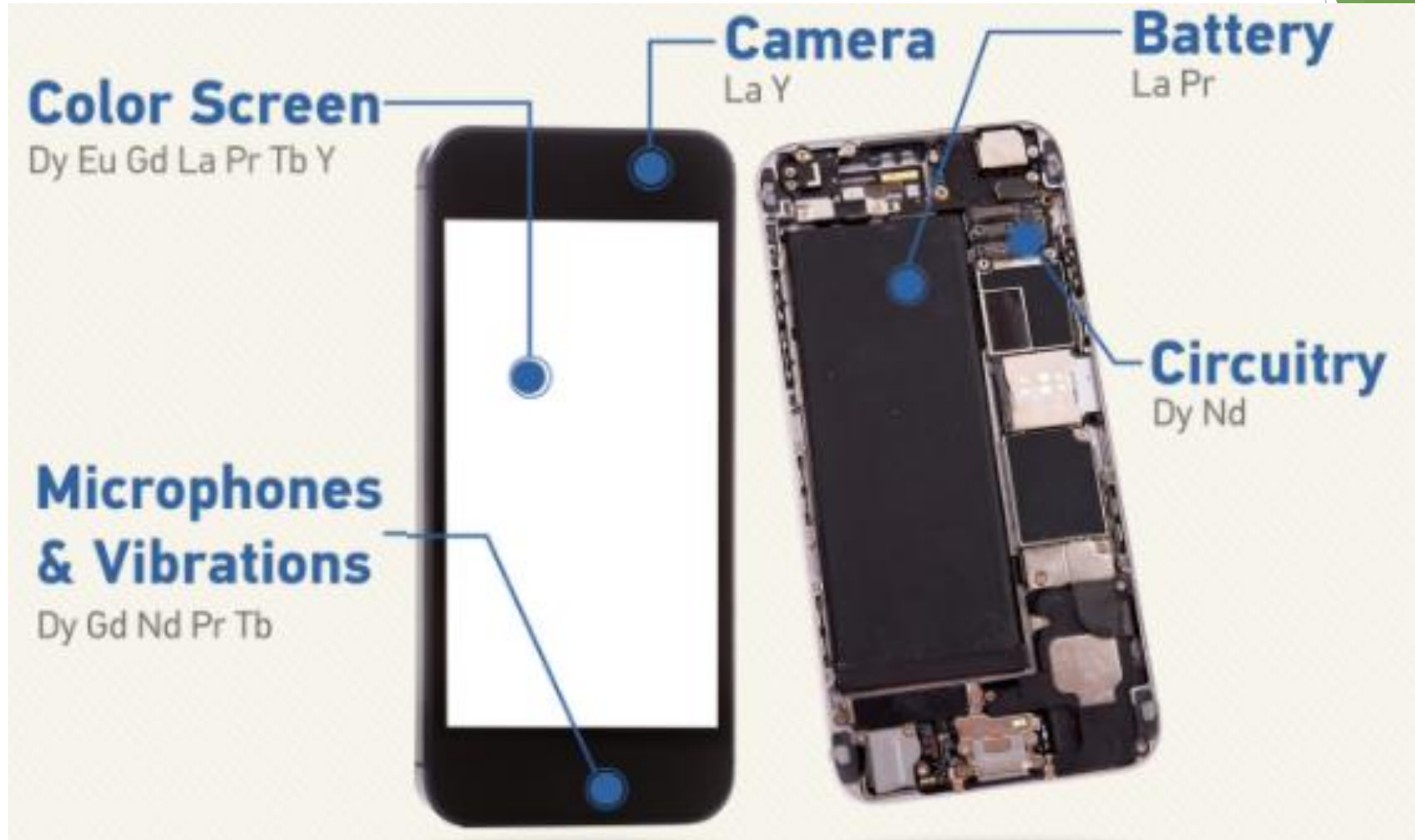
2350 kg

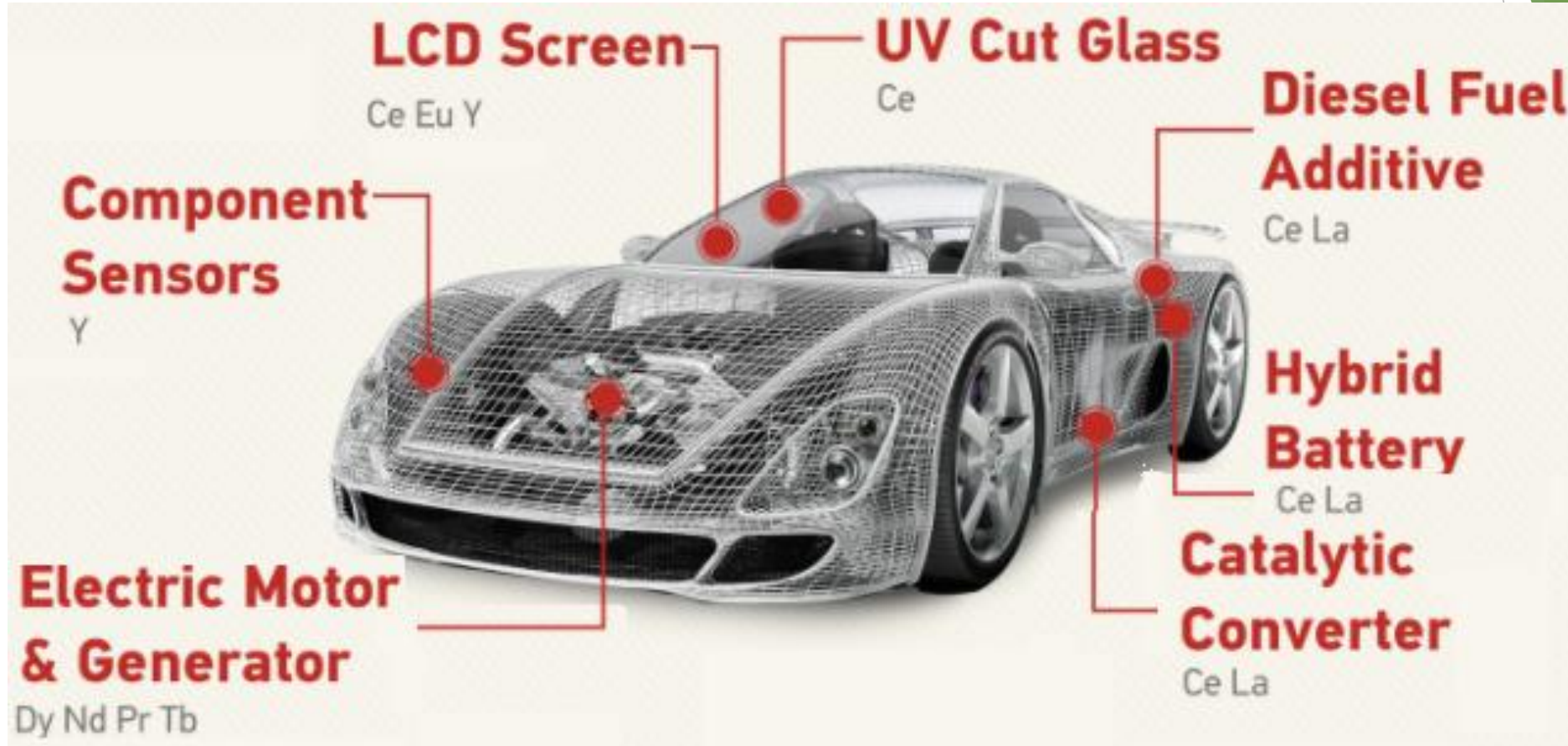
**SSN-774
Virginia-
class
Submarine**



4175 kg

Source: Congressional Research Service







DEFENSE TECHNOLOGIES

Like in the guidance systems of smart bombs



MEDICAL TECHNOLOGIES

Like those used in MRI and X-ray systems



COLOR DISPLAY MONITORS

Like in those used on computers and televisions



ELECTRONIC EQUIPMENT

Like the magnets in your hard drive and speakers



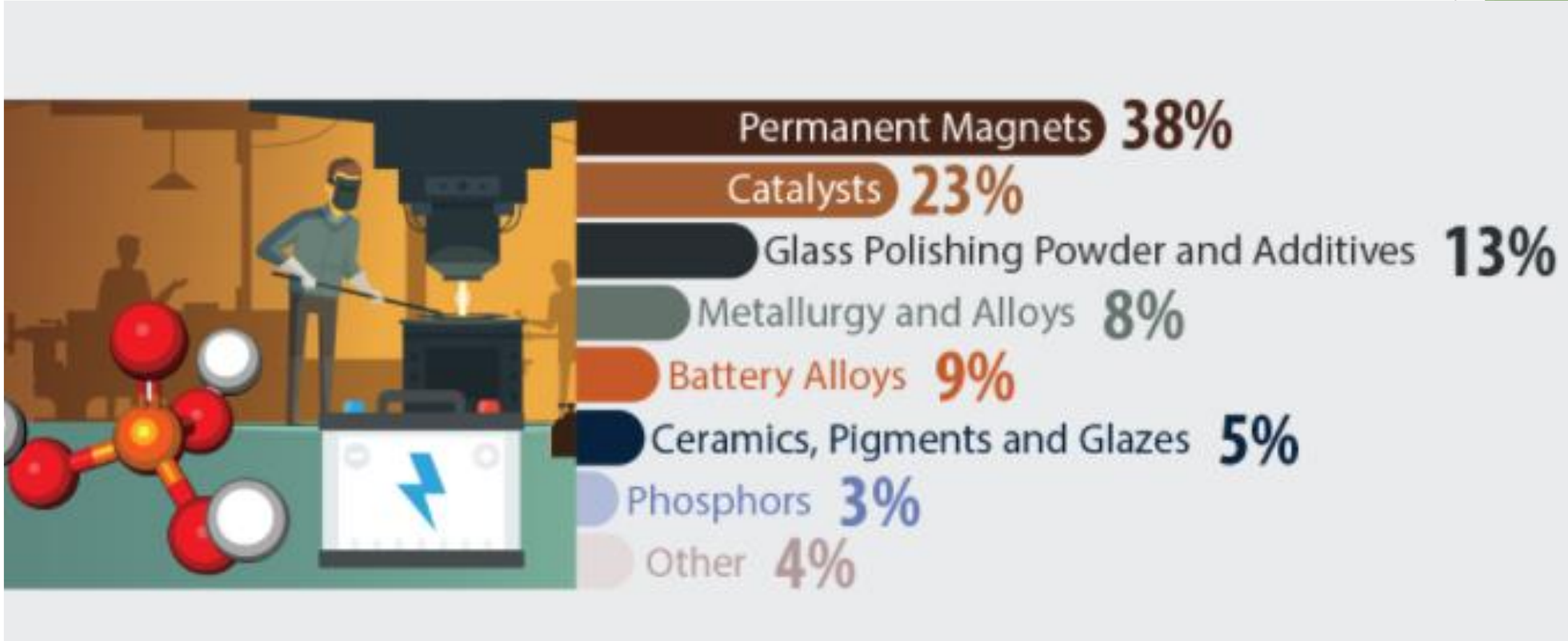
CLEAN ENERGY TECHNOLOGIES

Like in the manufacturing of wind turbines and hybrid cars



OPTICAL LENSES

Like those used in cameras and telescopes

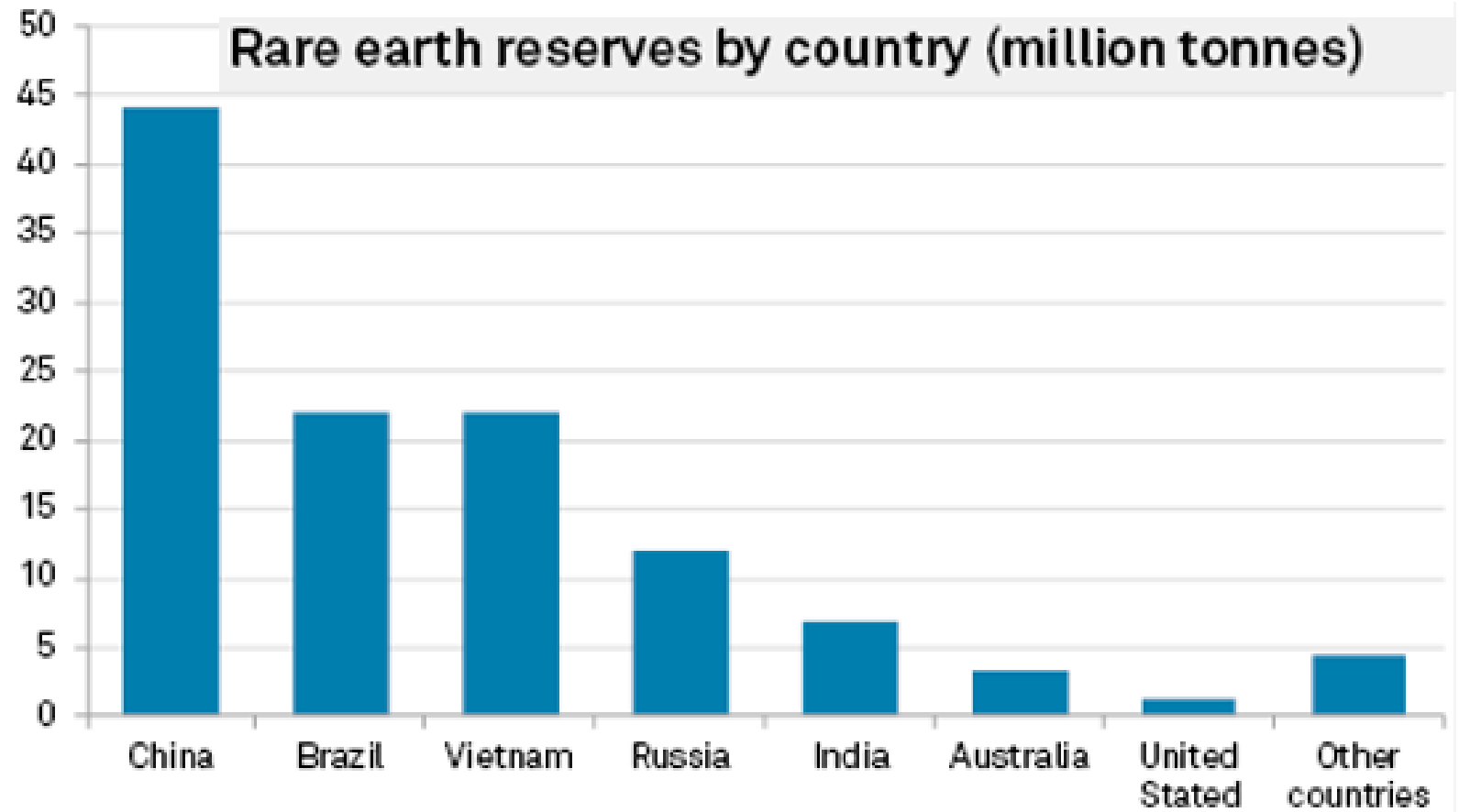


Toplam yaklaşık 170.000 ton

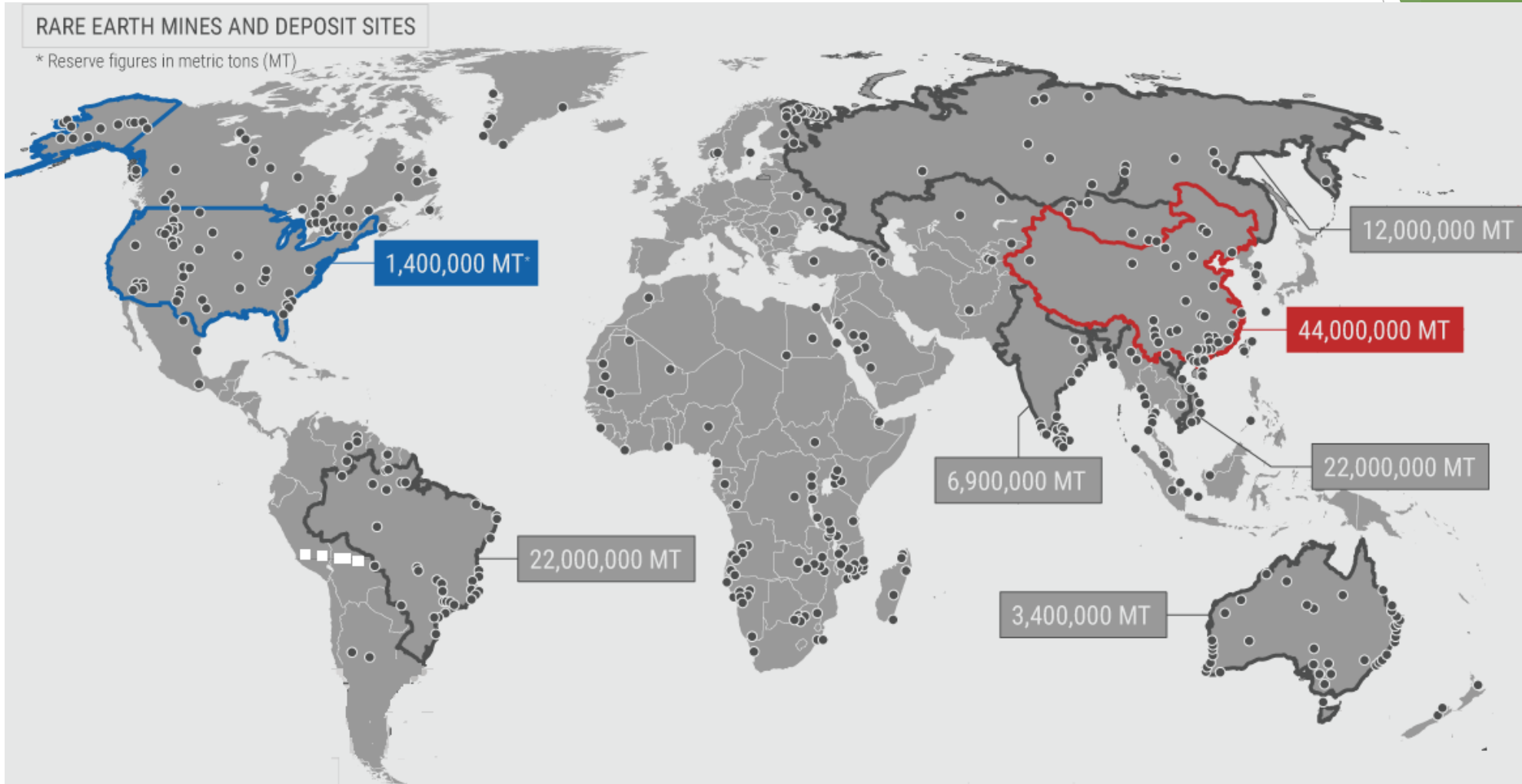


NTE Rezervleri

Country	Reserves (metric tons)
United States	1,400,000
Australia	3,400,000
Brazil	22,000,000
Canada	830,000
China	44,000,000
Greenland	1,500,000
India	6,900,000
Malawi	140,000
Malaysia	30,000
Russia	18,000,000
South Africa	860,000
Thailand	n/a
Vietnam	22,000,000
World total (rounded)	120,000,000



Data compiled June 21, 2019.
The U.S. Geological Survey's reserves data for Russia were revised based on government reports.
Data shown is in rare-earth oxide equivalent content.
Source: U.S. Geological Survey, Mineral Commodity Summaries, February 2019



Global distribution of rare earth element deposits



Büyük NTE işletmeleri (Rezerv + Kaynak)

Property name	Primary commodity	Country	Development stage	Contained reserves and resources (tonnes)*
Bayan Obo	Lanthanides	China	Operating	56,940,000
Tomtorskoye	Lanthanides	Russia	Late stage	19,200,000
St-Honore	Lanthanides	Canada	Late stage	18,382,000
Minami Tori Shima	Lanthanides	Japan	Early stage	16,000,000
Kvanefjeld	Lanthanides	Greenland	Preproduction	11,120,000
Ashram	Lanthanides	Canada	Late stage	4,686,113
Ngualla	Lanthanides	Tanzania	Feasibility	4,620,000
Strange Lake	Lanthanides	Canada	Feasibility	4,406,200
Nechalacho	Lanthanides	Canada	Feasibility	4,252,600
Montviel	Lanthanides	Canada	Late stage	3,877,020
Mt Weld	Lanthanides	Australia	Operating	3,437,430
Nolans Bore	Lanthanides	Australia	Feasibility	1,456,000
Mountain Pass	Lanthanides	USA	Operating	1,310,000

Data compiled June 21, 2019.

* Shows contained reserves and resources for the property's primary commodity. Excludes properties that are inactive or temporarily on hold.

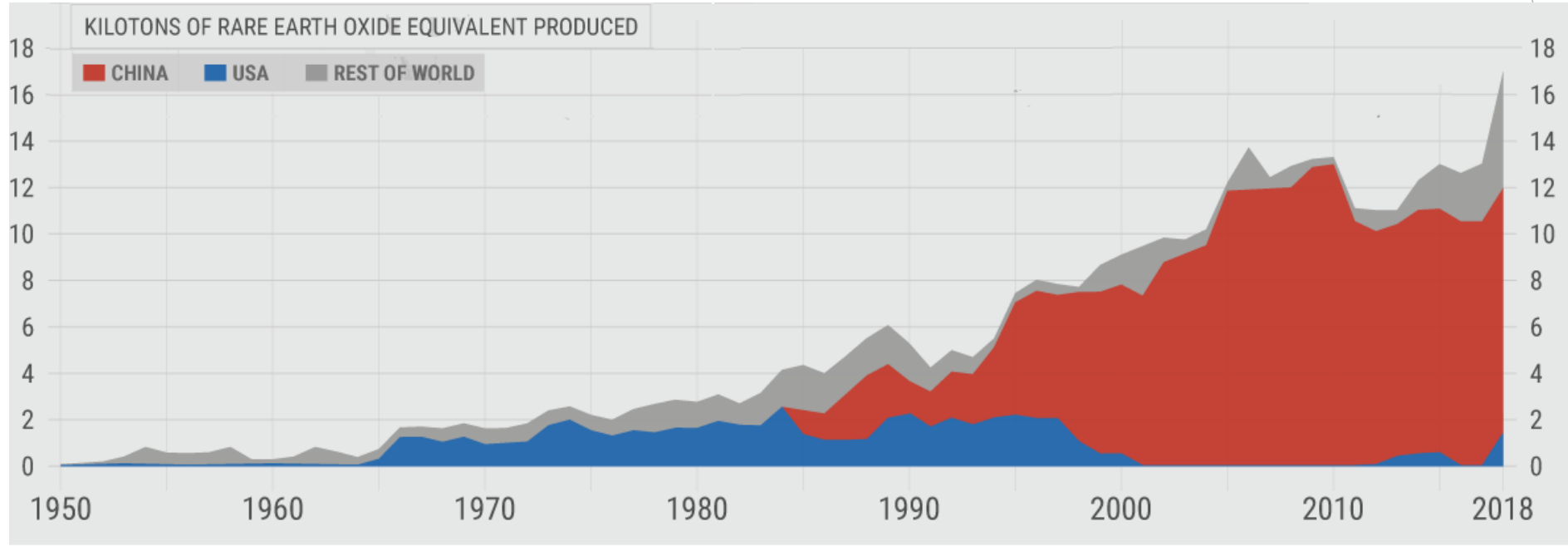
Source: S&P Global Market Intelligence

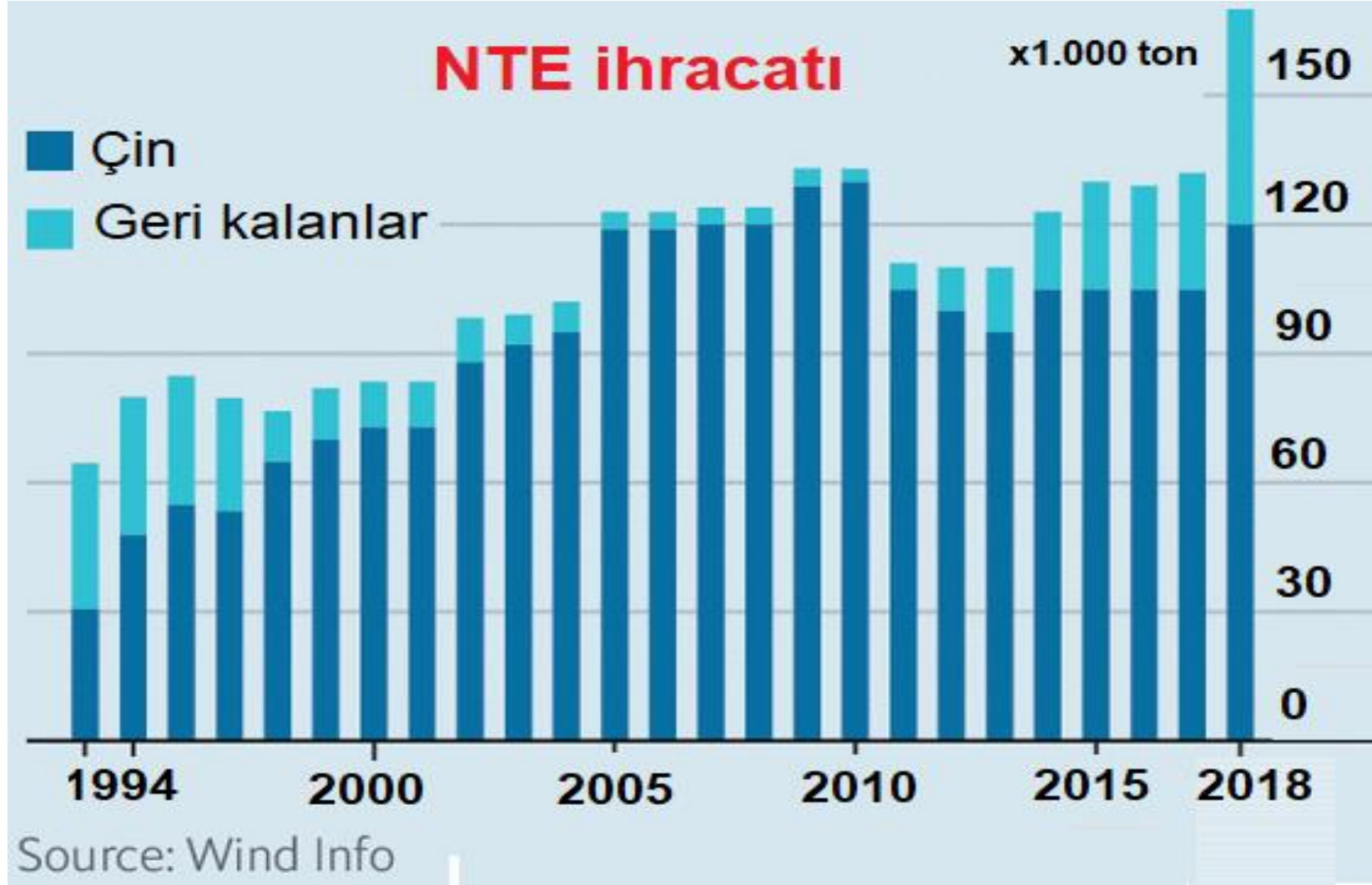
2018 PRODUCTION Tonnes



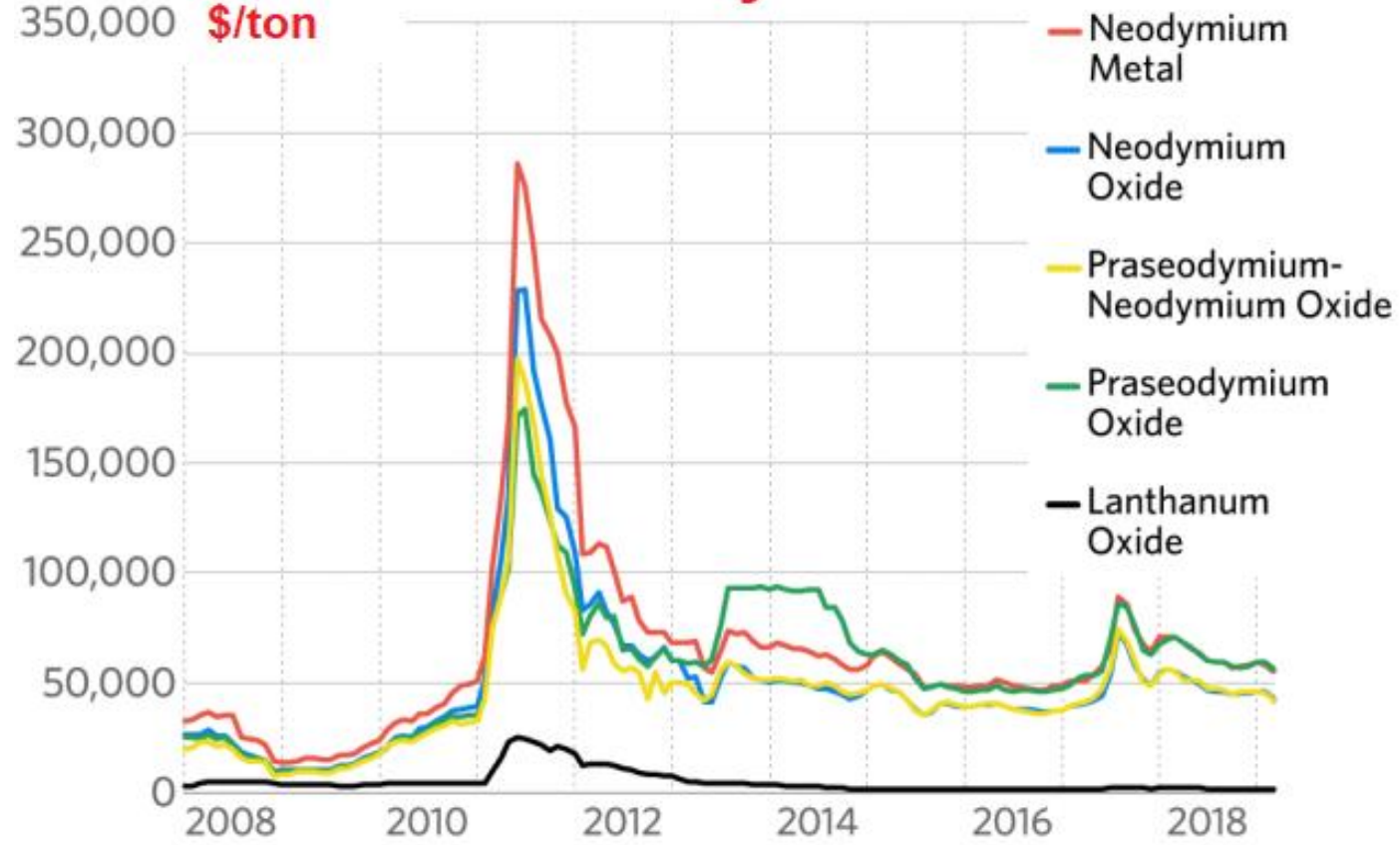
RESERVES Million tonnes







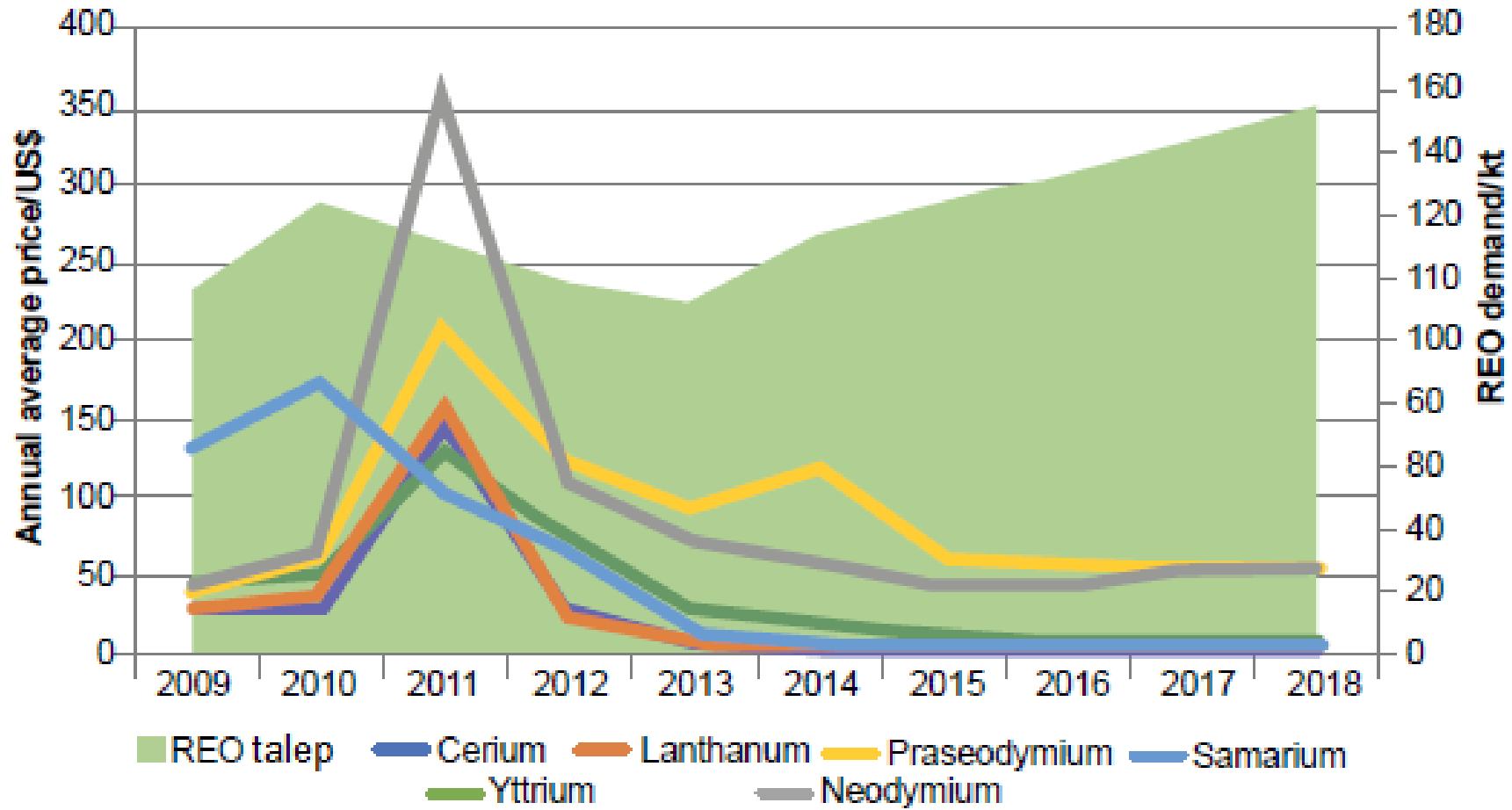
NTE fiyatları



Source: Bloomberg

Copyright Stratfor 2019

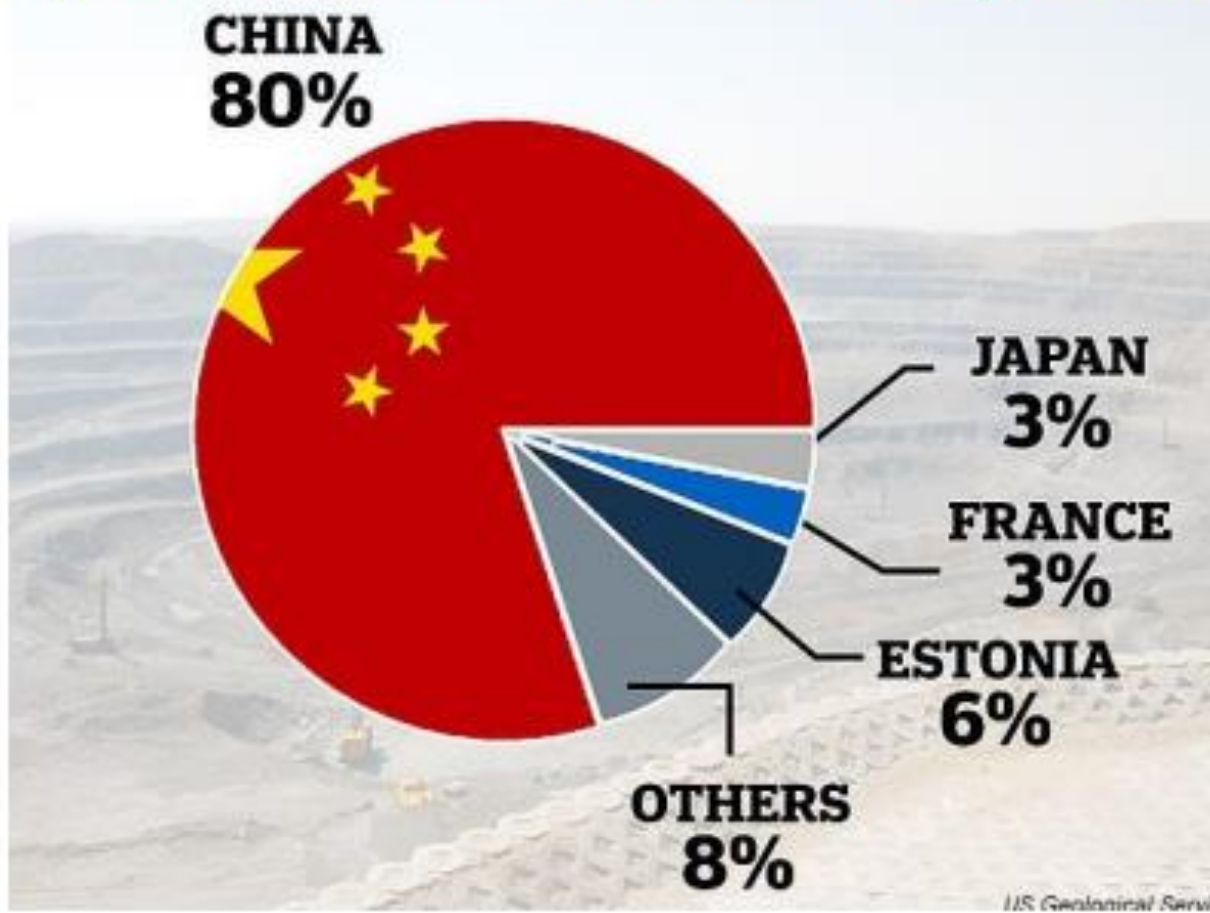
NTE talep ve fiyatları



Source: IHS Markit.

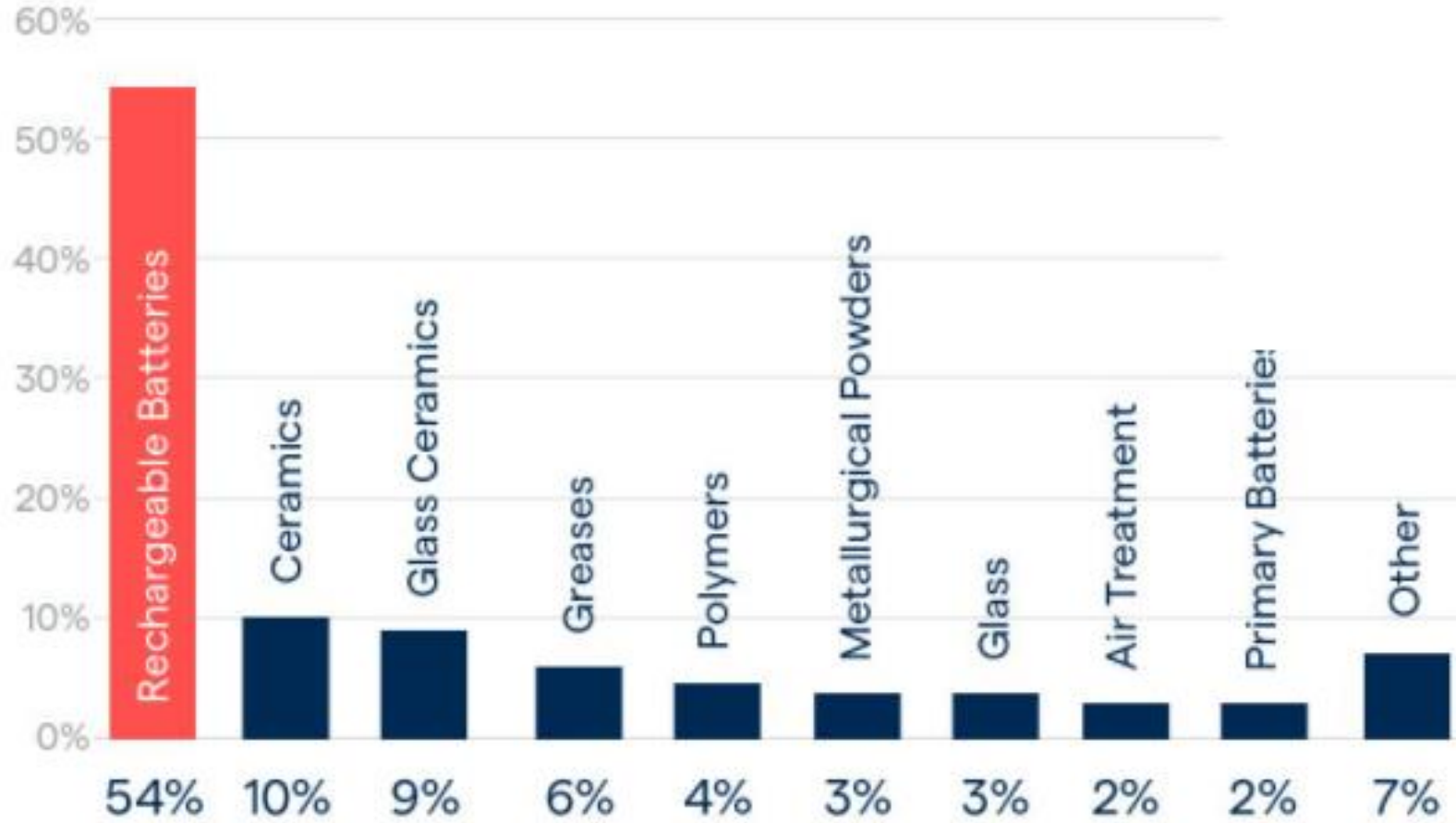
© 2019 IHS Markit

Dünya NTE gereksiniminin karşılanması

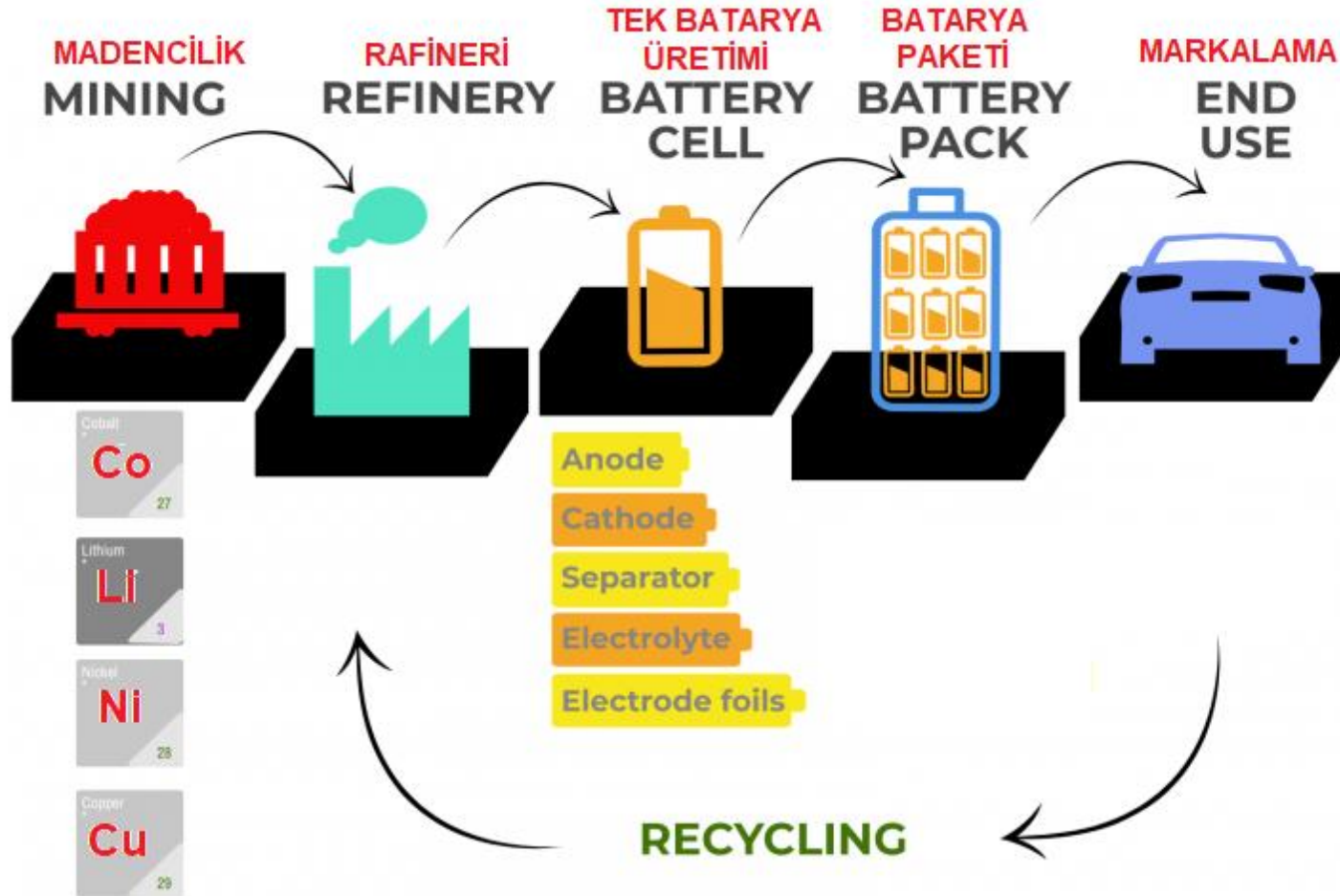


DÜNYADA LİTYUM

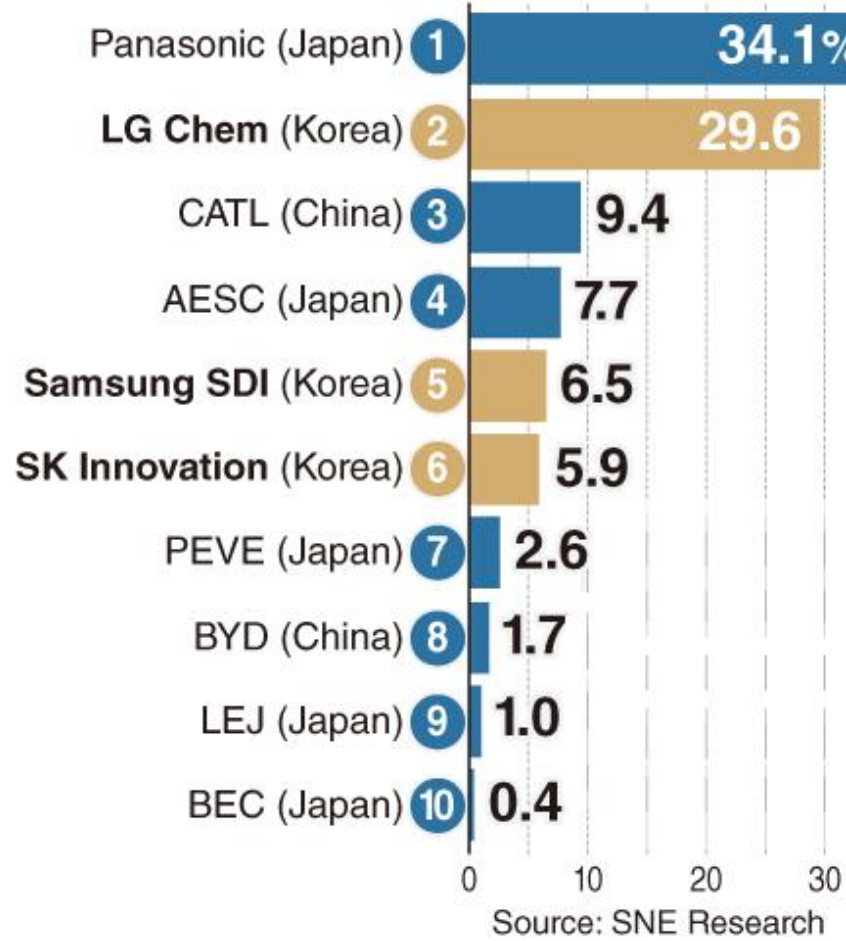
Li kullanım oranları

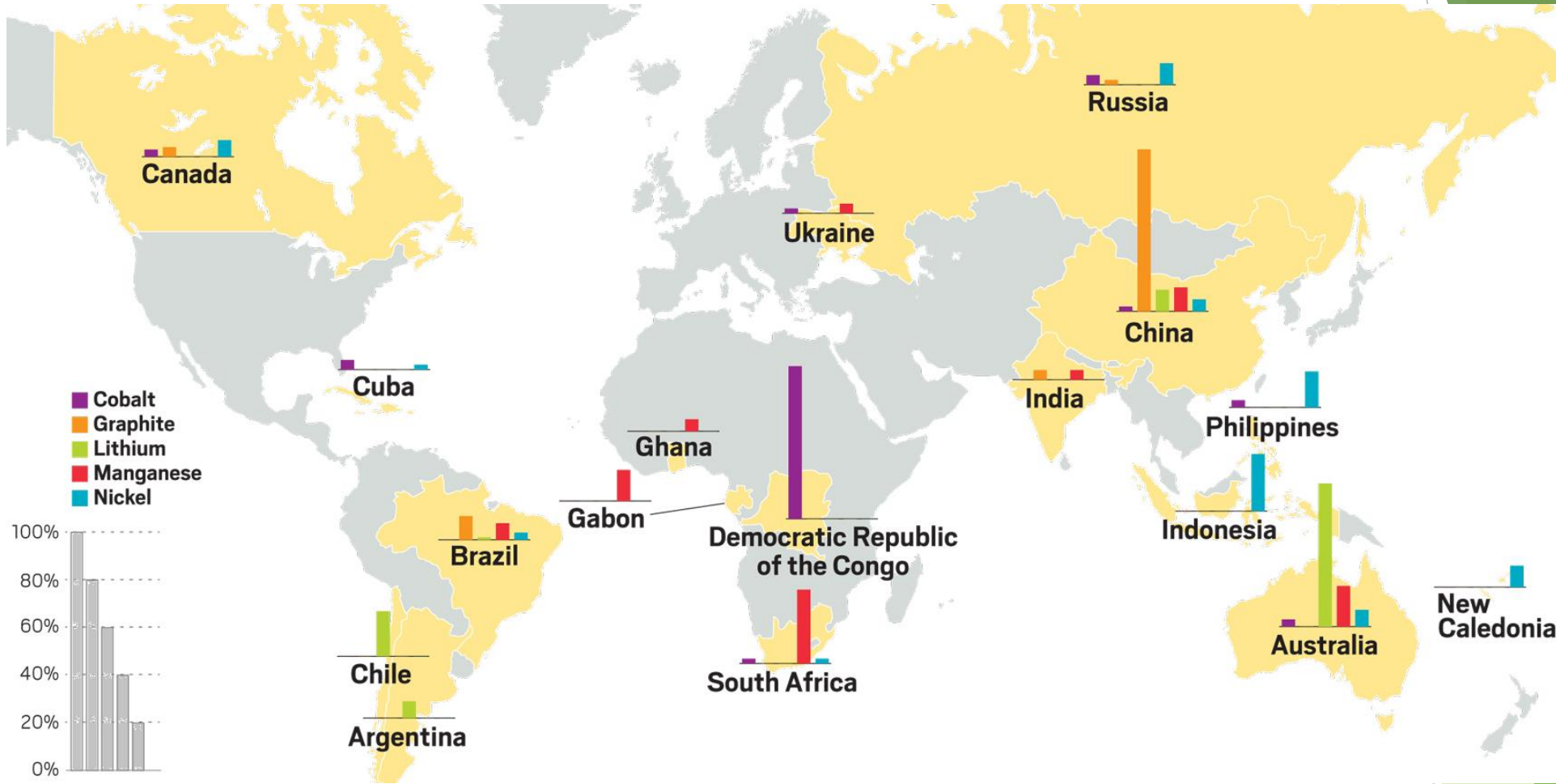


Li-iyon piller ticari aşamaları

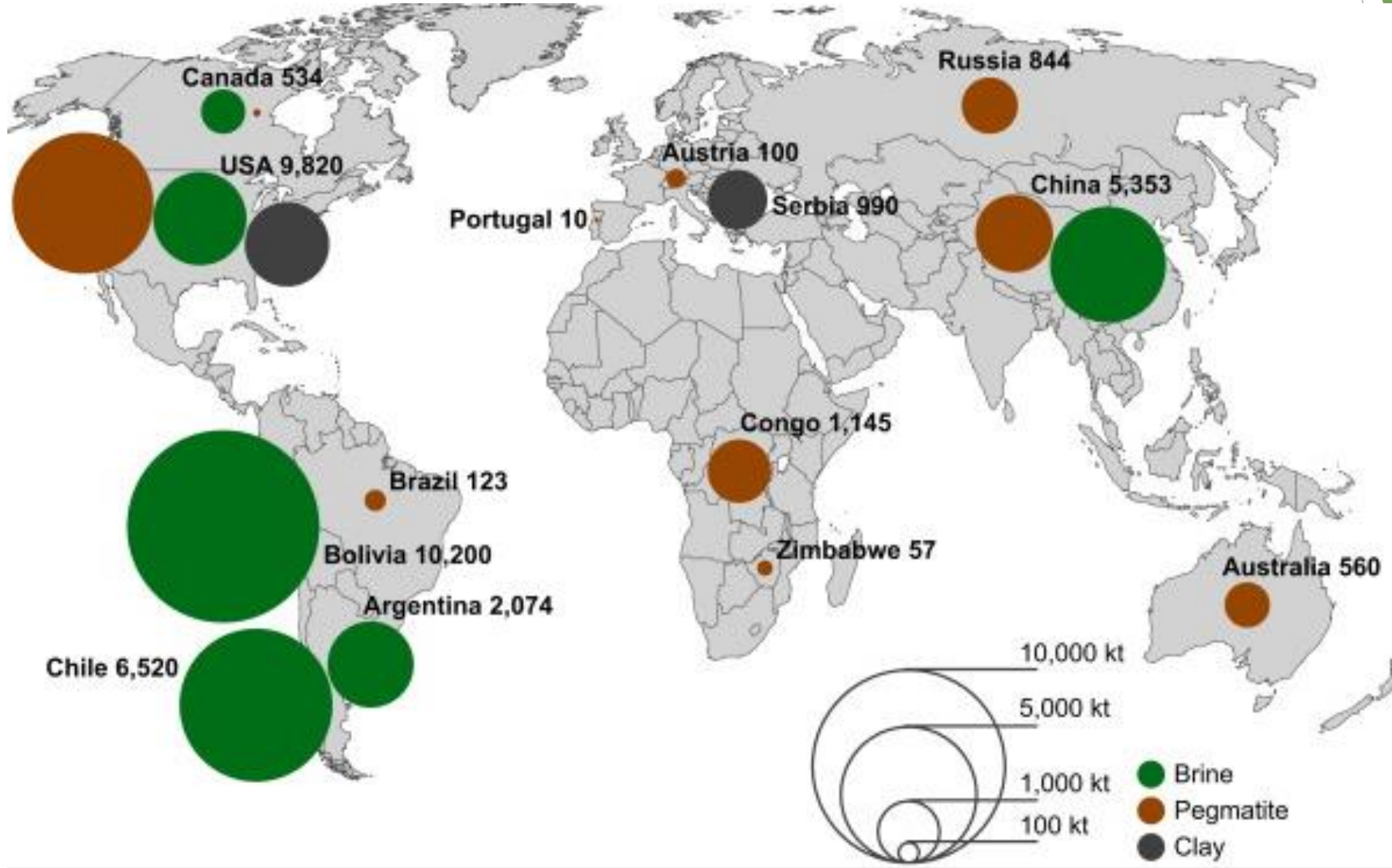


Top 10 EV battery firms worldwide

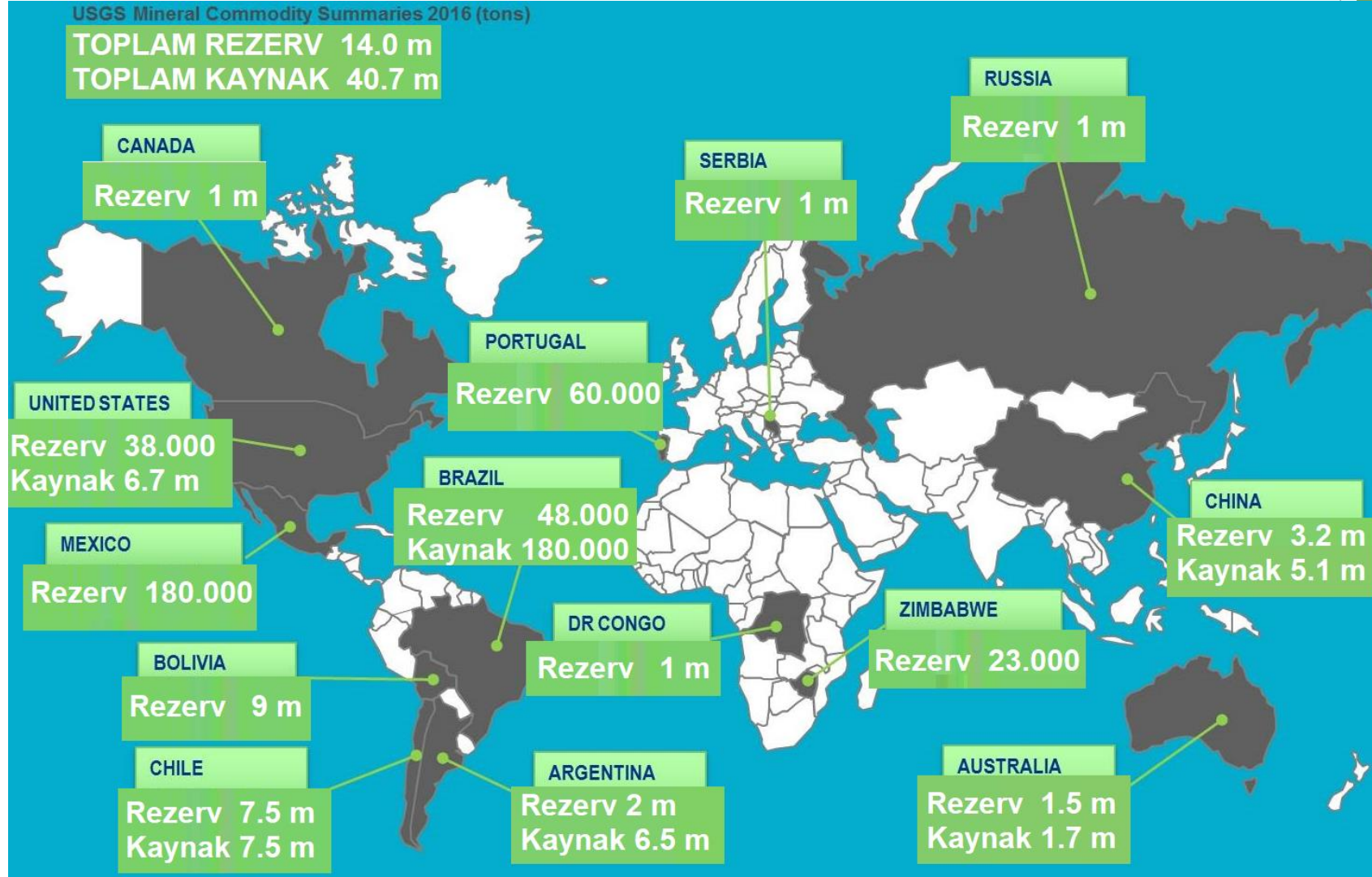




Li kaynakları

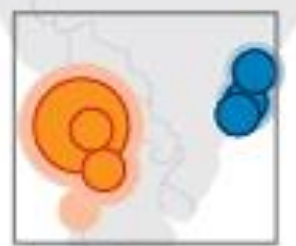
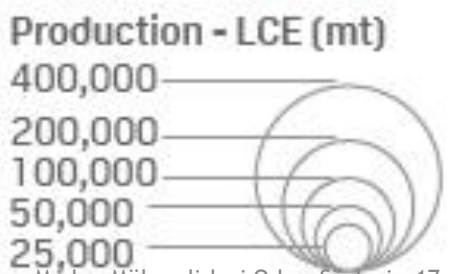


Dünya Li rezervleri





Type	2019	2025
Spodumene	Blue circle	Light blue circle
Brine	Orange circle	Light orange circle
Other*	Red circle	Pink circle



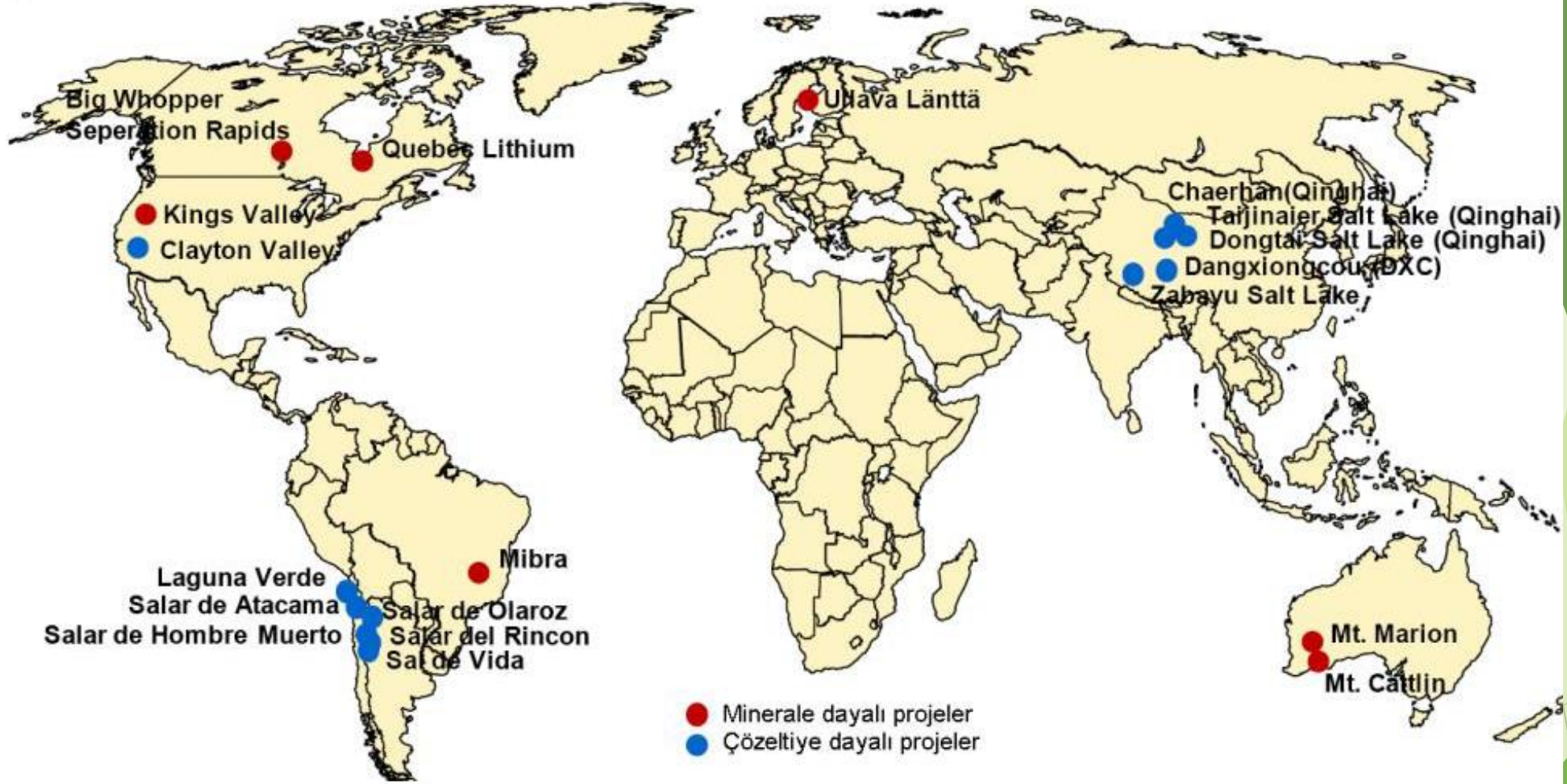
Maden Mühendisleri Odası Soyleşi 17.03.2021 Necati Yıldız
 *Clay, lepidolite, petalite.
 LCE = Lithium carbonate equivalent.

Pilgangoora**
Wodgina



Mt Marion
Bald Hill
Mt Cattlin
Greenbushes

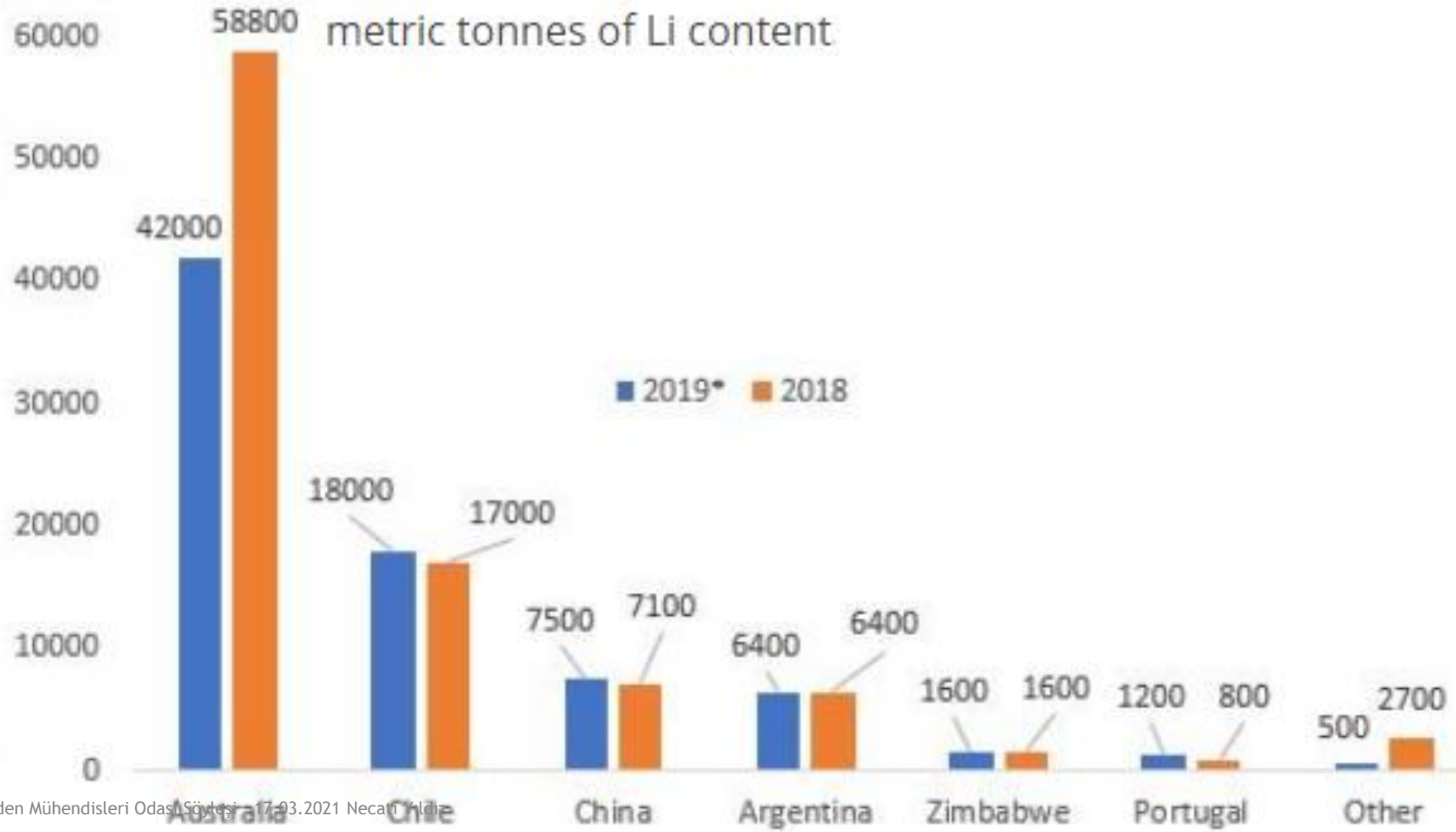


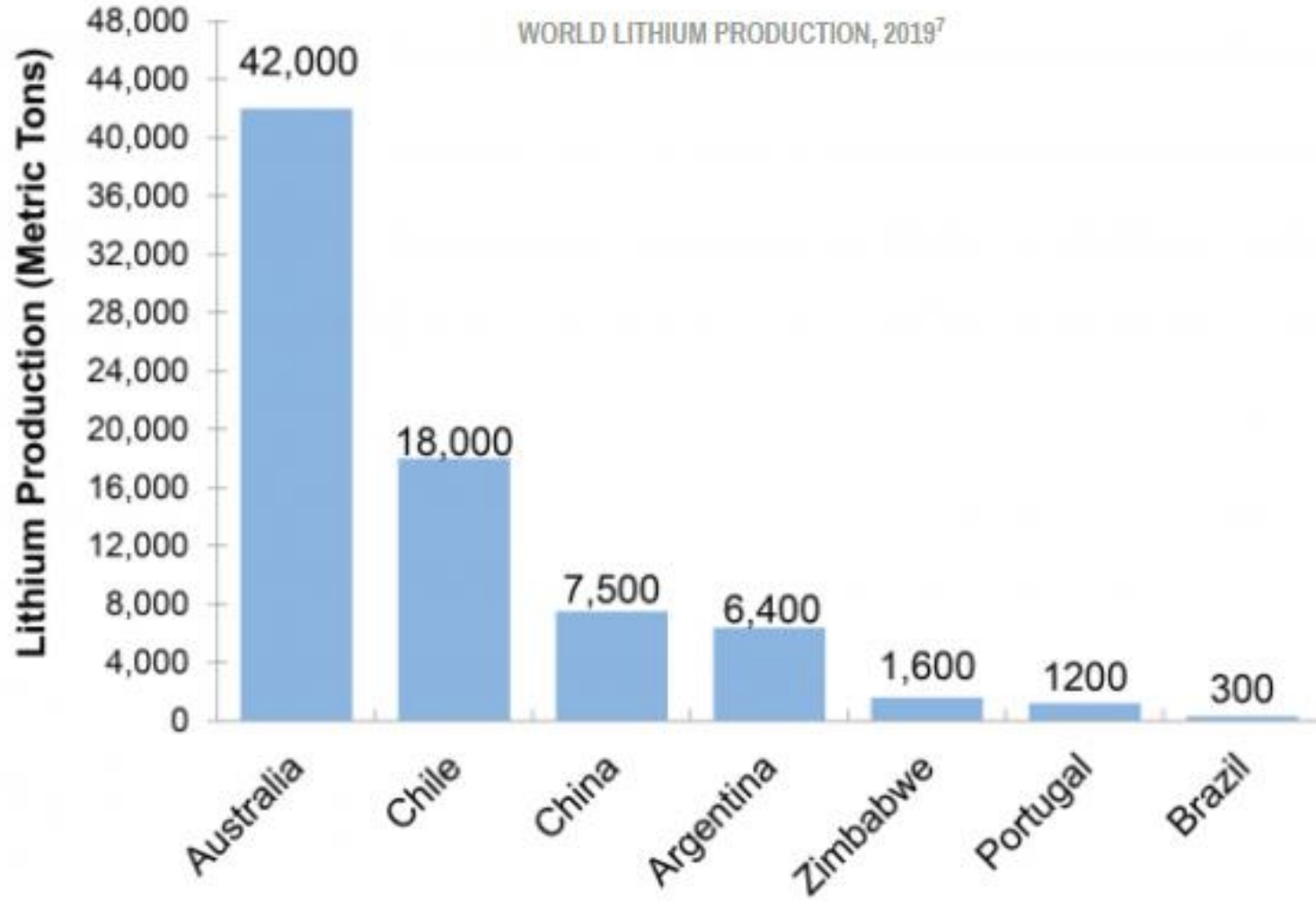


Li üretimi

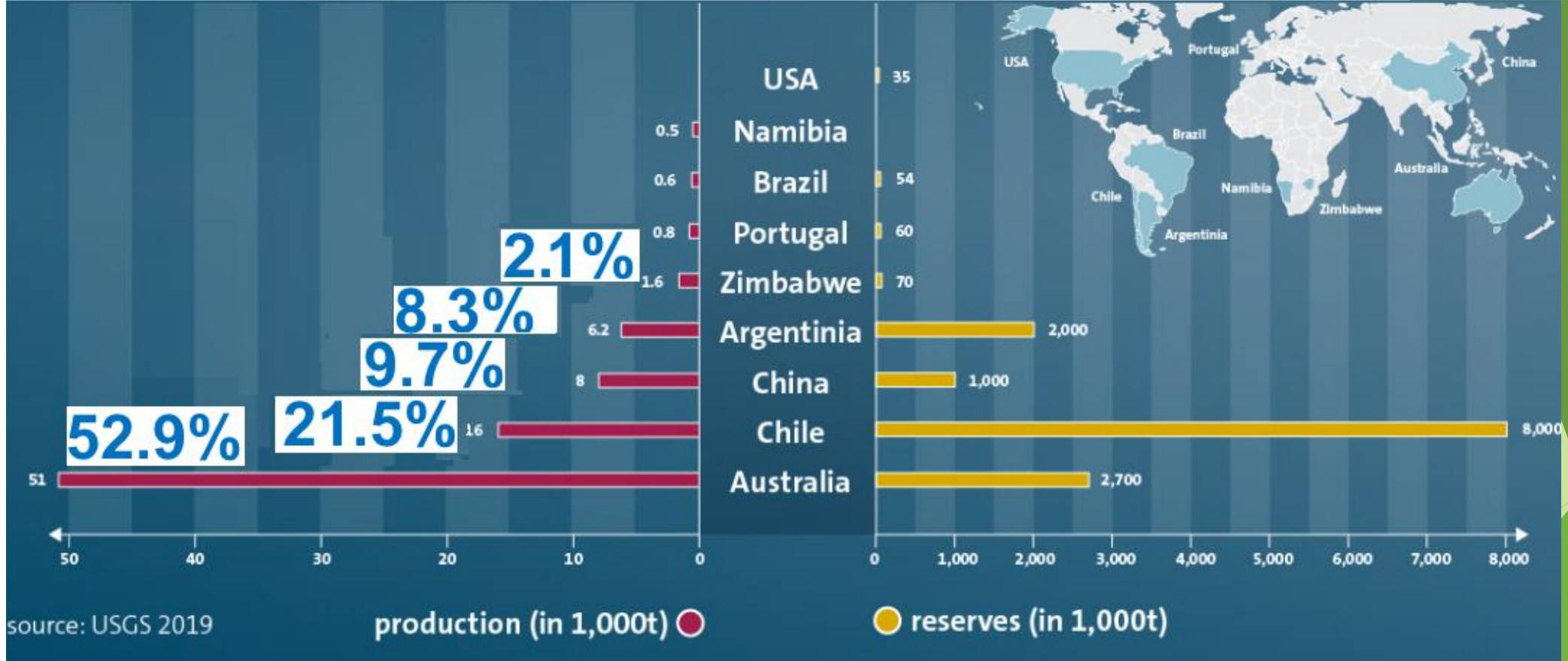


Ülkelerin Li üretimi

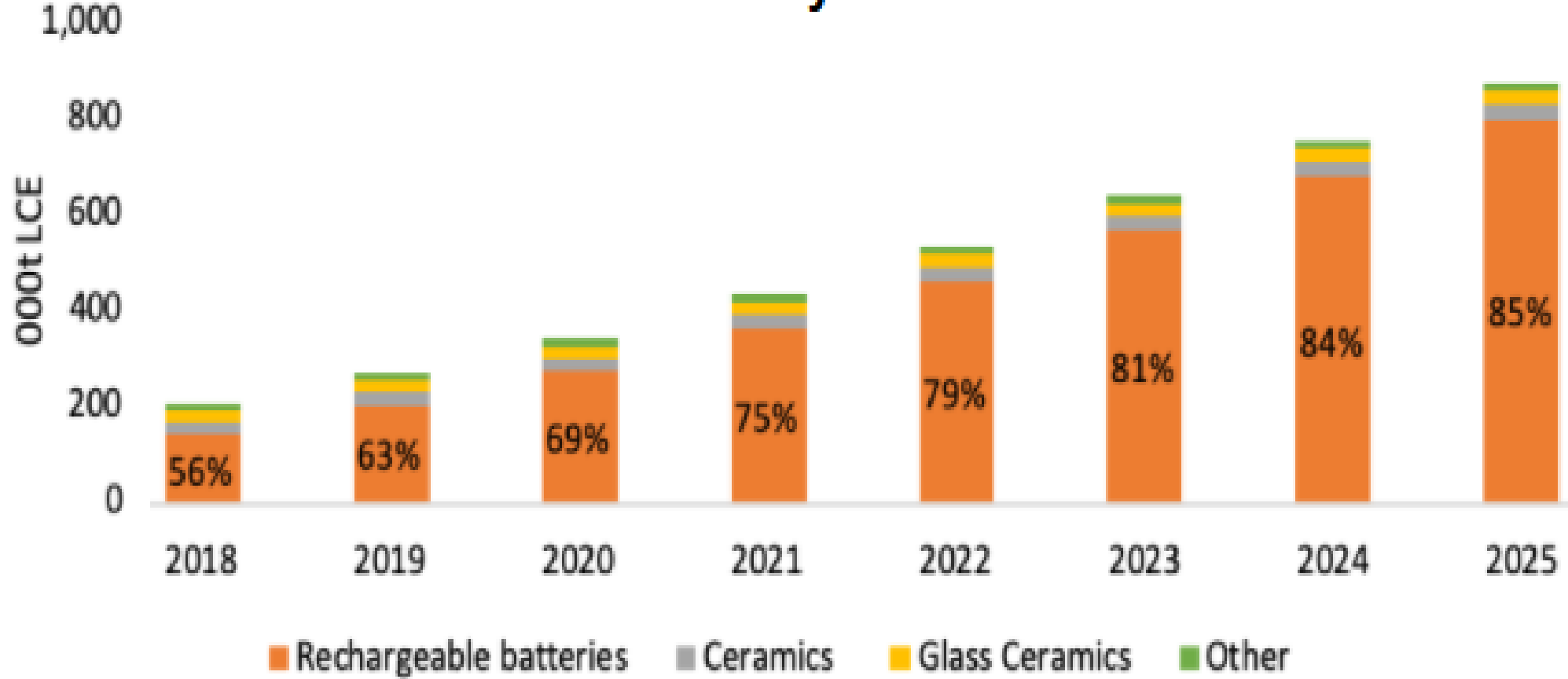




Ülkelerin Li üretimi

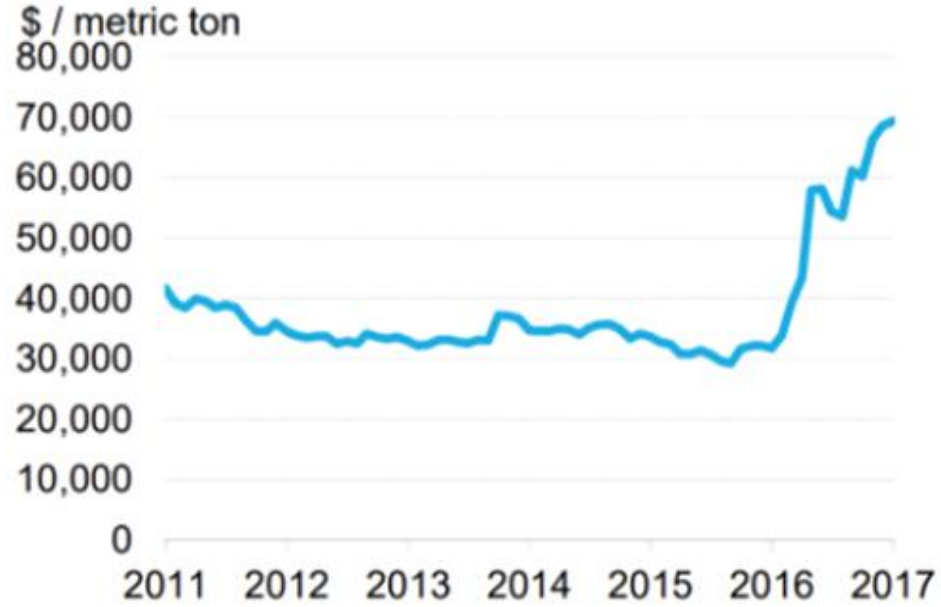


Rafine lityum talebi



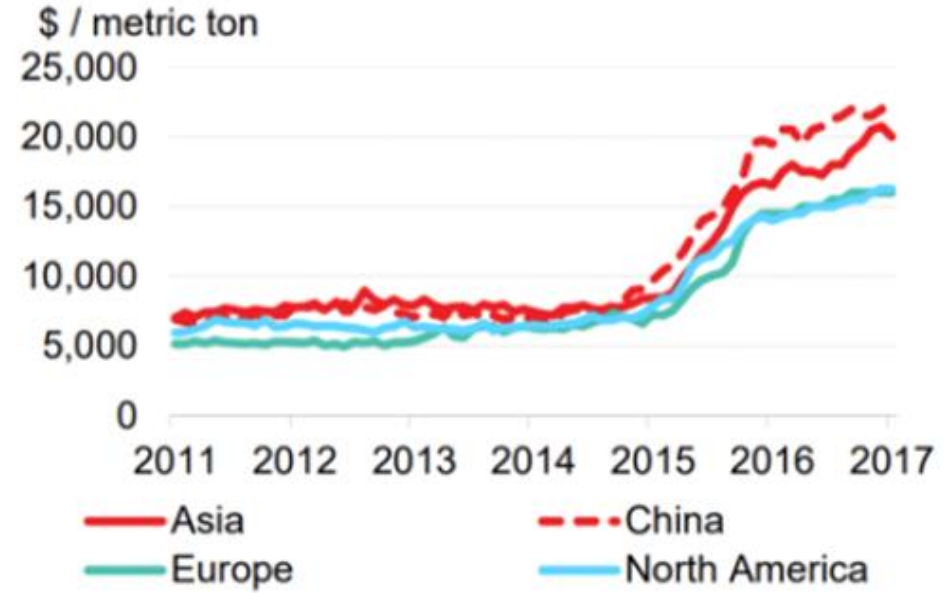
Li ve Co fiyatları

China Shanghai Cobalt



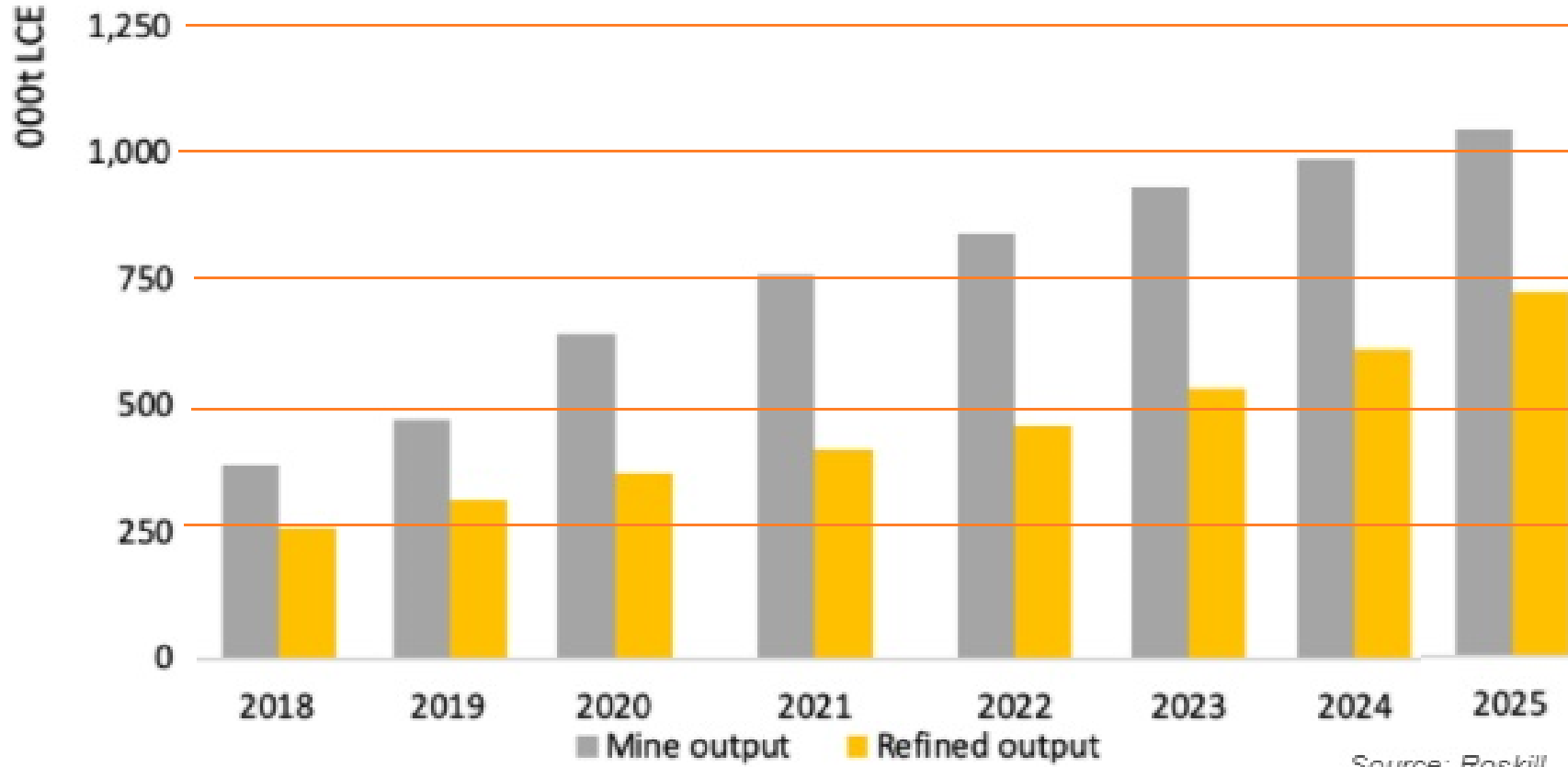
Source: Antaike Information Development Co., Bloomberg

Lithium hydroxide

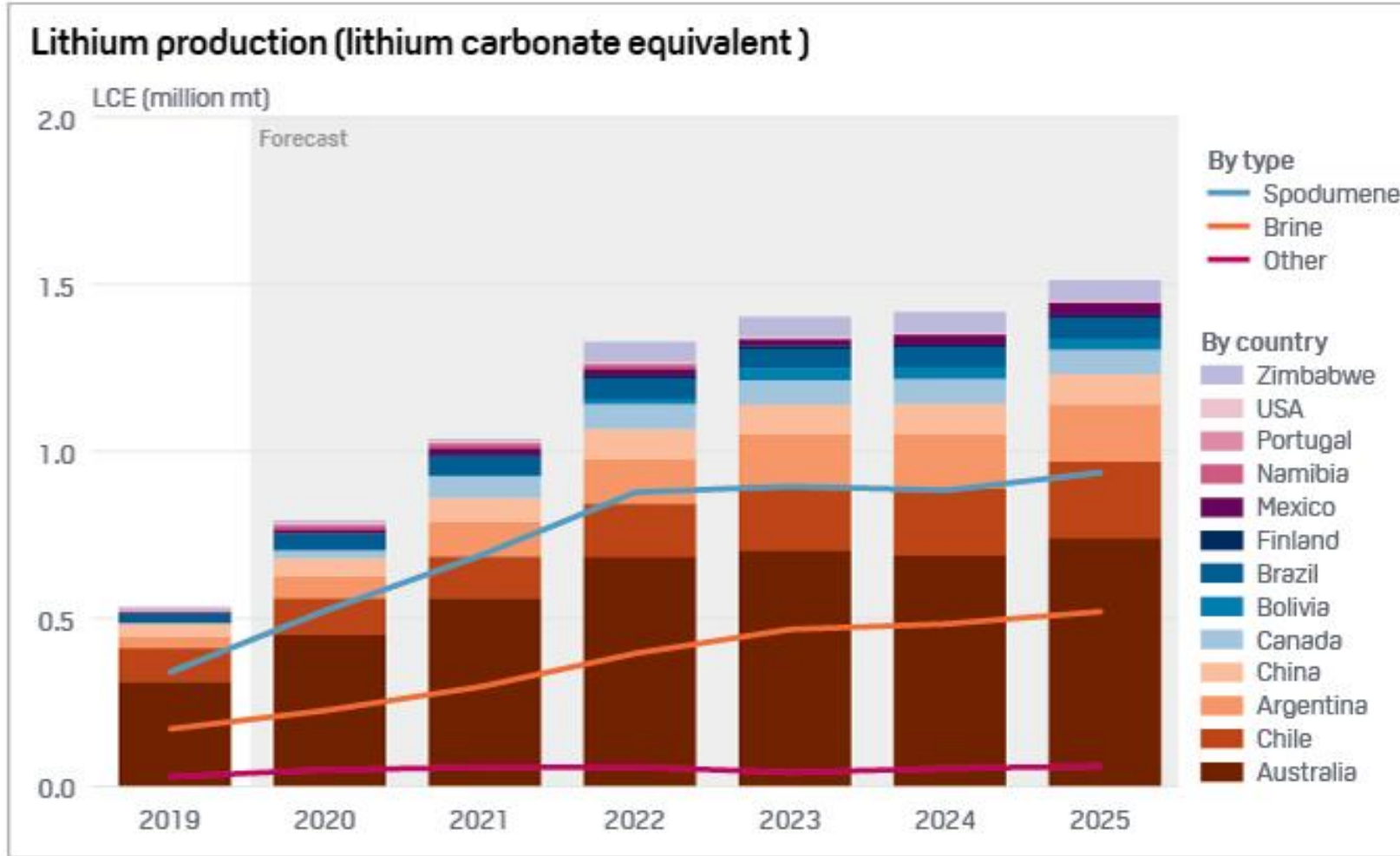


Source: Benchmark Mineral Intelligence

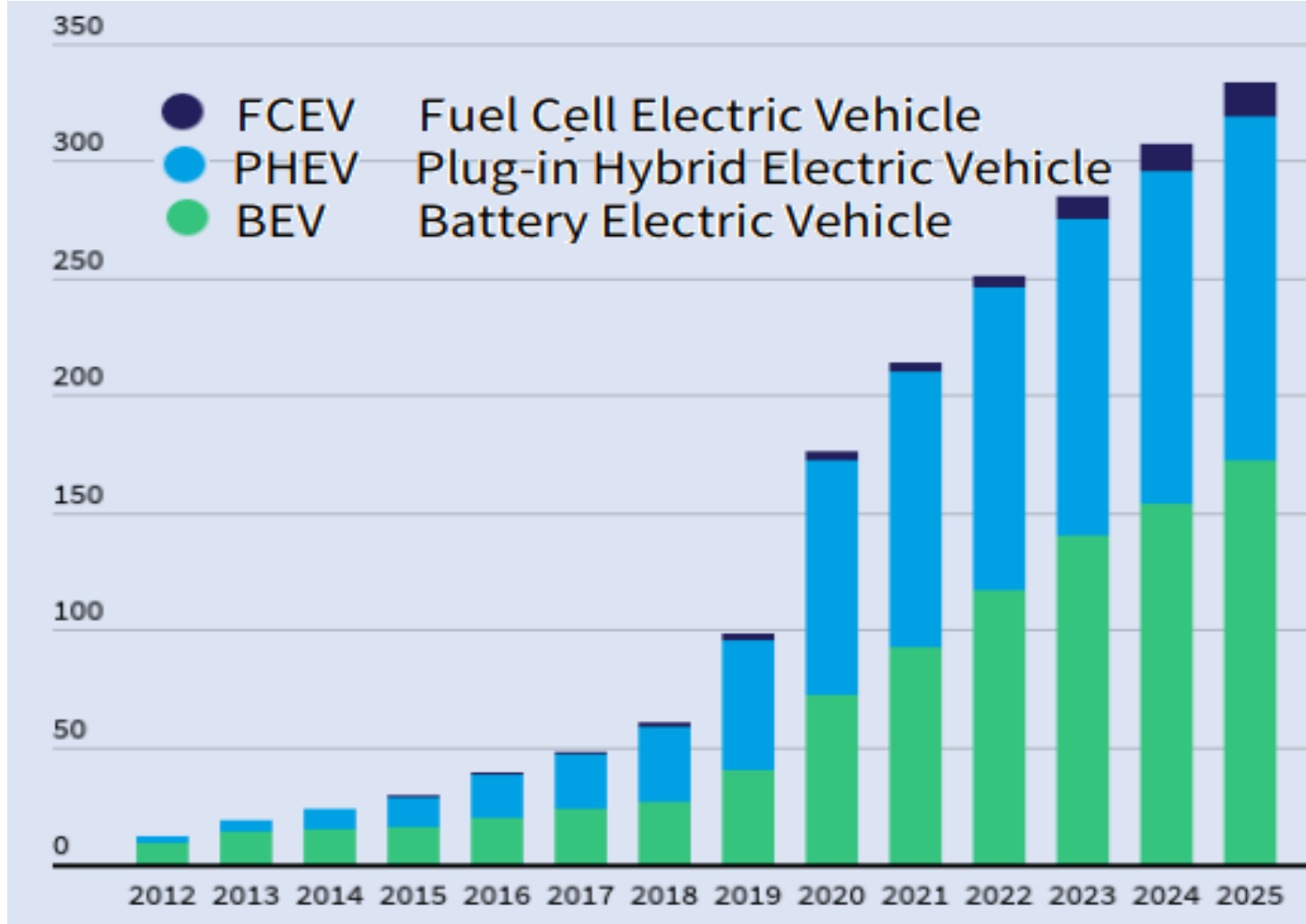
Tüvenen ve rafine Li üretimi



Ülkelerin Li CO3 karşılığı üretimi

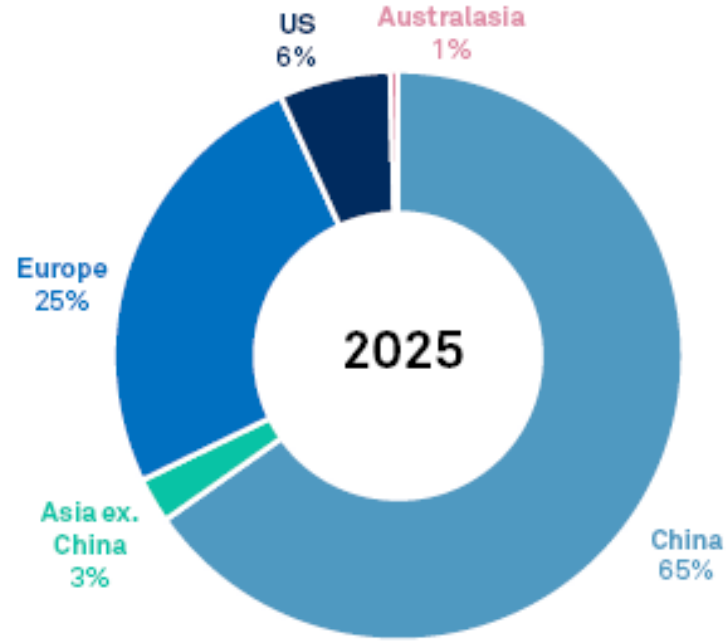
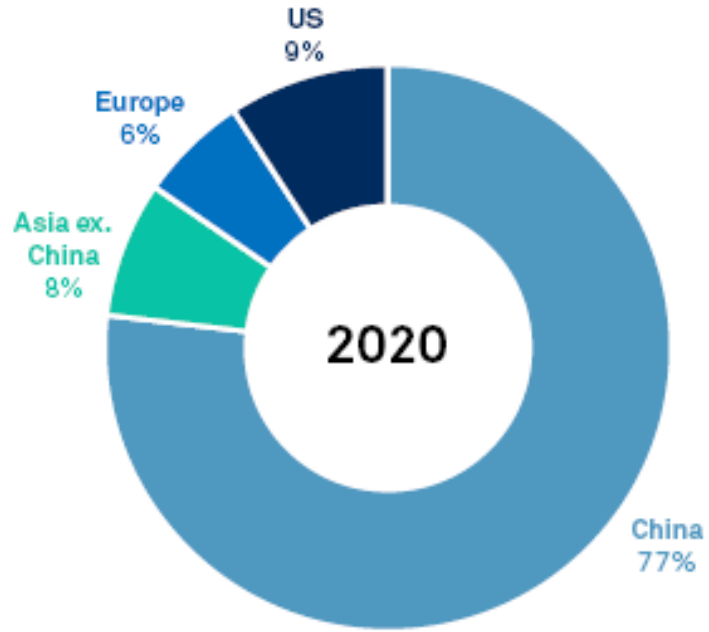


Elektrikli araç sayısı



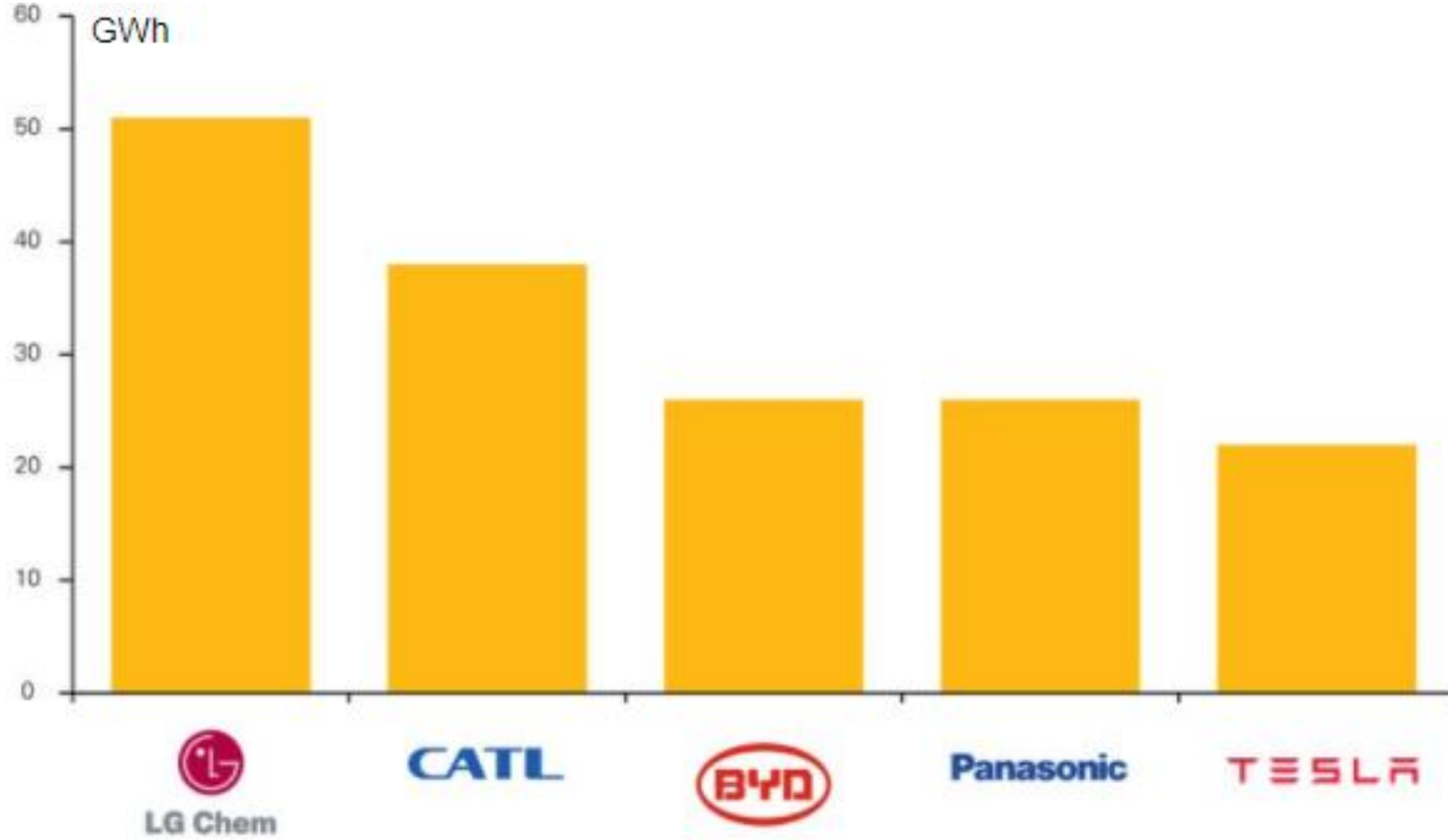
Ülkelerin Li-iyon pil üretimi

Europe's LIB capacity share rising from 6% in 2020 to 25% in 2025



Data as of Feb. 1, 2021.
LIB = lithium-ion battery
Sources: S&P Global Market Intelligence; Company announcements

Pil üretici firmalar



Sonora lithium Project, Mexico

Maden, Bacanora Minerals (% 77.5) ve Ganfeng Lithium (% 22.5) ortak girişimi olan Sonora Lithium (SLL) tarafından geliştirmektedir.

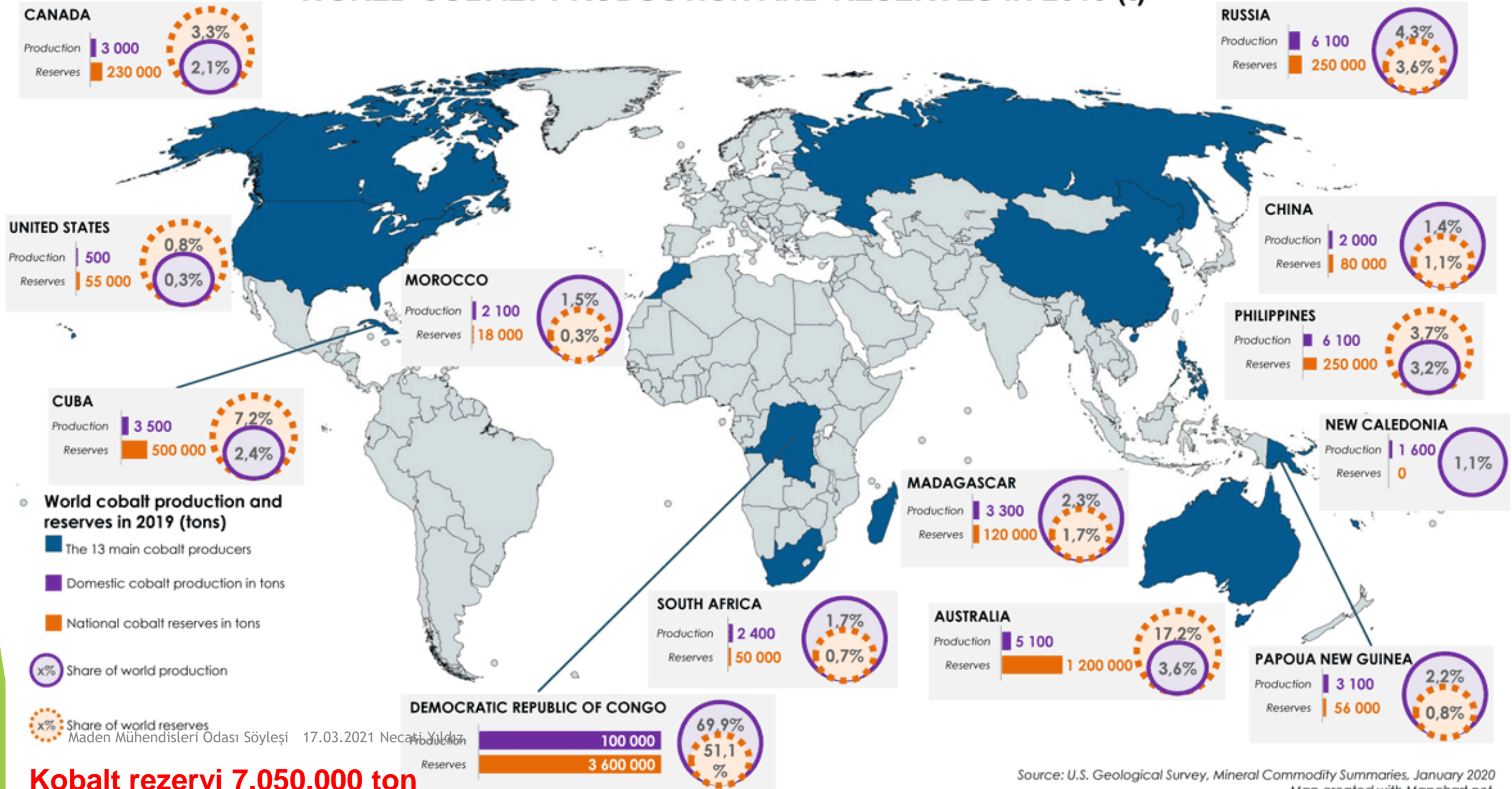
243,8 milyon tonluk rezervlerin 4,5 milyon ton lityum karbonat eşdeğeri içerdiği düşünülmektedir.

İlk aşamada 17.500 ton/yıl lityum karbonat üretim
İkinci aşama 35.000 ton / yıl lityum karbonat üretimi planlanmaktadır.



KOBALT MADENCİLİĐİ

WORLD COBALT PRODUCTION AND RESERVES IN 2019 (t)



World cobalt production and reserves in 2019 (tons)

The 13 main cobalt producers

Domestic cobalt production in tons

National cobalt reserves in tons

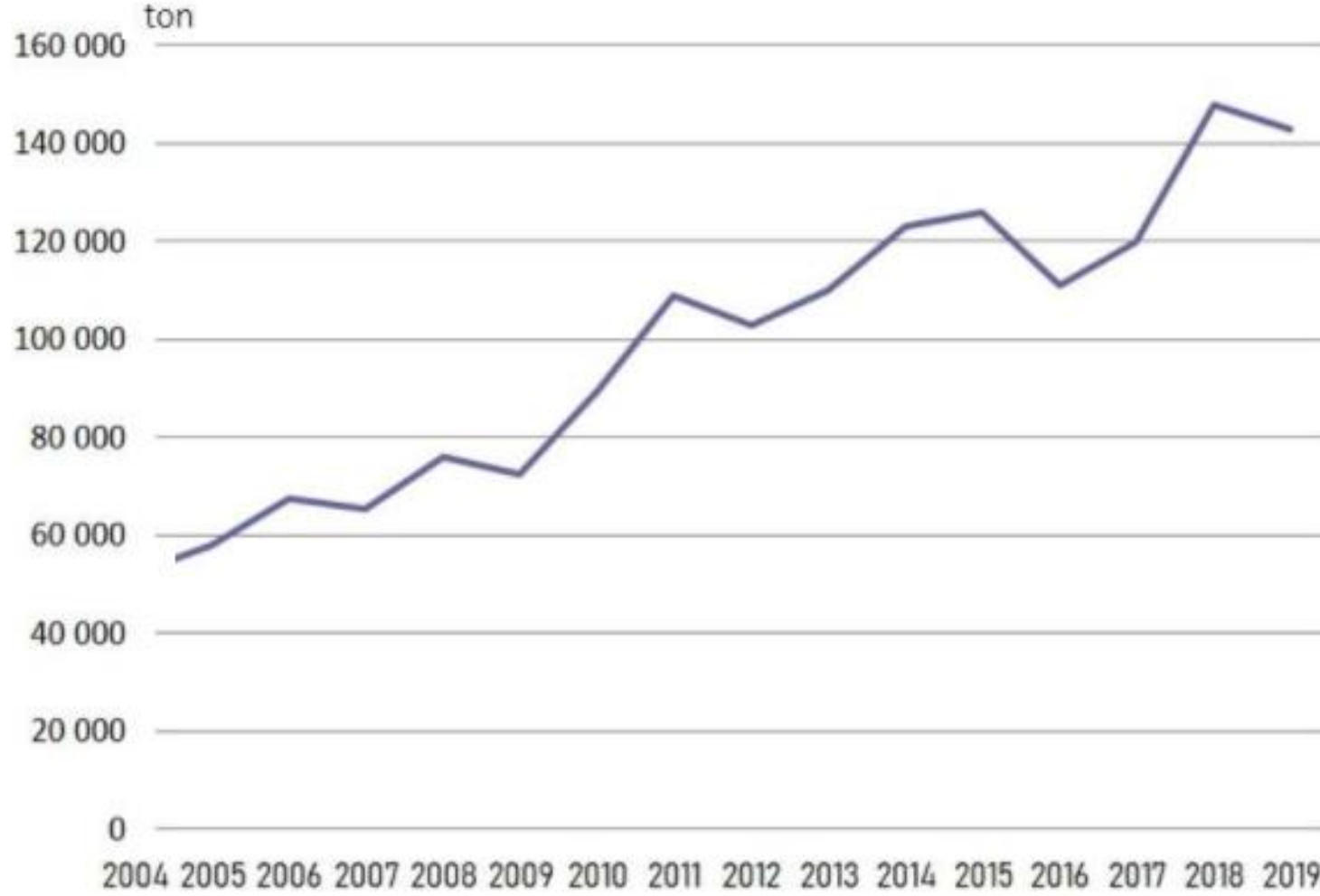
x% Share of world production

x% Share of world reserves

Maden Mühendisleri Odası Söyleşi 17.03.2021 Necati Yıldız

Kobalt rezervi 7.050.000 ton

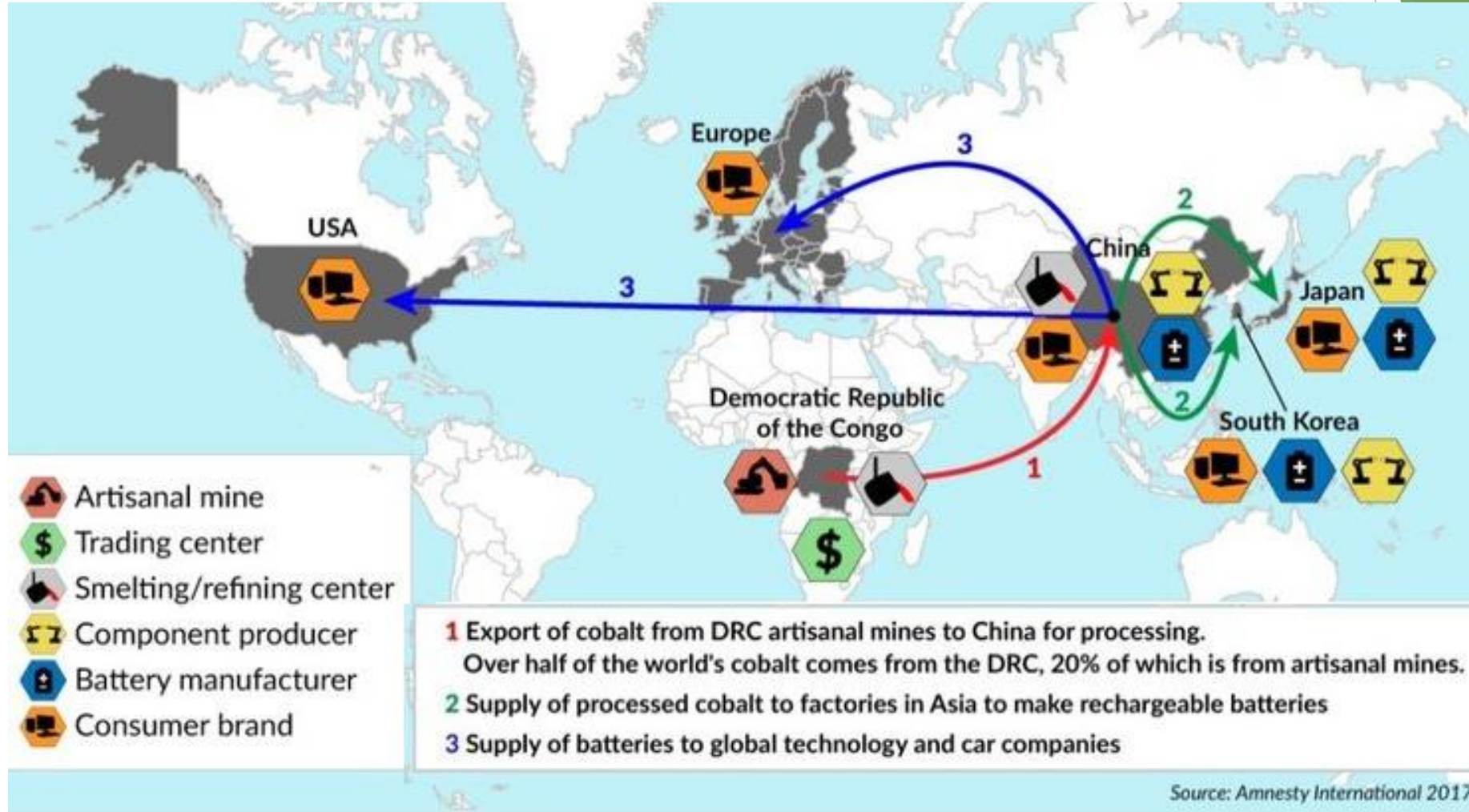
Dünya Kobalt üretimi

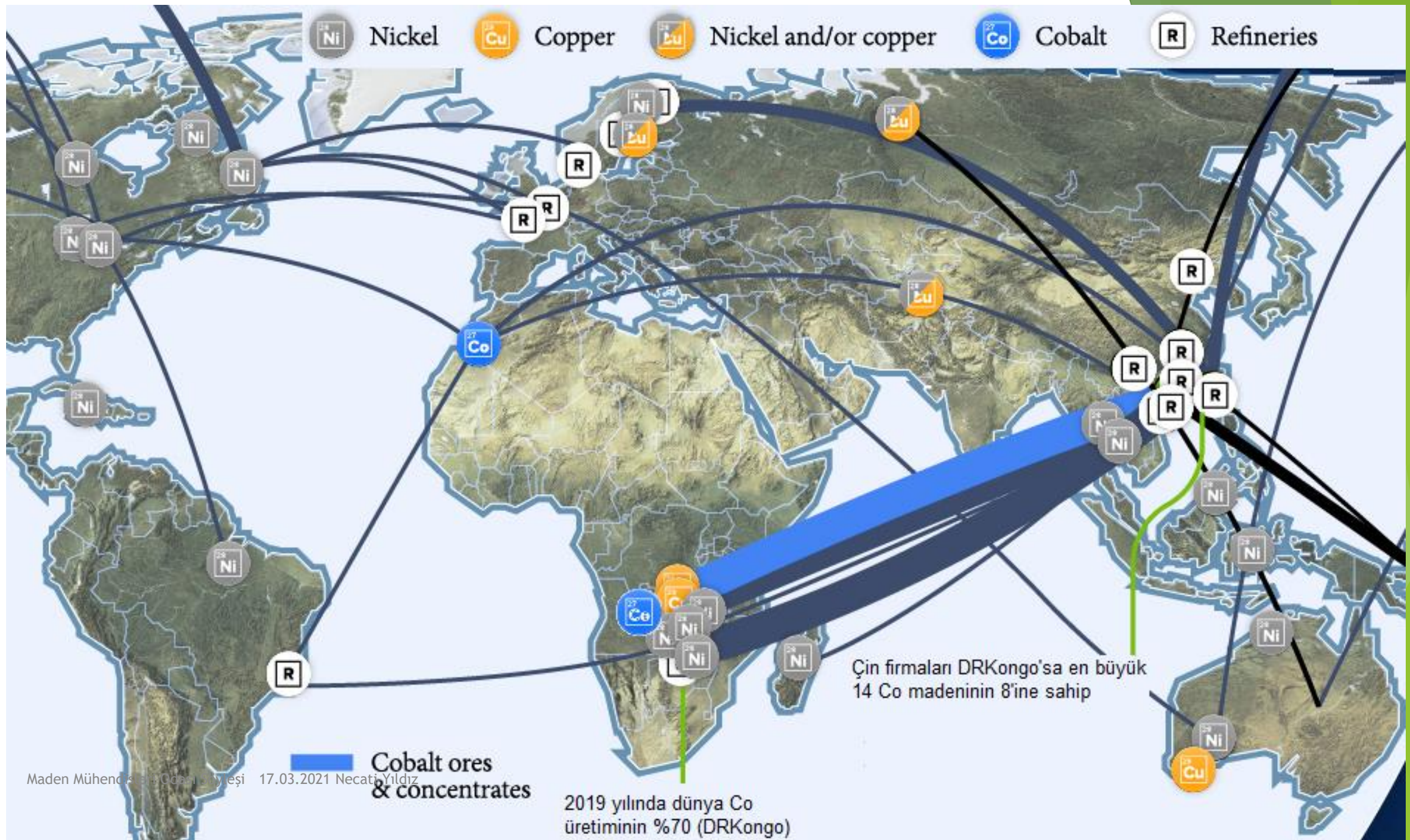


2019 Yılı Kobalt üretimi 145.000 ton

- 1. Democratic Republic of Congo – 100.000 ton**
- 2. Russia – 6.100 ton**
- 3. Australia – 5.100 ton**
- 4. Philippines – 4.600 ton**
- 5. Cuba – 3.500 ton**
- 6. Madagascar – 3.300 ton**
- 7. Papua New Guinea – 3.100 ton**
- 8. Canada – 3.000 ton**

Kobaltın ticari hareketi





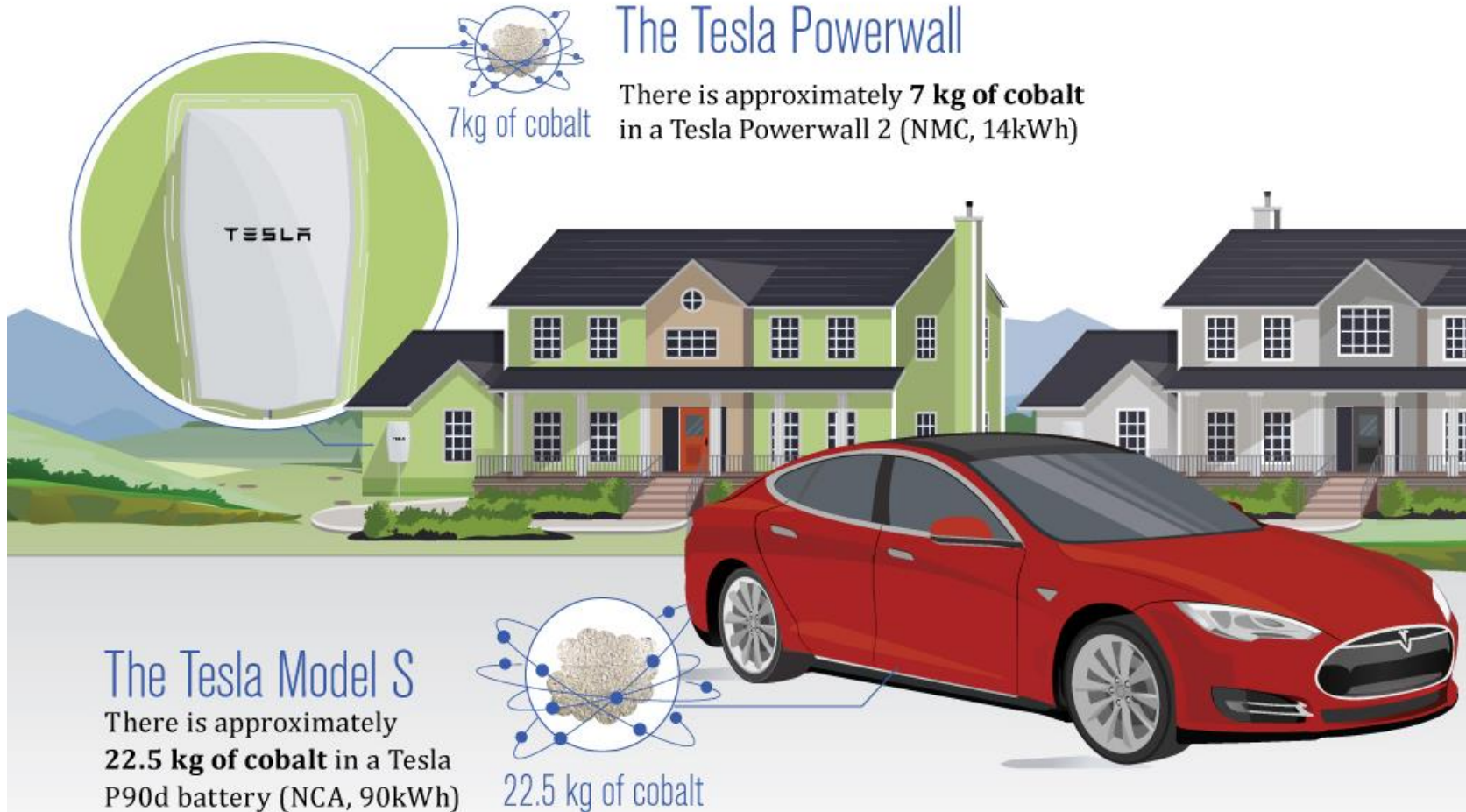


Battery Cathodes

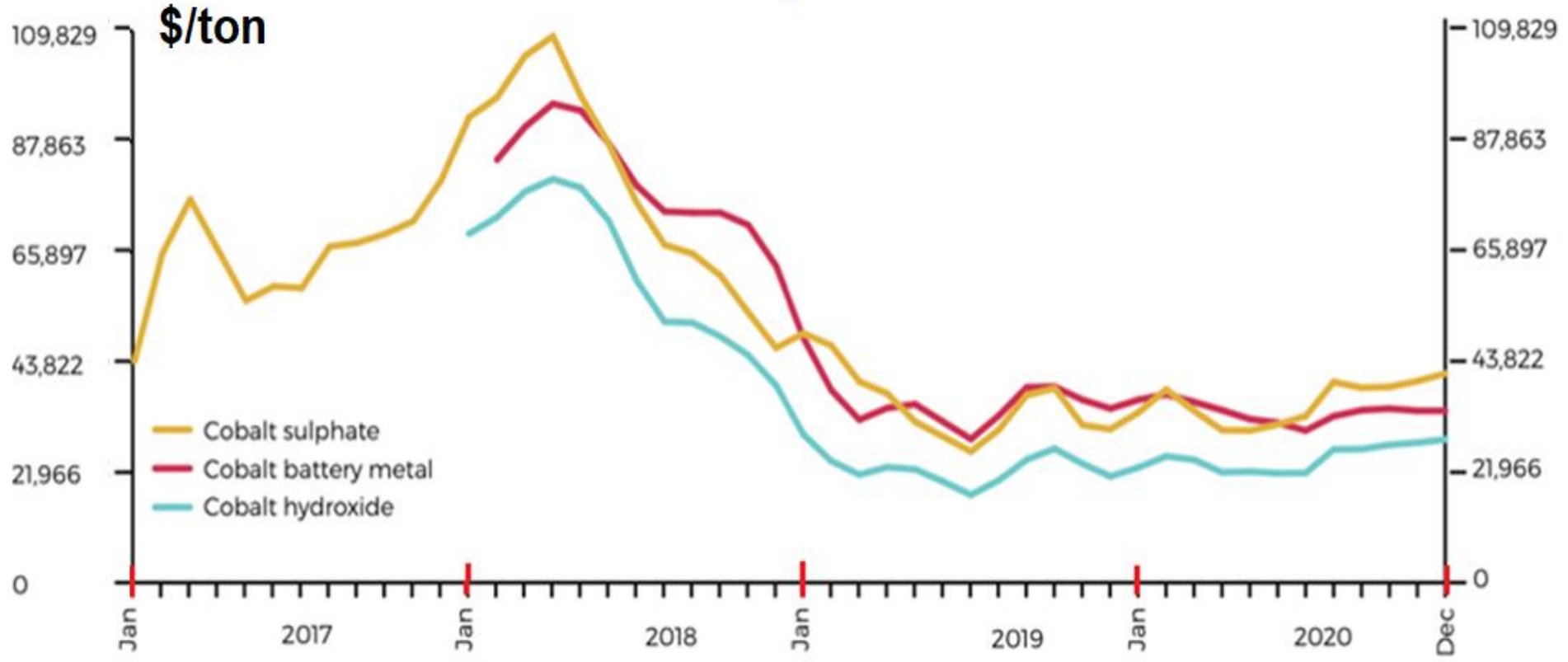


Superalloys

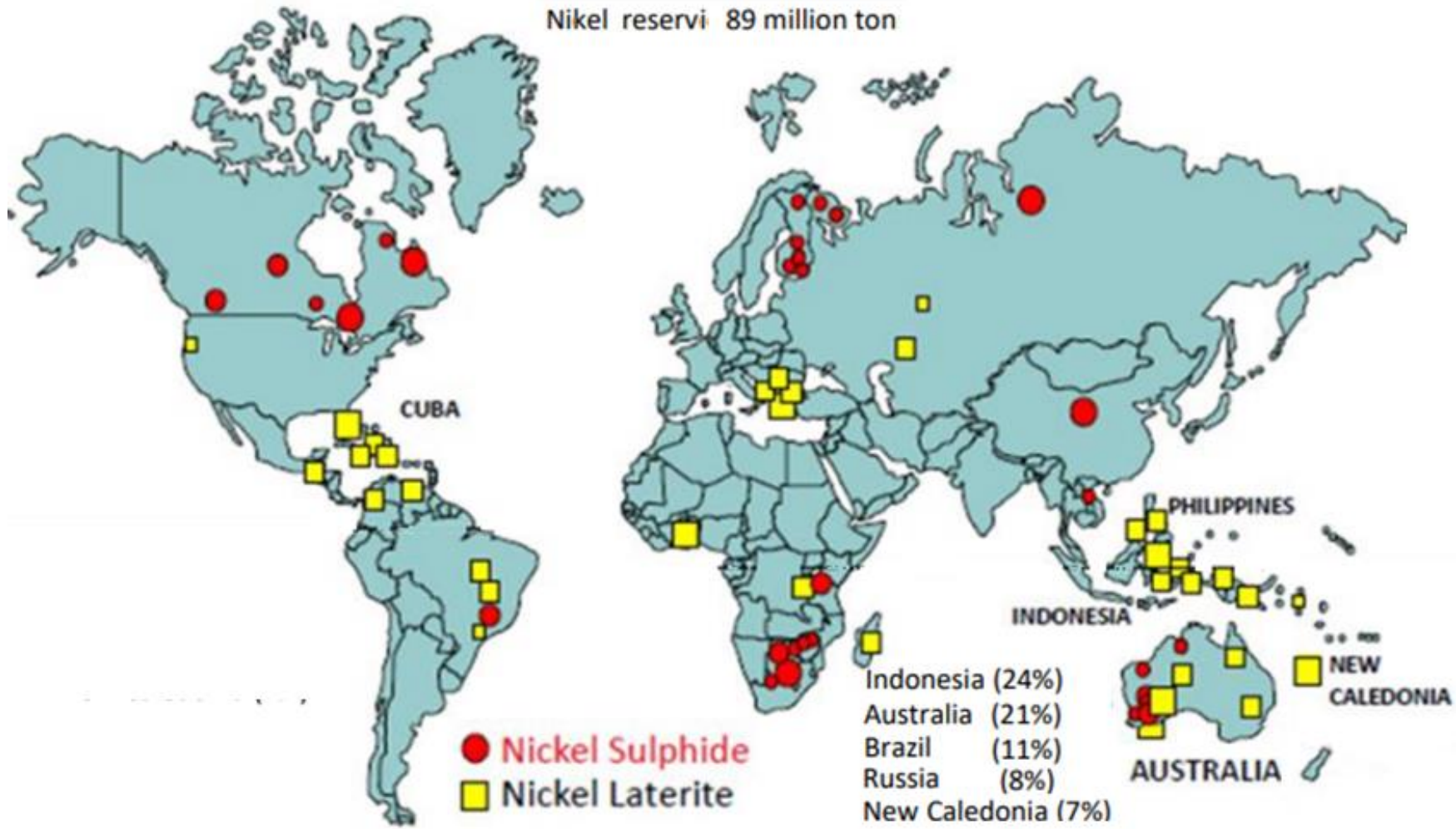


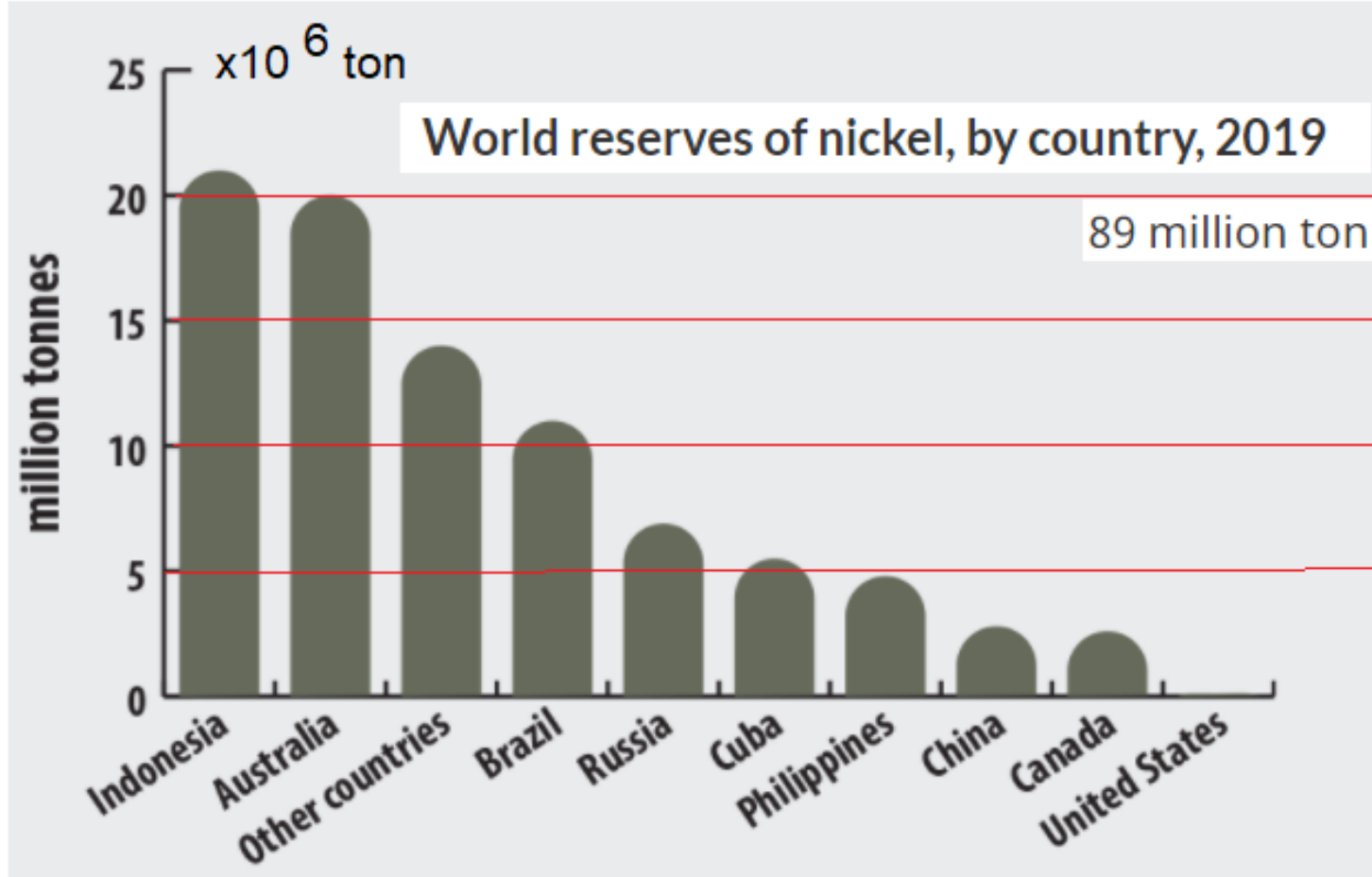


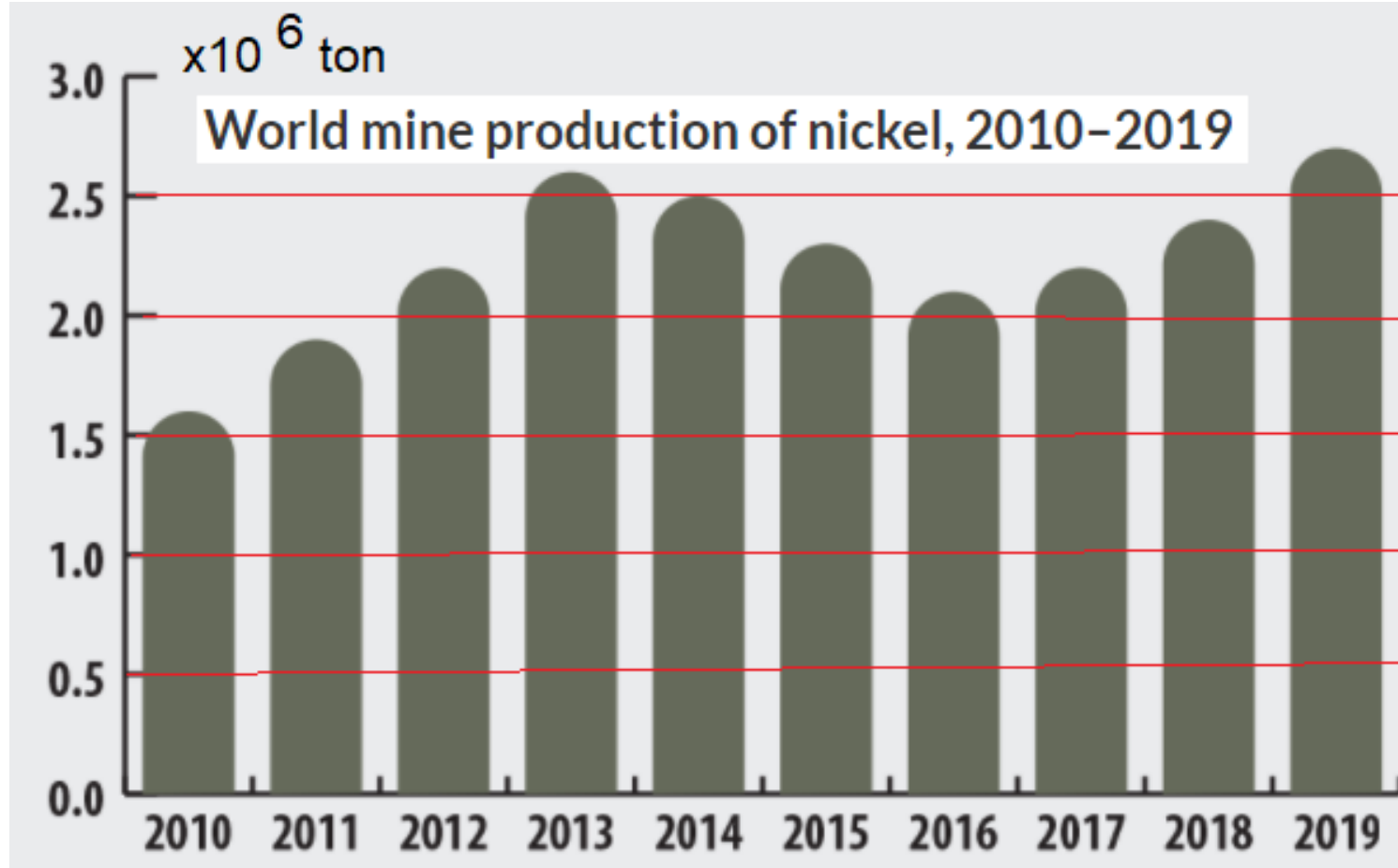
Kobalt fiyatları



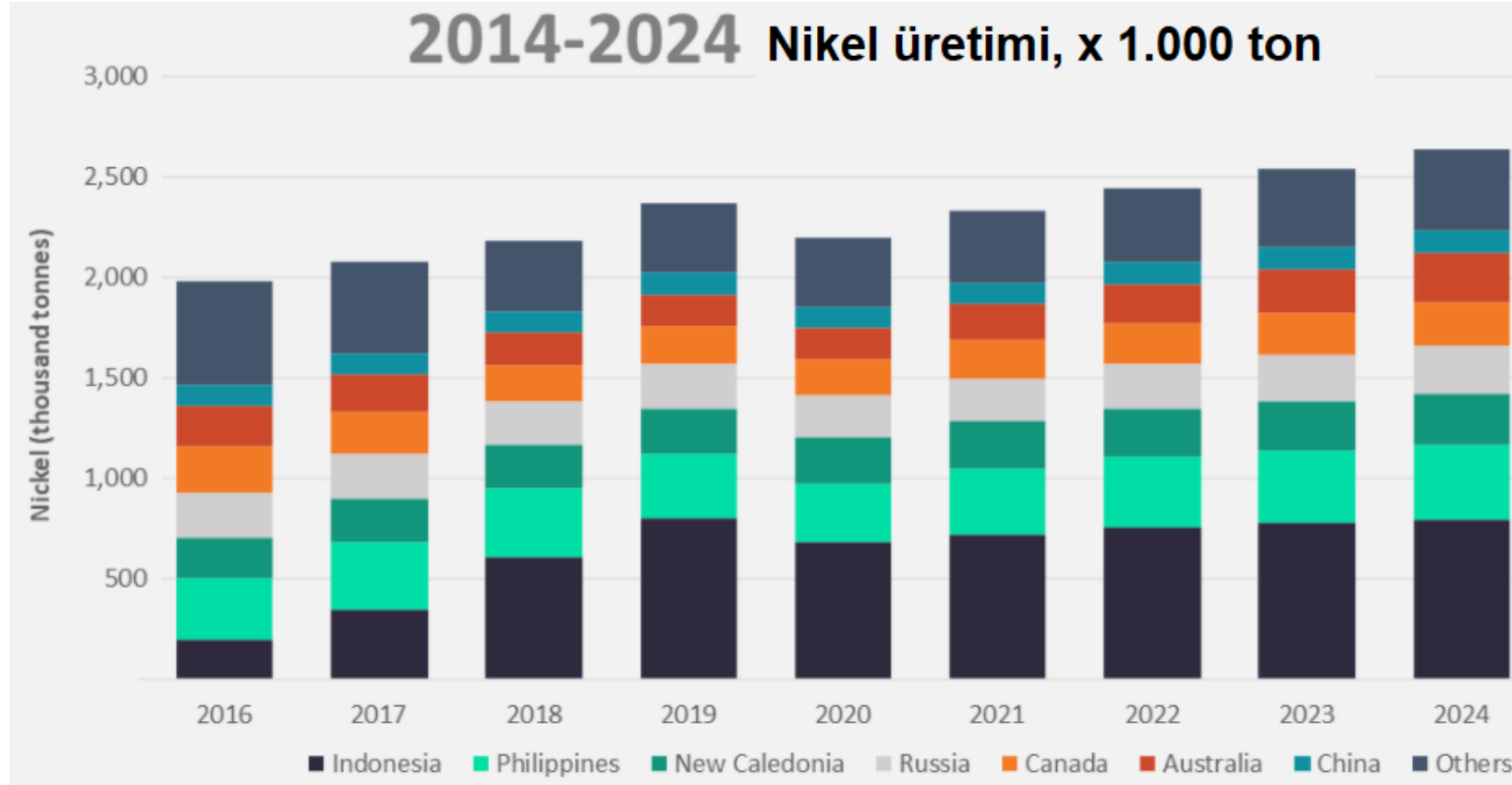
NİKEL MADENCİLİĞİ





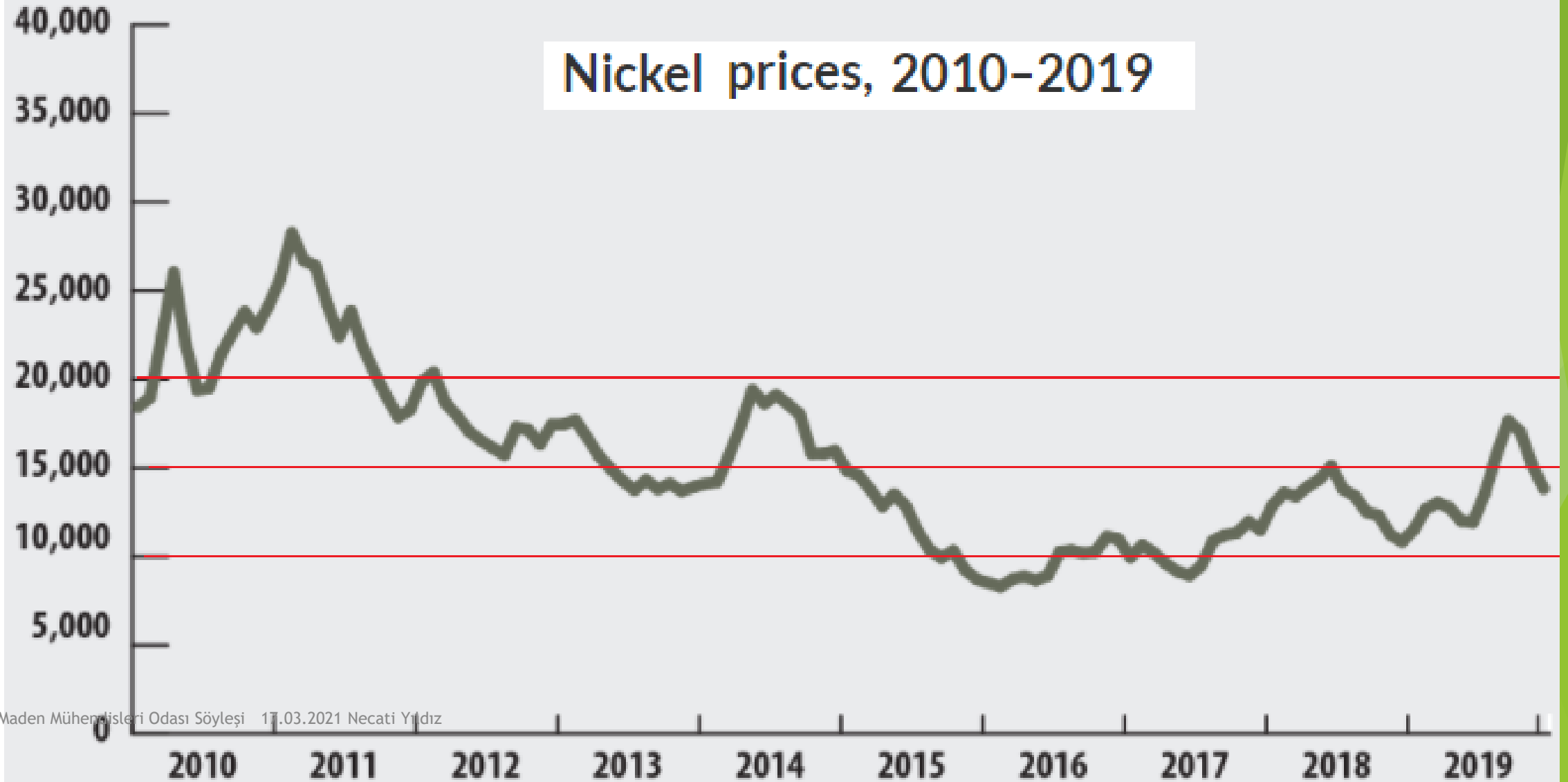


Ülkelerin nikel üretimi



US\$/ton

Nickel prices, 2010-2019



Nickel Price



Source: Macrotrends

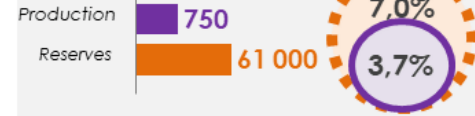
www.profitrends.com

BAKIR MADENCİLİĐİ

UNITED STATES OF AMERICA



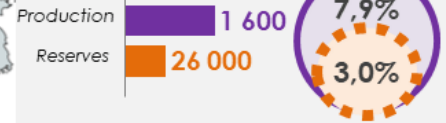
RUSSIA



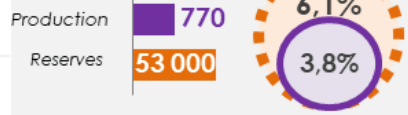
KAZAKHSTAN



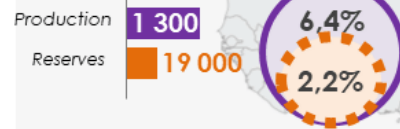
CHINA



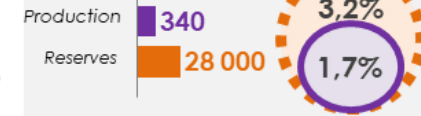
MEXICO



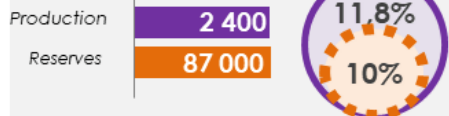
DEM. REP. OF THE CONGO



INDONESIA



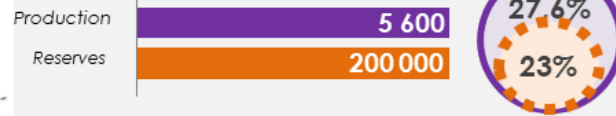
PERU



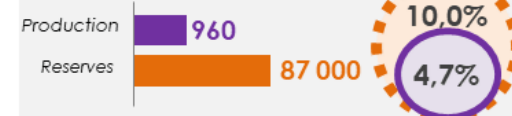
ZAMBIA



CHILE



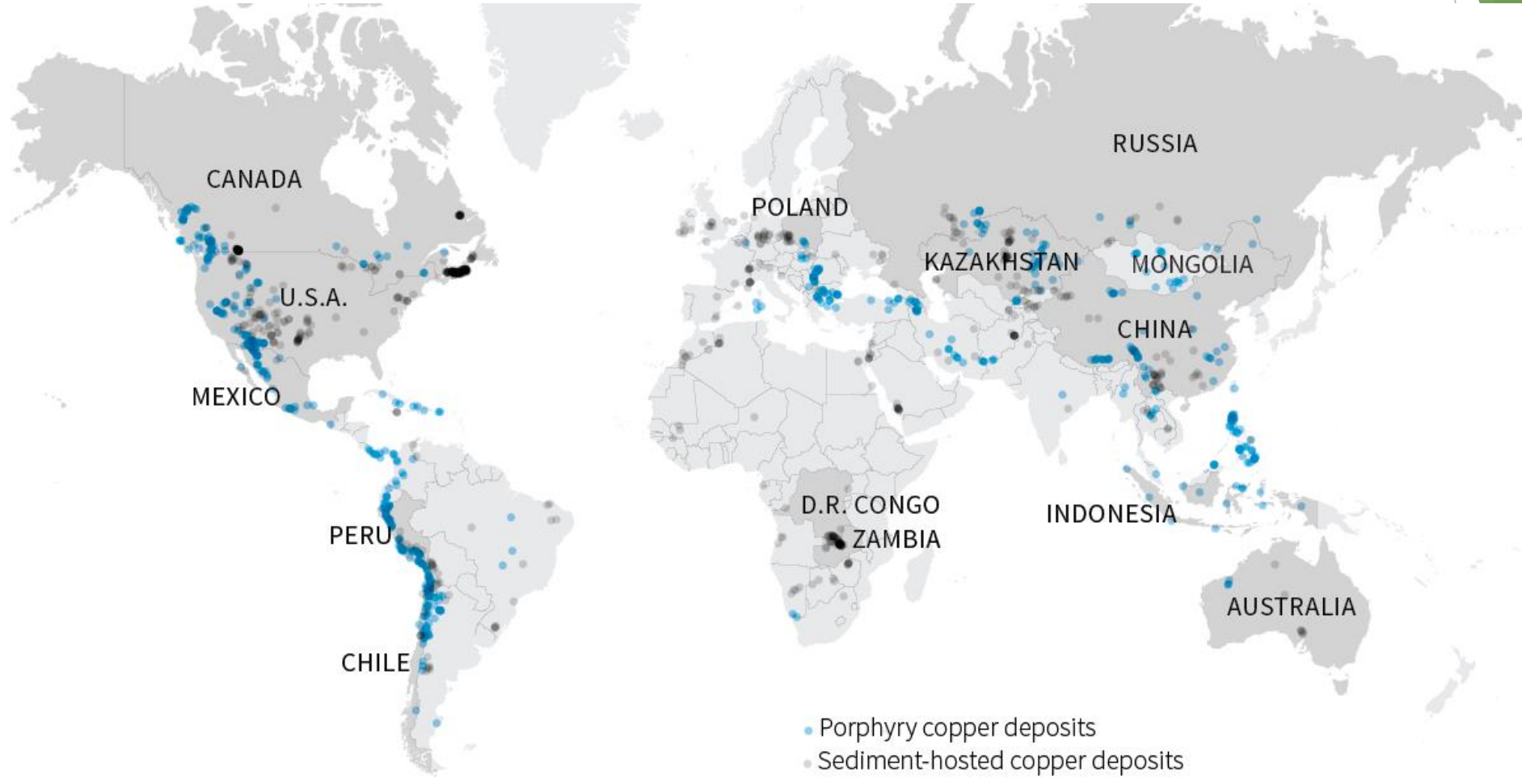
AUSTRALIA



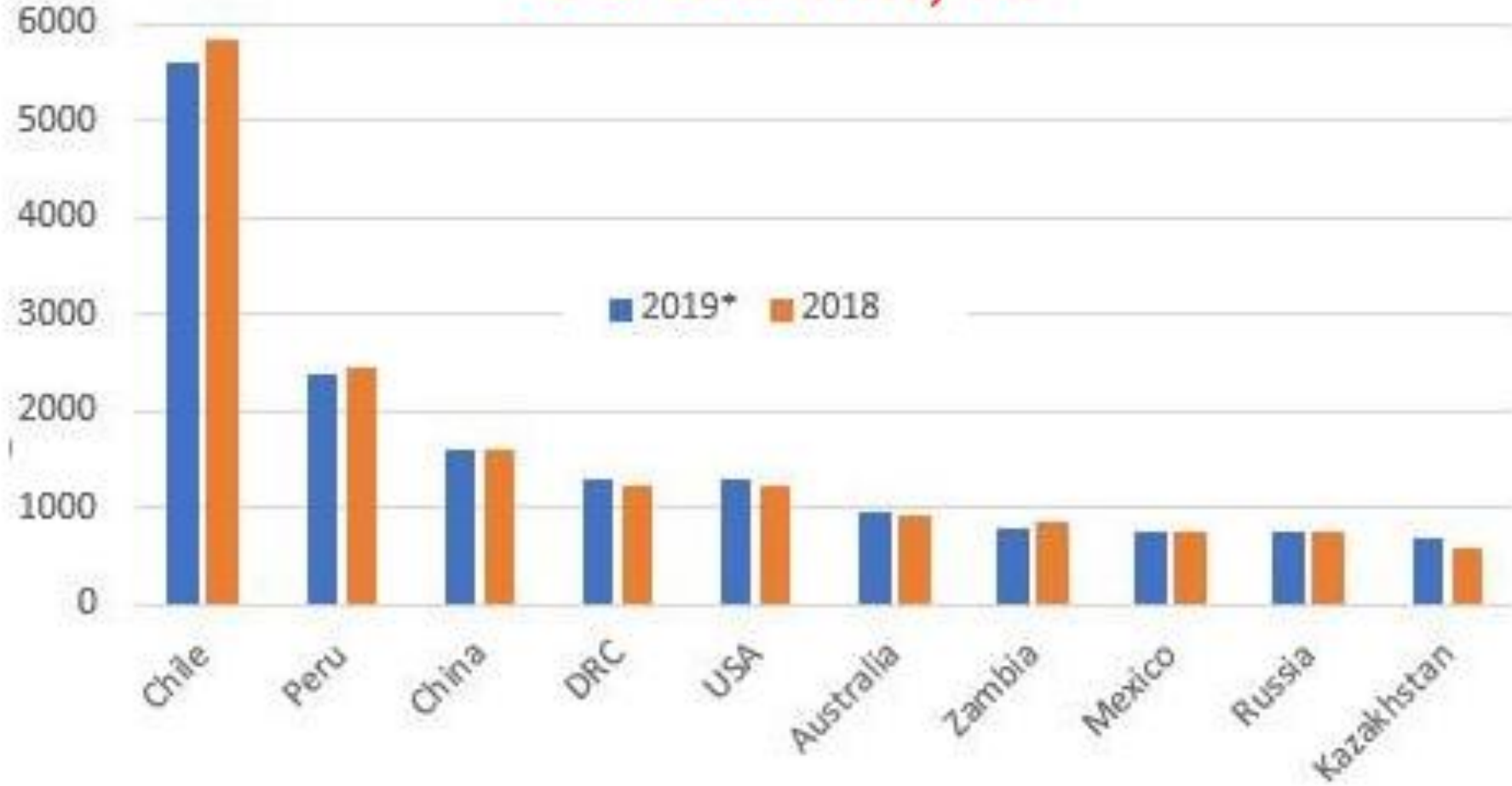
- The 11 main copper producers
- Domestic copper production in kt
- Domestic copper reserves in kt

- x% Share of world production
- x% Share of world reserves

Sıra	Ülke	2019 üretimi x 10 ⁶ ton	Ülke	Rezerv x 10 ⁶ ton
#1	Chile	5,600	Chile	200,000
#2	Peru	2,400	Peru	87,000
#3	China	1,600	Australia	87,000
#4	United States	1,300	Russia	61,000
#5	Congo	1,300	Mexico	53,000
#6	Australia	960	United States	51,000
#7	Zambia	790	Indonesia	28,000
#8	Mexico	770	China	26,000
#9	Russia	750	Kazakhstan	20,000
#10	Kazakhstan	700	Congo	19,000
#11	Indonesia	340	Zambia	19,000
	Other Countries	3,800	Other Countries	220,000
Source: USGS	World Total	20,000	World Total	870,000



Cu üretimi, kt



	Üretici	2018 Cu kton	2019 Cu kton
1	Codelco	1,806	1,706
2	Glencore	1,454	1,371
3	BHP Billiton	1,231	1,258
4	Freeport	1,414	1,170
5	Southern Copper	884	994
6	KGHM	634	702
7	First Quantum	606	702
8	Rio Tinto	608	577
9	Antofagasta	486	520
10	Norilsk Nickel	474	499

Rafineri Cu İhracatçılar

2019

- ① Chile
- ② Russia
- ③ Congo
- ④ Japan
- ⑤ Australia
- ⑥ Kazakhstan
- ⑦ China
- ⑧ Poland
- ⑨ South Korea
- ⑩ Peru

Rafineri Cu İthalatçıları

2019

- ① China
- ② United States
- ③ Germany
- ④ Italy
- ⑤ Taiwan**
- ⑥ UAE
- ⑦ Thailand
- ⑧ Turkey
- ⑨ Malaysia
- ⑩ Vietnam

Cu cevheri ve konsantre

İhracatçıları 2019

- ① Chile
- ② Peru
- ③ Australia
- ④ Canada
- ⑤ United States
- ⑥ Brazil
- ⑦ Mexico
- ⑧ Mongolia
- ⑨ Spain
- ⑩ Indonesia

Cu cevheri ve konsantre

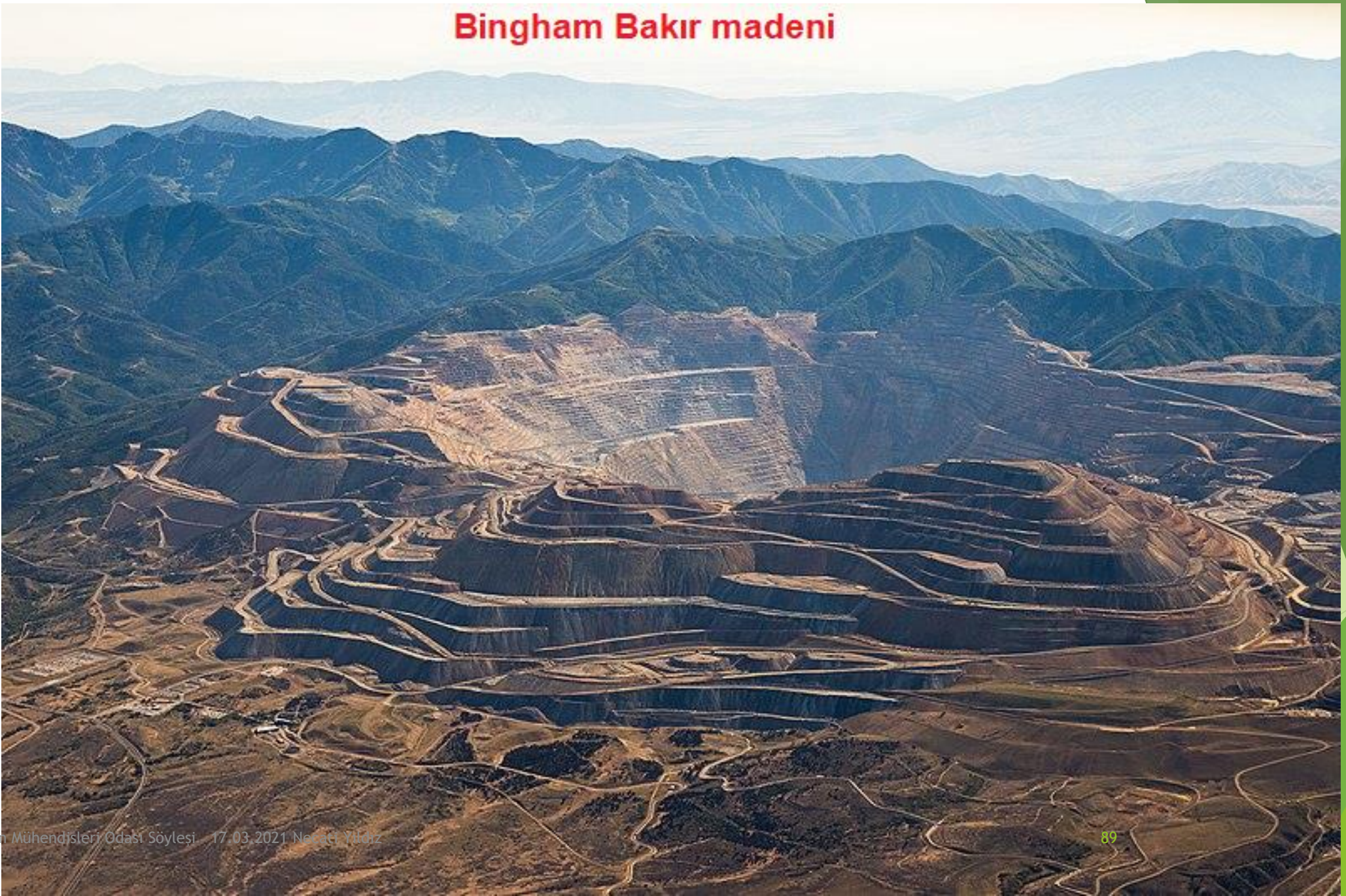
İthalatçıları 2019

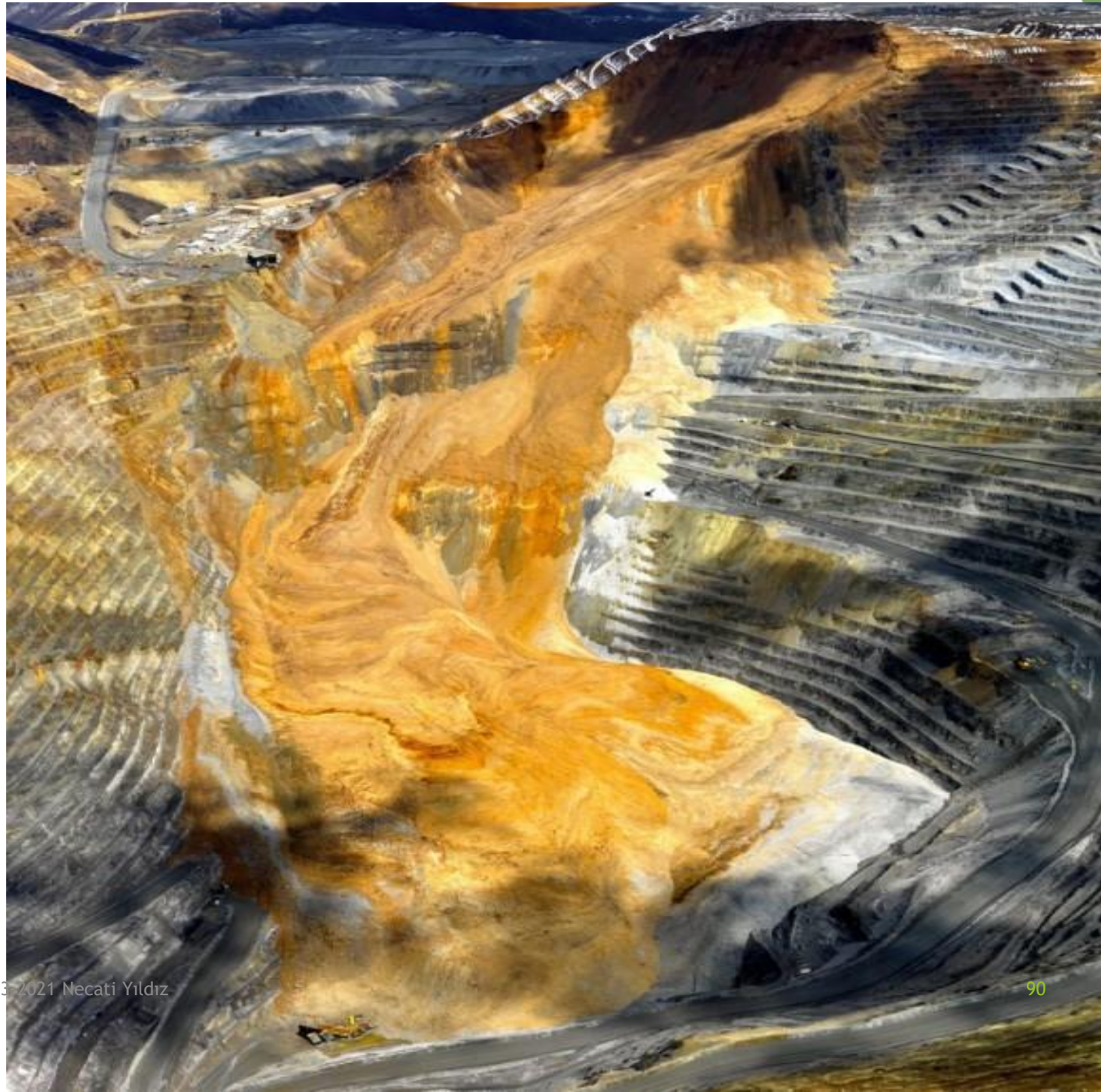
- ① China
- ② Japan
- ③ South Korea
- ④ Spain
- ⑤ Germany
- ⑥ Bulgaria
- ⑦ India
- ⑧ Taiwan**
- ⑨ Brazil
- ⑩ Finland

Escondida Bakır Madeni, Şili



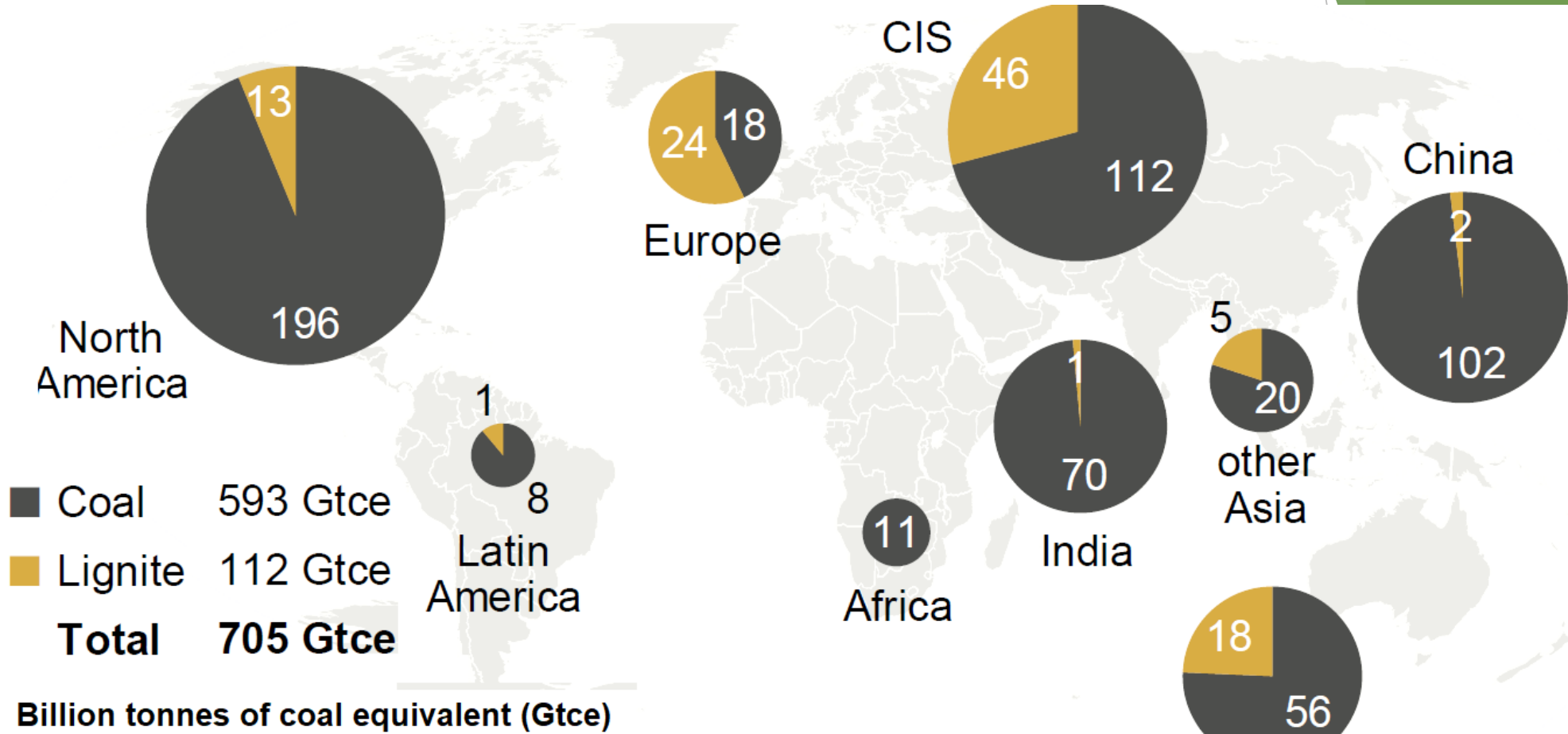
Bingham Bakır madeni





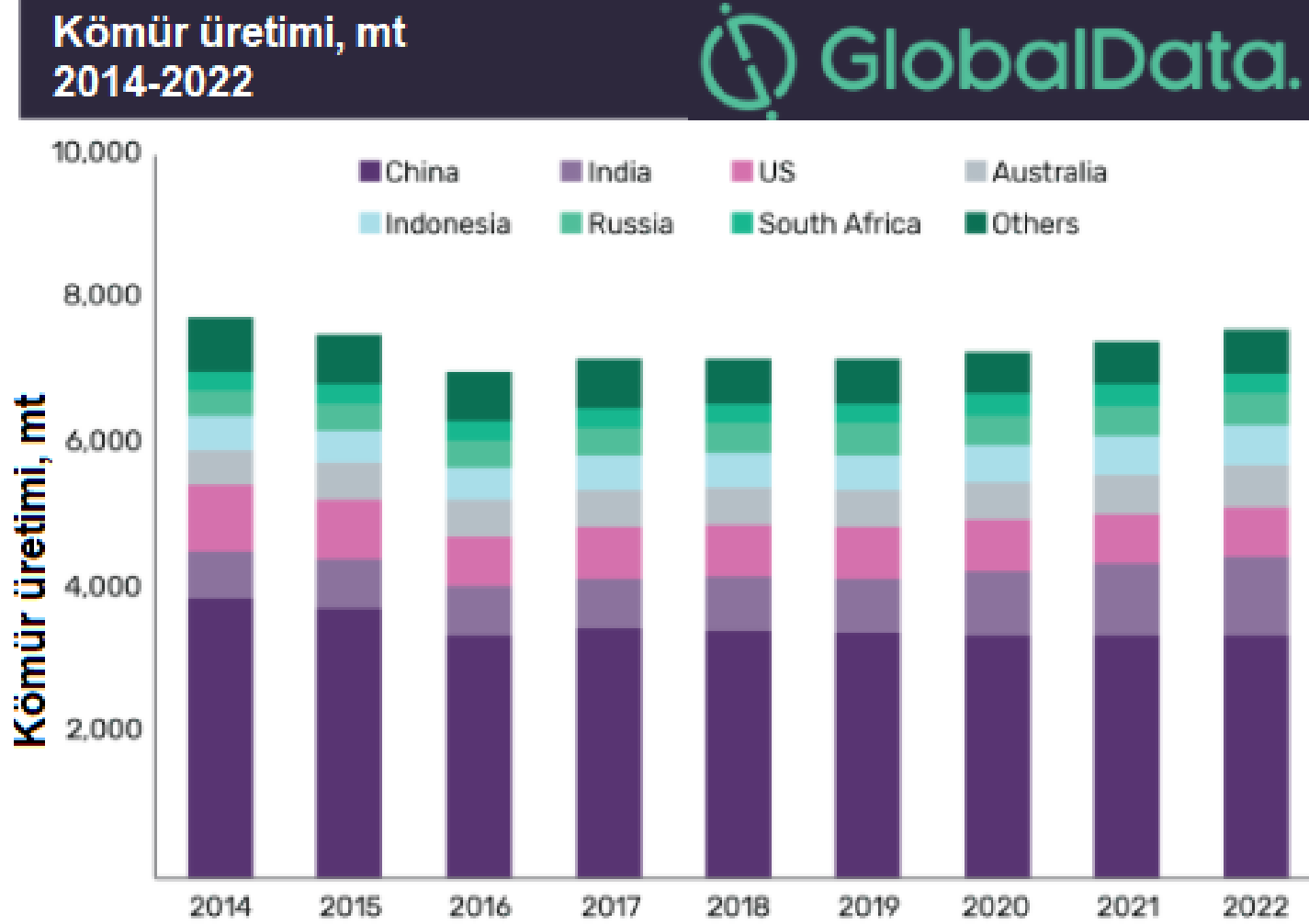
KÖMÜR MADENCİLİĞİ

Dünyada kömür rezervi

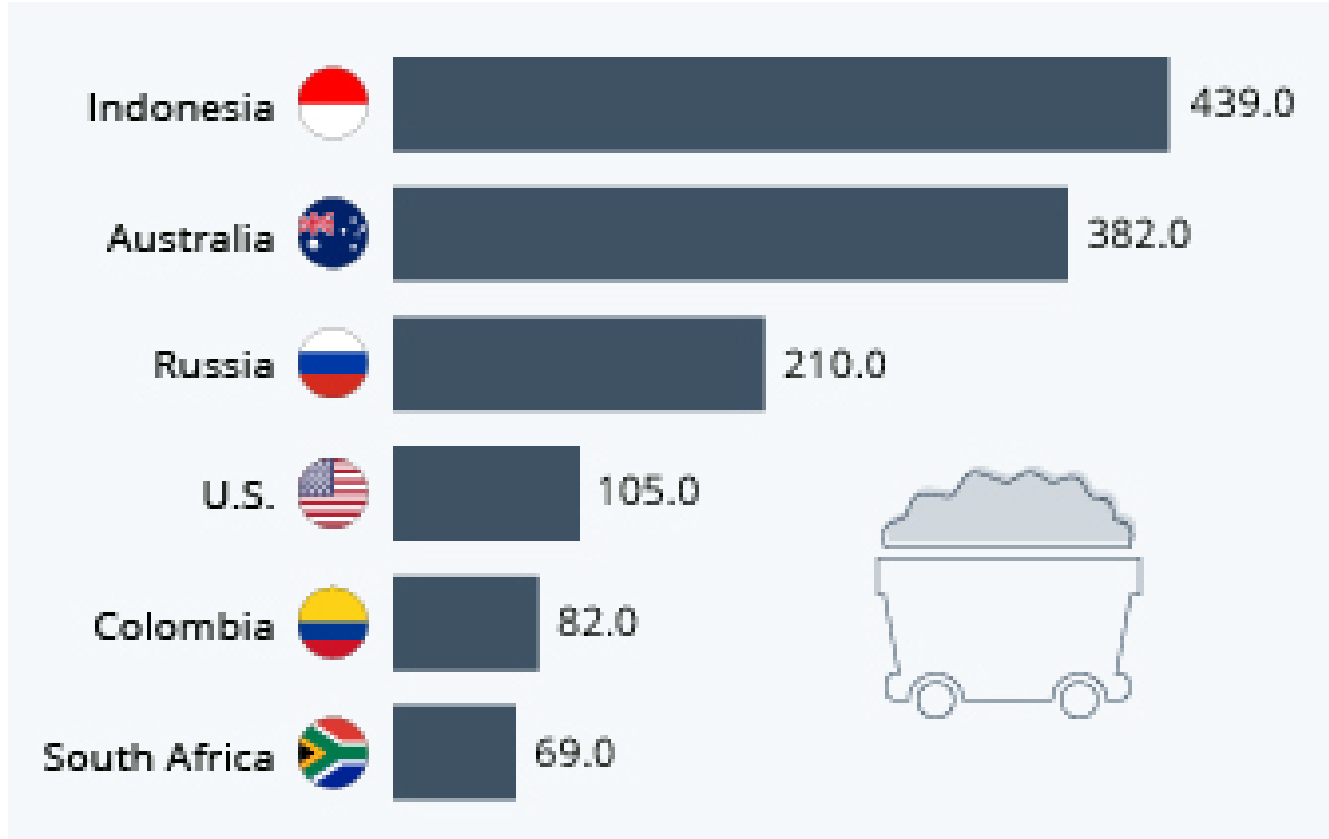


Dünya	Antrasit & bitümlü		Subbitümlü & linyit		Toplam	
	Ton (mil)	%	Ton (mil)	%	Ton (mil)	%
	734,903	100%	319,879	100%	1,054,782	100%

Dünya kömür üretimi

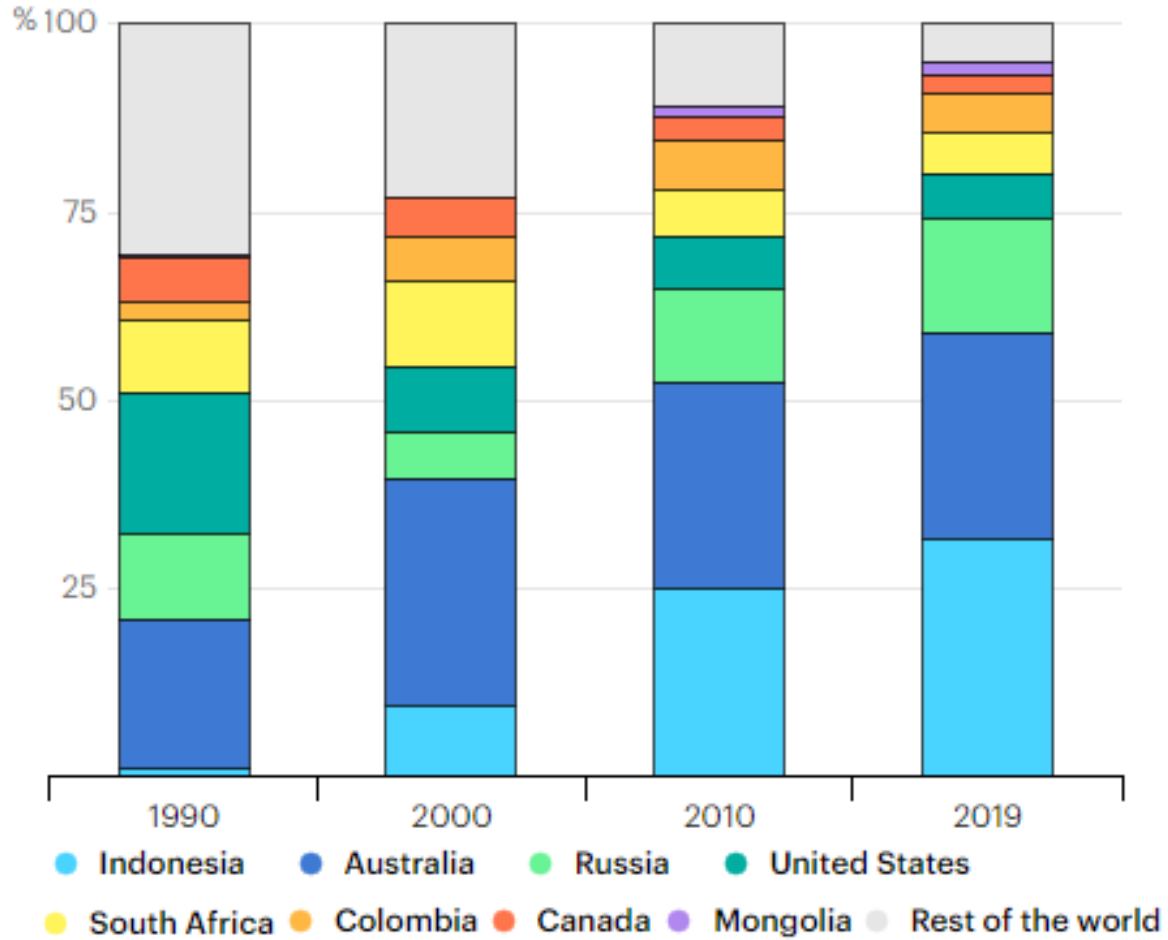


En büyük kömür ihracatçıları, mt

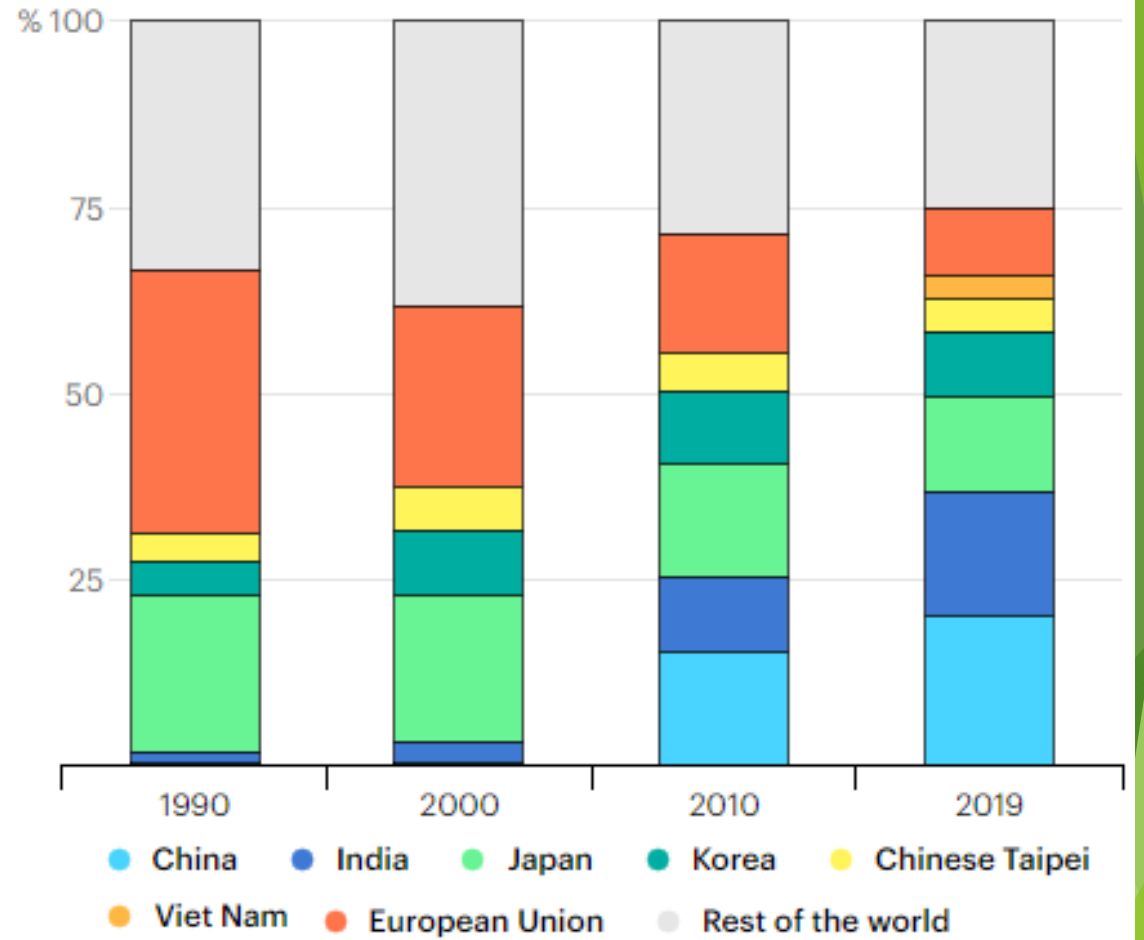


Dünyada kömür ticareti

İhracat



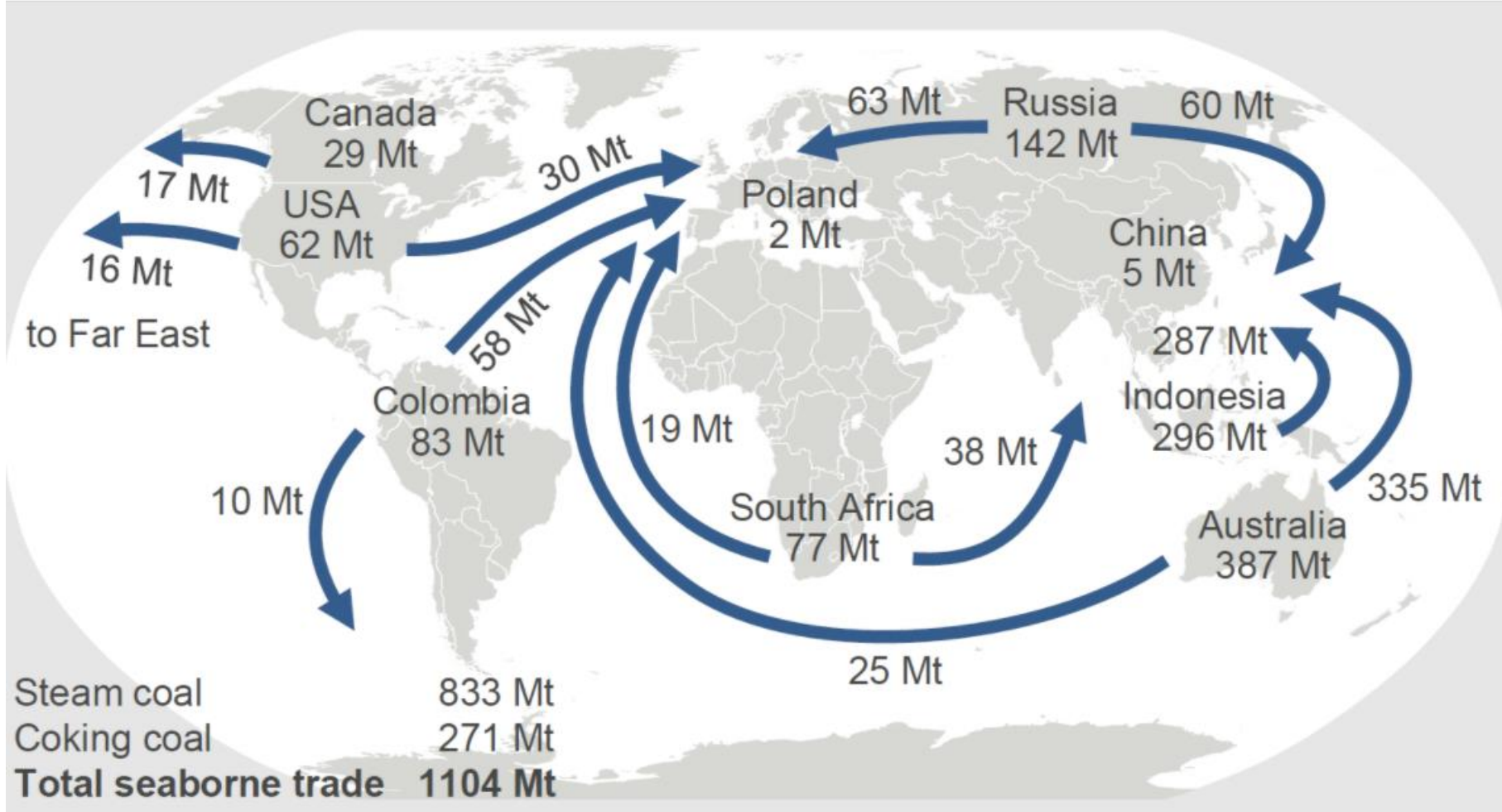
İthalat



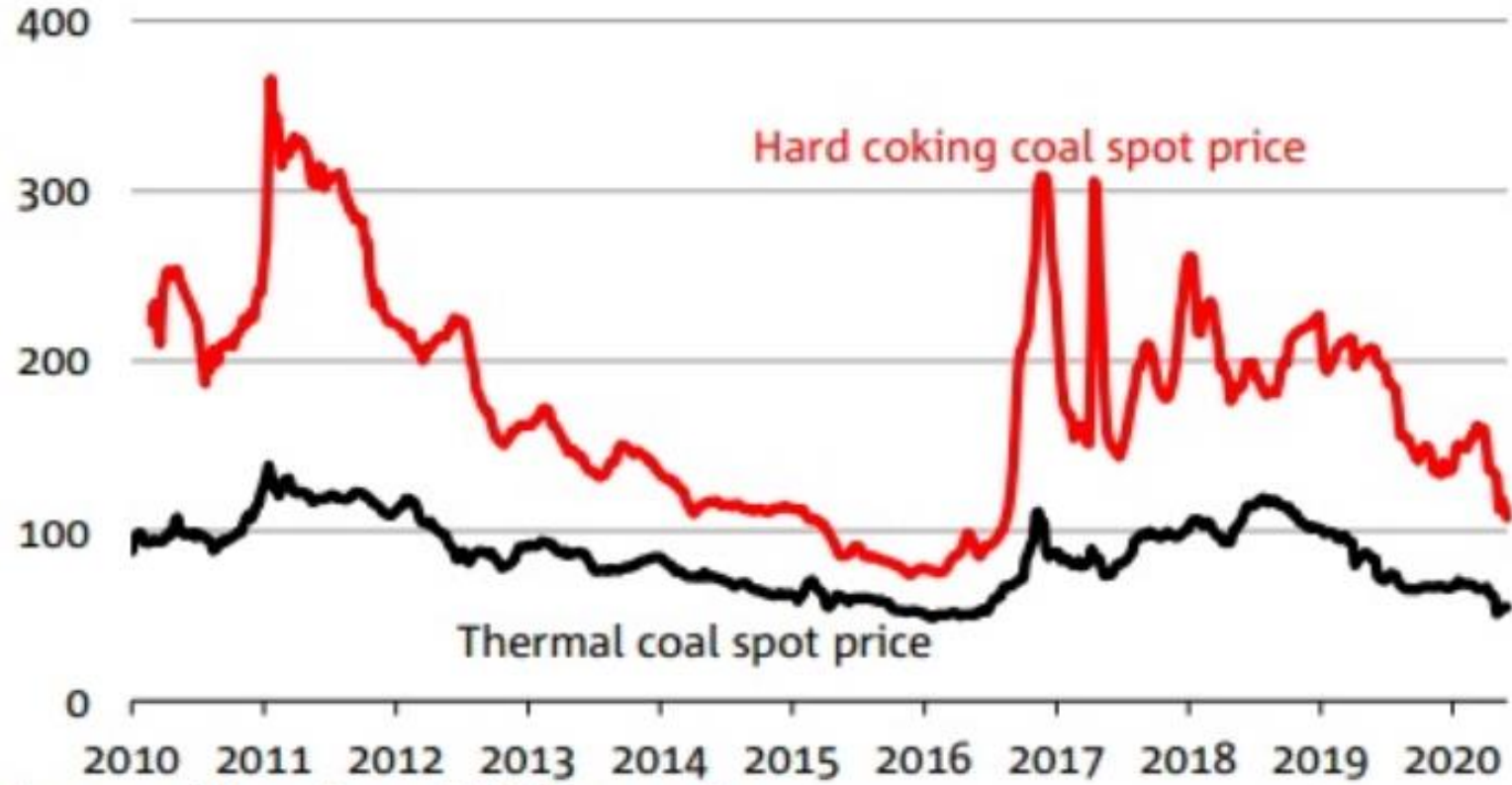
Steam coal 833 Mt
Coking coal 271 Mt
Total seaborne trade 1104 Mt

Maden Mühendisleri Odası Söyleşi 17.03.2021 Necati Yıldız

Dünyada kömür ticareti



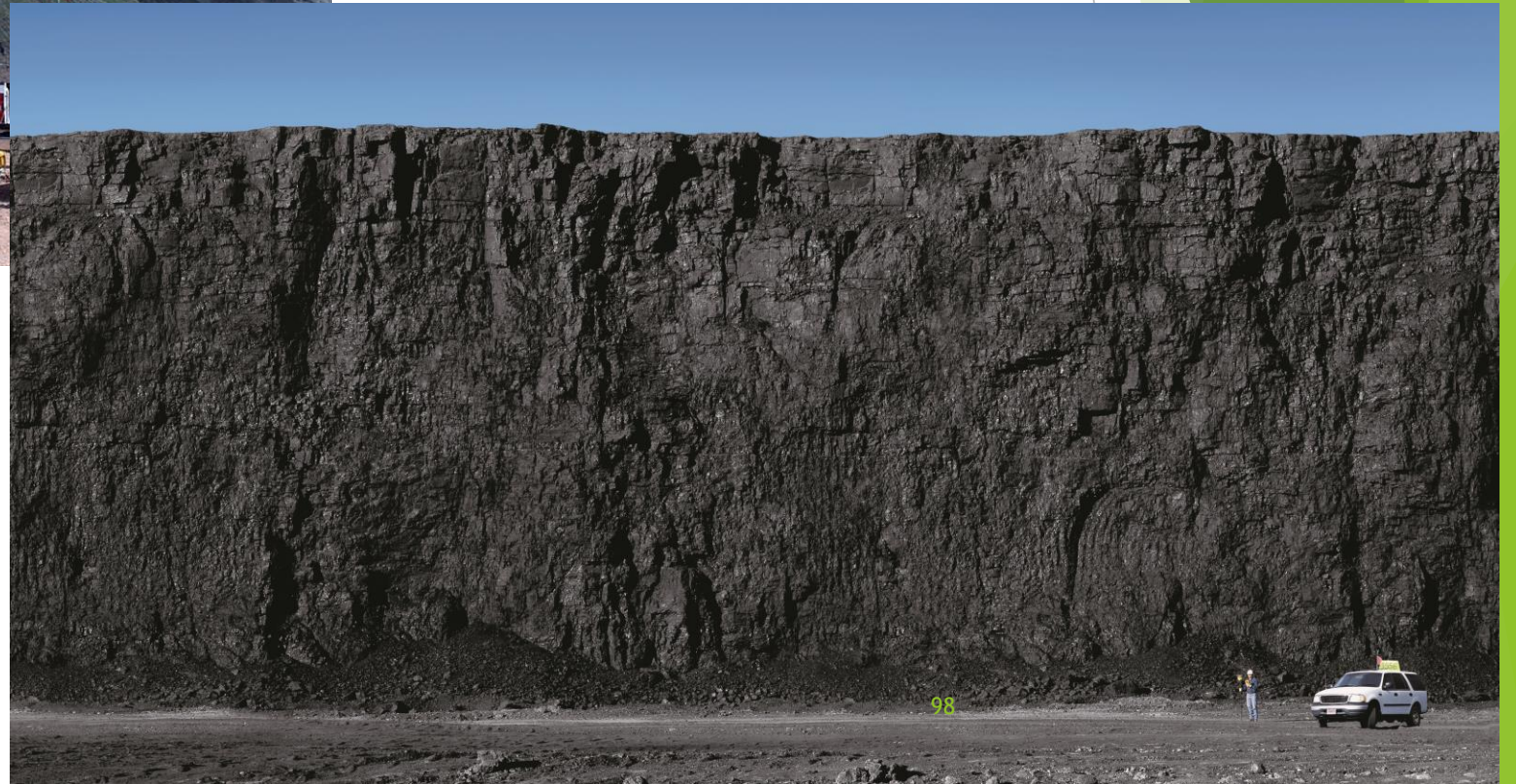
US\$/t (FOB)



Sources: Bloomberg, NAB Economics



North Antelope Rochelle coal mine, US



DÜNYADA DEMİR MADENCİLİĞİ

2019 elik reticisi ilk 20 lke

