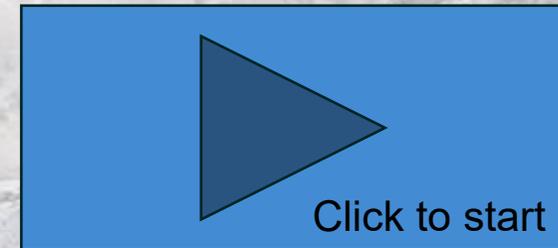


Why the metals in your smartphone matter

By the end of this session, you will know:

- Which metals are hidden inside a smartphone, and what are they used for.
- Where do the metals in our smartphones come from.
- What about the recycling rates.
- Simple actions you can take to reduce the impact of your smartphone use.



Life is centered around the smartphone

60.4 % of the global population owns a smartphone

Between 1.2 and 1.4 billion smartphones are produced every year

5G networks will cover 65 % of the global population by 2025



Why the metals in your smartphone matter

- **Everyday essential:** Smartphones are used for everything from banking to navigation, making them indispensable.
- **Hidden complexity:** Dozens of supply chains converge in one pocket-sized device.
- **Resource intensity:** Manufacturing one device requires the extraction and processing of vast amounts of raw material.
- **Environmental impact:** Mining and processing these metals consume energy, emit CO₂ and can harm ecosystems.
- **Limited recycling:** Many of these metals are barely recovered, leading to growing demand for resources.

Life is centered around the smartphone

A typical smartphone weighs around 110 g.

Yet, producing its 50+ metals requires moving about 143.4 kg of ore and waste rock.

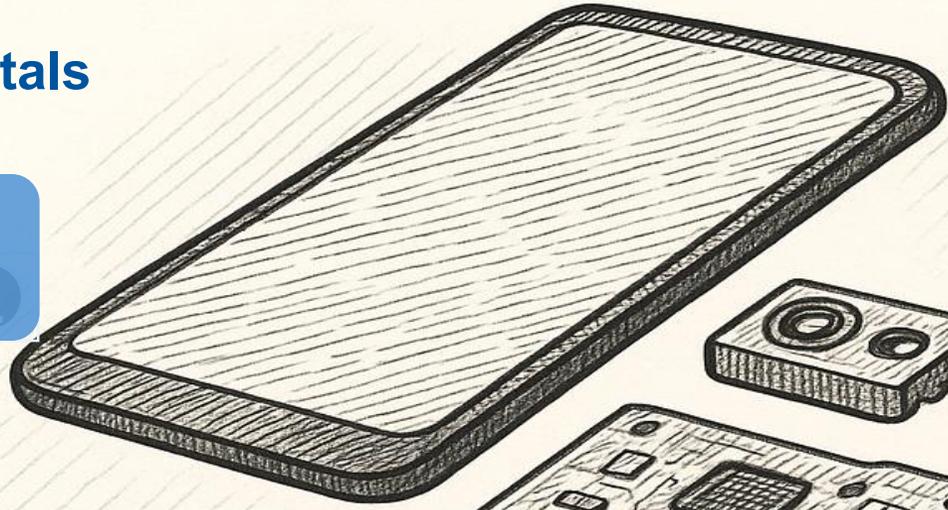
This is roughly the weight of two average adults.



What does this mean?

Components and metals

1 Click here to see all the metals 



Touchscreen and Display
In, Si, Sn, La, Pr, Eu, Gd, Tb, Dy

Magnets in the Camera
Dy, Fe, Nd, Pr

Vibration Motor
Dy, Fe, Mo, Nd, W

Circuit Board
Ag, Au, Cr, Cu, Pd, Si, Ta, Ti

Battery
Co, Li, Mn, Ni

2 Click here for world map showing the origin of these metals 

4

4 Click here to learn more about the metals 

3 Click here to learn more about the 12 most valuable metals. 

Casing
Al, Mg

1 H Hydrogen																	2 He Helium						
3 Li Lithium	4 Be Beryllium																	5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium																	13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton						
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon						
55 Cs Caesium	56 Ba Barium	57-71 Lanthanoids	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon						
87 Fr Francium	88 Ra Radium	89-103 Actinoids	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Cn Copernicium	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson						

57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium
89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium

Metals contained in Smartphones

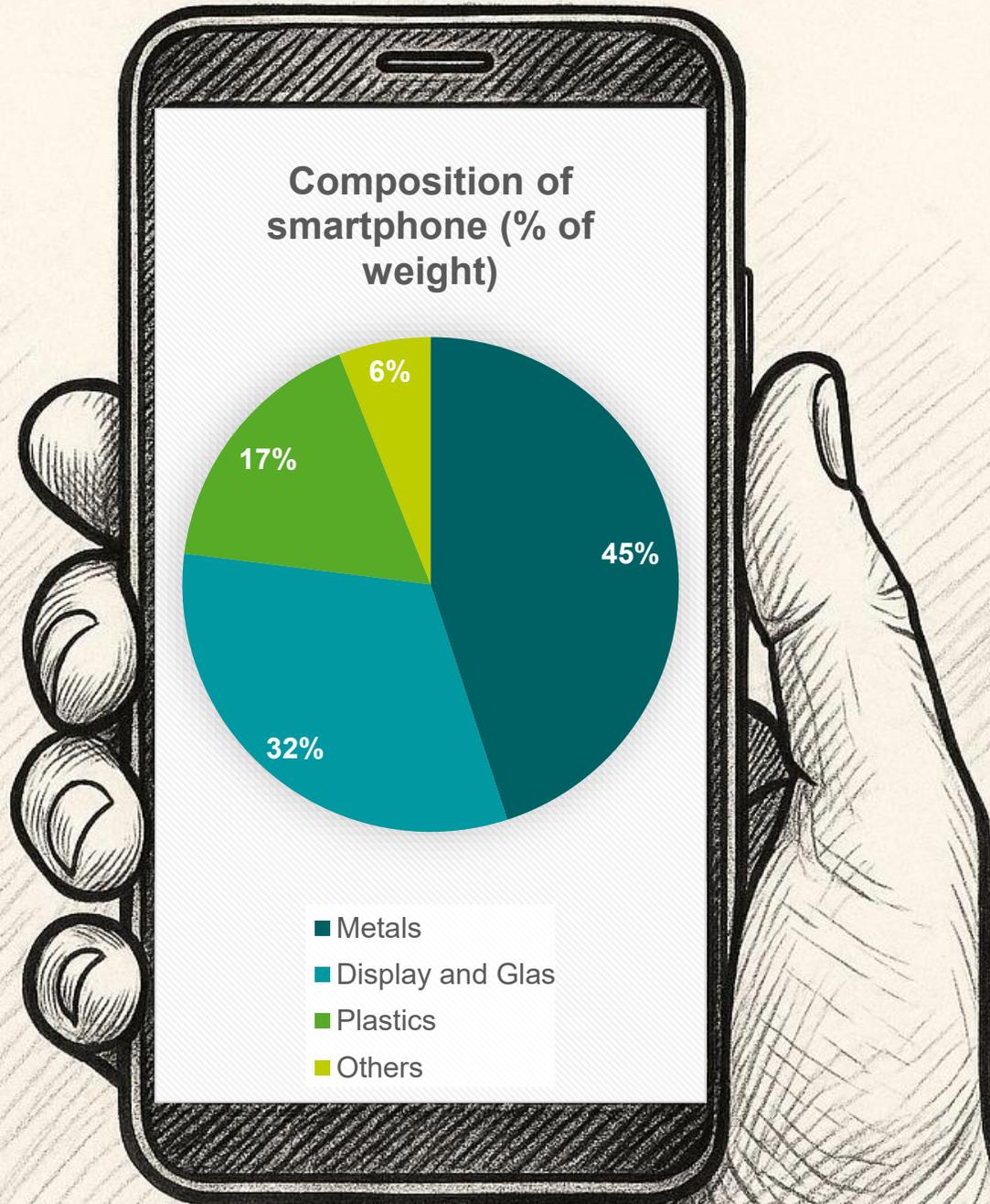
- > 1 g
- > 0.1 g
- > 0.01 g
- < 0.01 g

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Overview



Statistics

- Average composition of smartphones (left); contents of 12 metals (right, ordered by descending values).
- These 12 of the 53 metals make up 97 % of metal value of 1.11 € in total (prices averaged over first half of 2020)

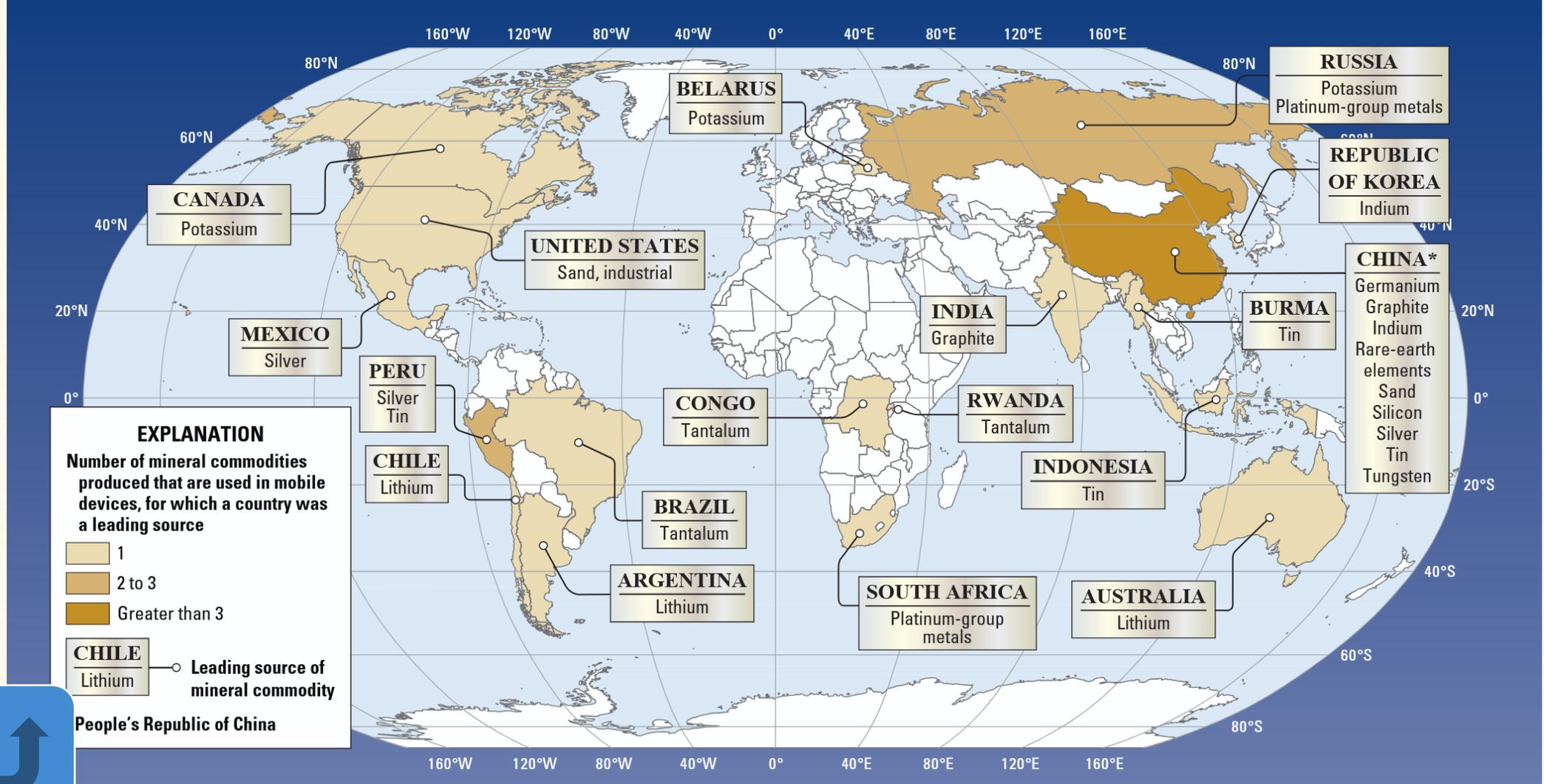


	Metal content	Metals value
Au	0,017 g	73 %
Pd	0,0019 g	11 %
Cu	6,61 g	13 %
Ni	2,60 g	
Si	9,27 g	
Mg	7,24 g	
Pt	0,0005 g	
Nd	0,21 g	
Al	6,68 g	
Ta	0,04 g	
Sn	0,64 g	
Fe	15,98 g	

*in % of total metal value of 1.11 €

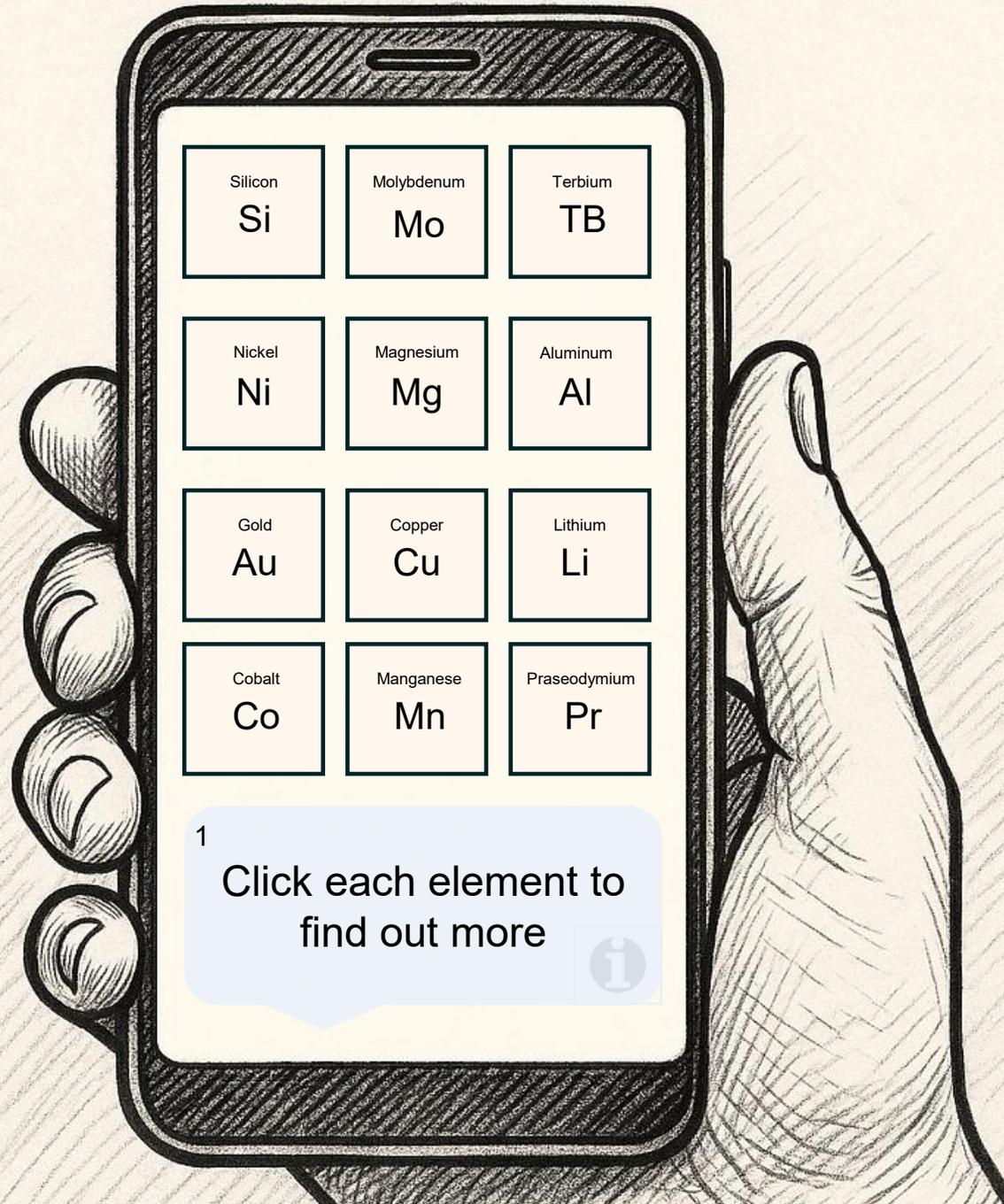
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Leading sources of mineral commodities used in mobile devices



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Elements



1
Click each element to
find out more

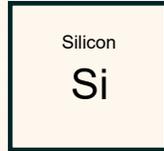
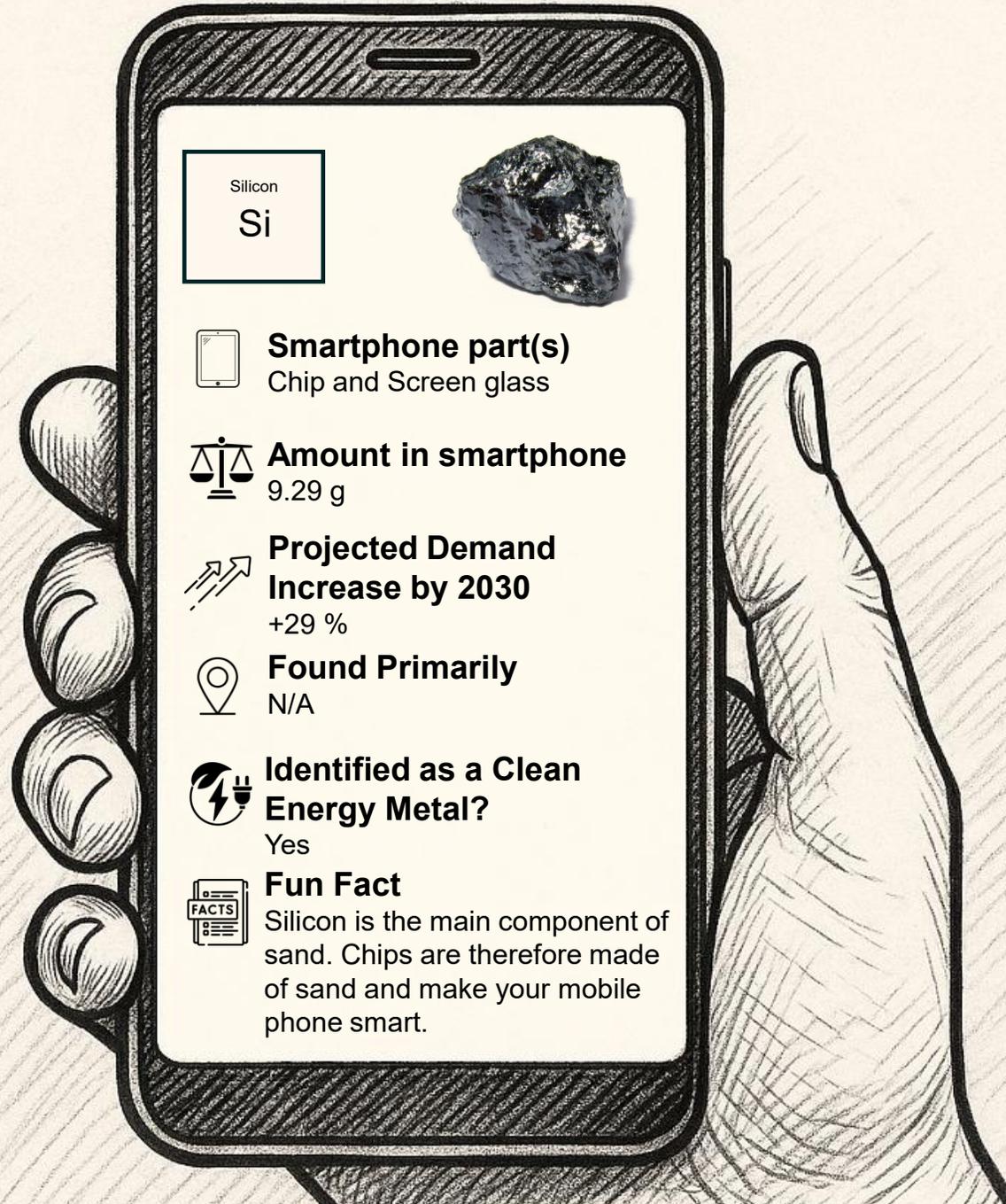


2

Click to learn about
Replacement cycles of
smartphones



Silicon



Smartphone part(s)
Chip and Screen glass



Amount in smartphone
9.29 g



Projected Demand Increase by 2030
+29 %



Found Primarily
N/A



Identified as a Clean Energy Metal?
Yes

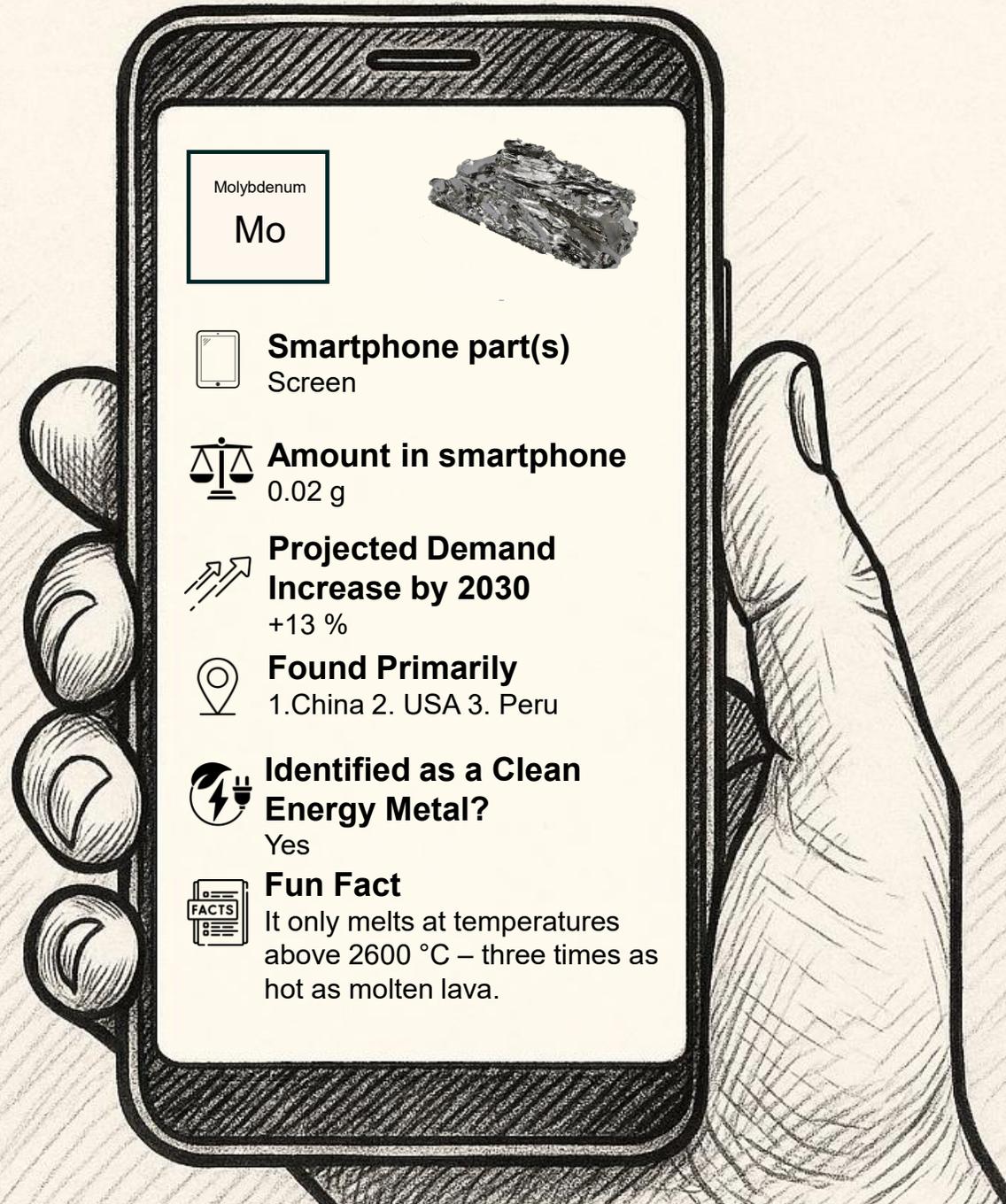


Fun Fact
Silicon is the main component of sand. Chips are therefore made of sand and make your mobile phone smart.

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Molybdenum



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Terbium



Terbium
TB



 **Smartphone part(s)**
Vibration unit, liquid crystal display

 **Amount in smartphone**
Not Available

 **Projected Demand Increase by 2030**
195 % - 434 %

 **Found Primarily**
1. China 2. Vietnam 3. Brazil & Russia

 **Identified as a Clean Energy Metal?**
Yes – for battery and wind

 **Fun Fact**
Rare earth metals are a key component of the green energy transition helping to support magnets, turbines, and EVs.

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Overview



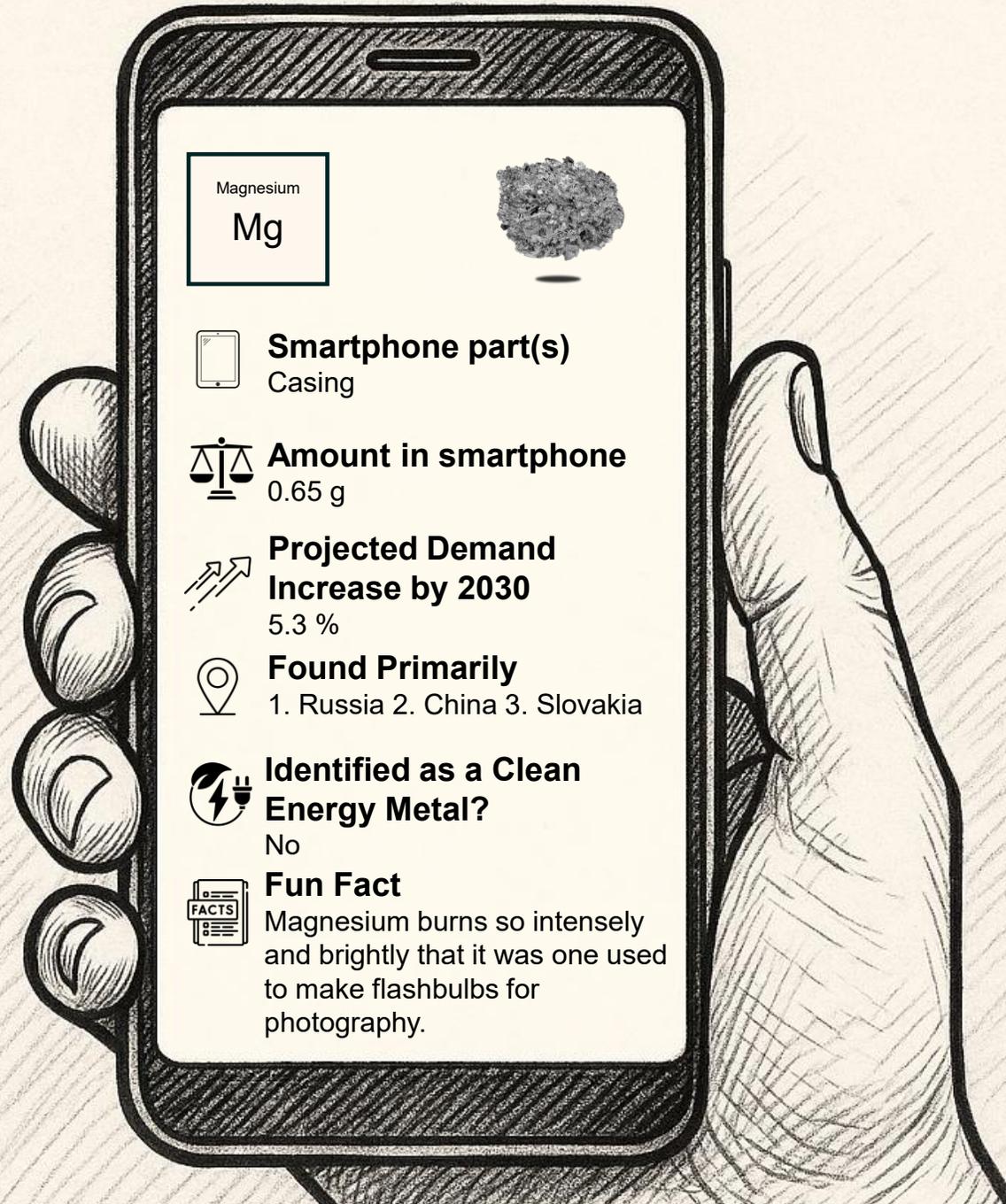
Nickel



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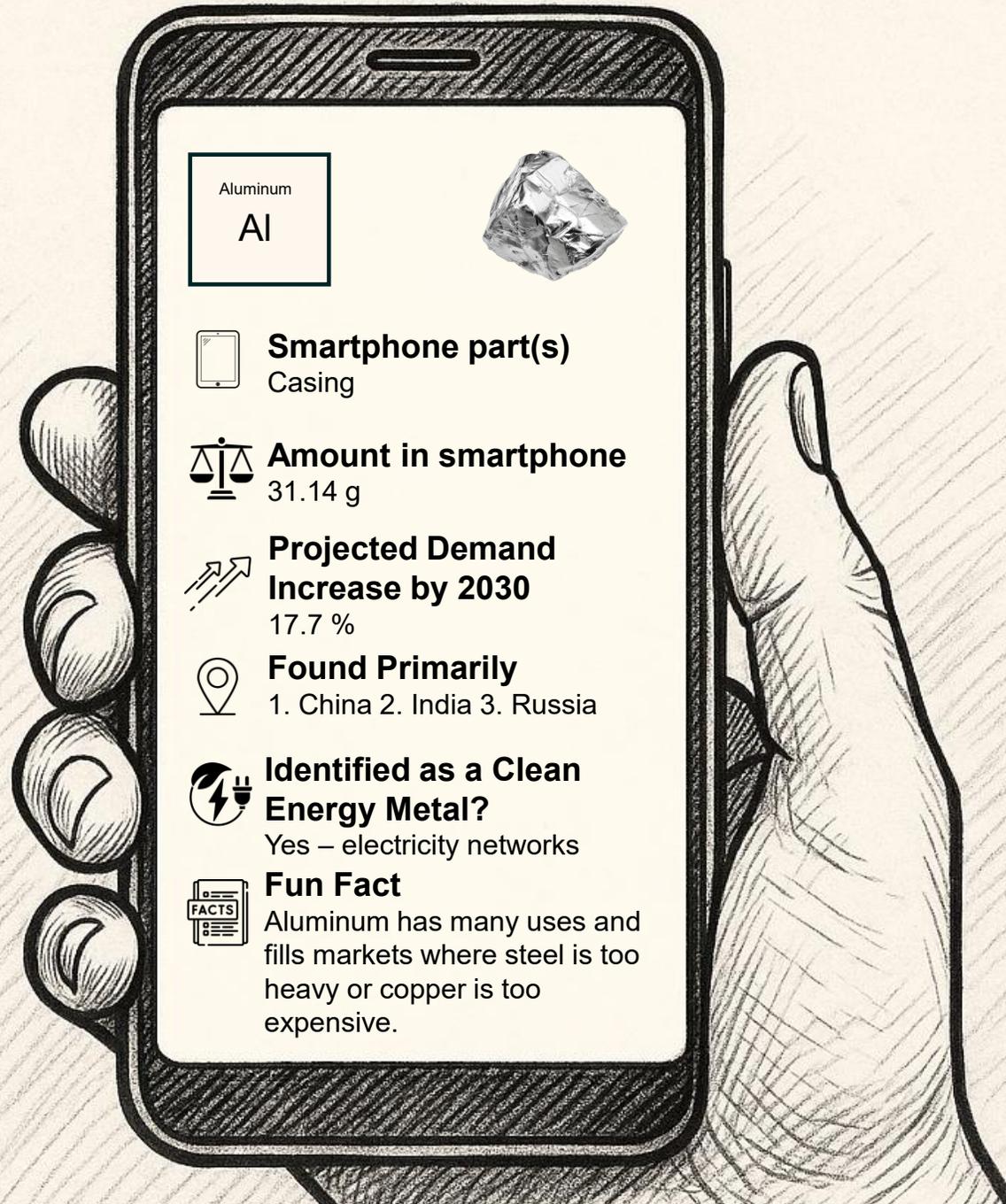
Magnesium



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Aluminum



Aluminum
Al



 **Smartphone part(s)**
Casing

 **Amount in smartphone**
31.14 g

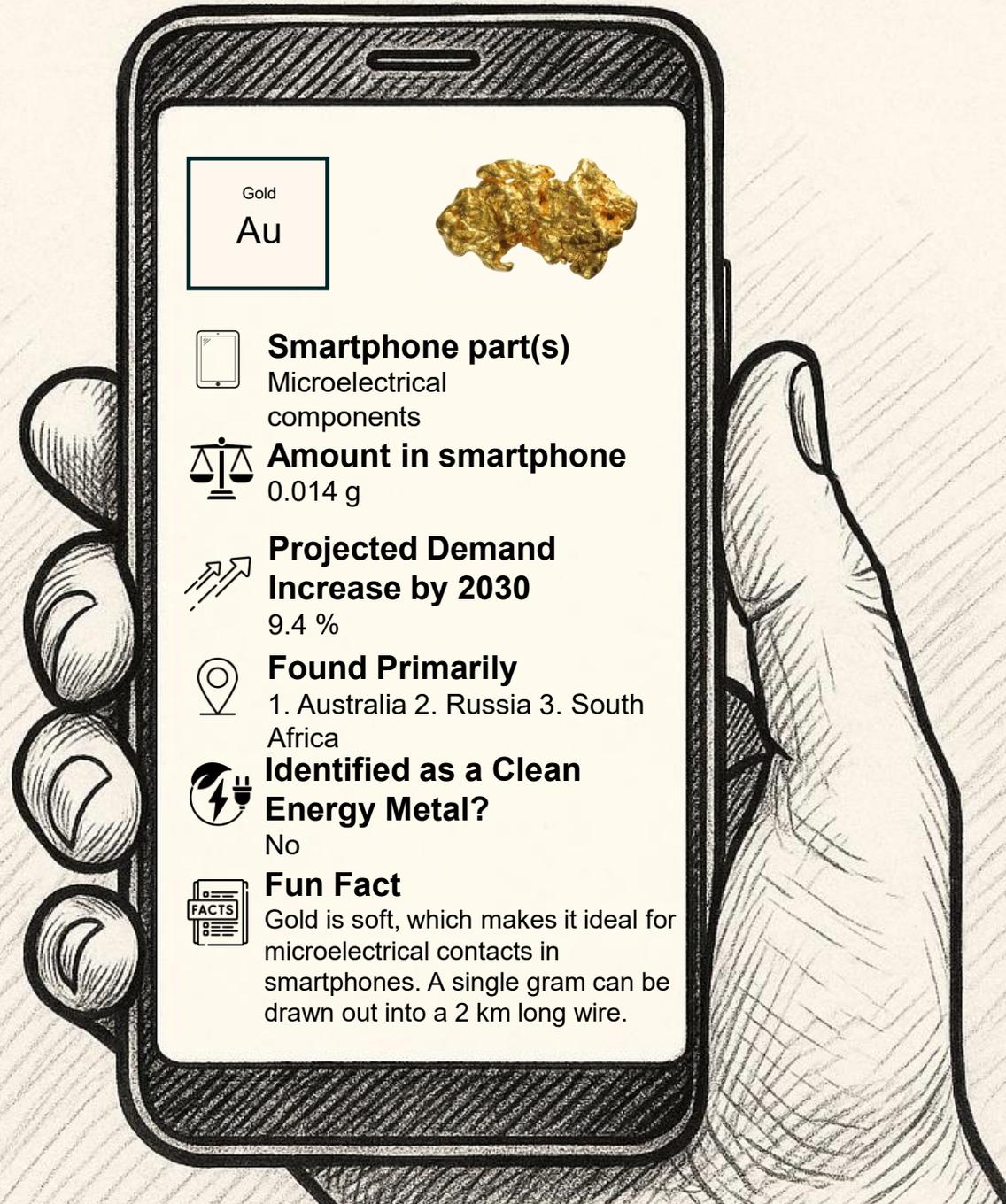
 **Projected Demand Increase by 2030**
17.7 %

 **Found Primarily**
1. China 2. India 3. Russia

 **Identified as a Clean Energy Metal?**
Yes – electricity networks

 **Fun Fact**
Aluminum has many uses and fills markets where steel is too heavy or copper is too expensive.

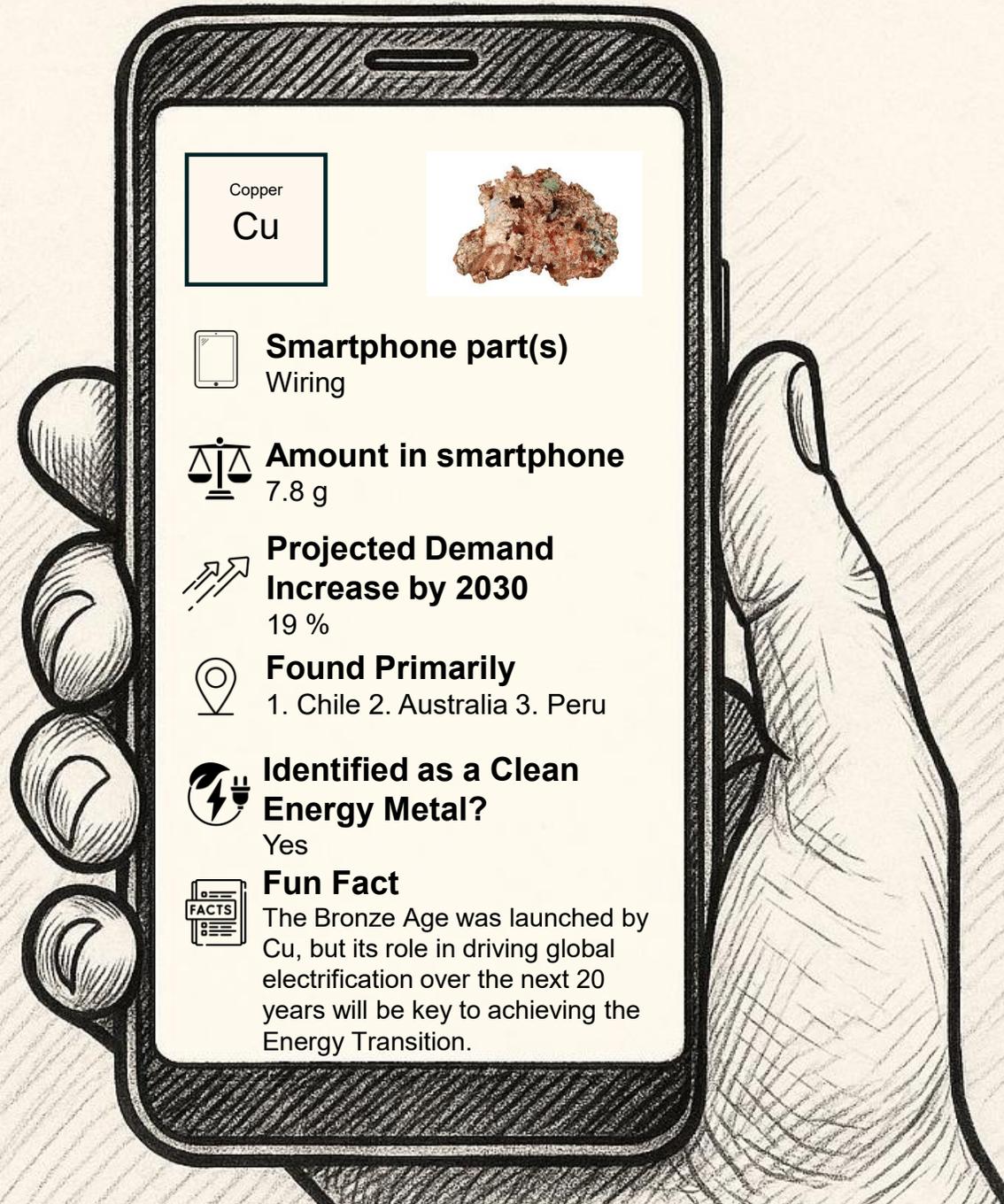
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Overview



Copper



Copper
Cu



 **Smartphone part(s)**
Wiring

 **Amount in smartphone**
7.8 g

 **Projected Demand Increase by 2030**
19 %

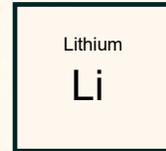
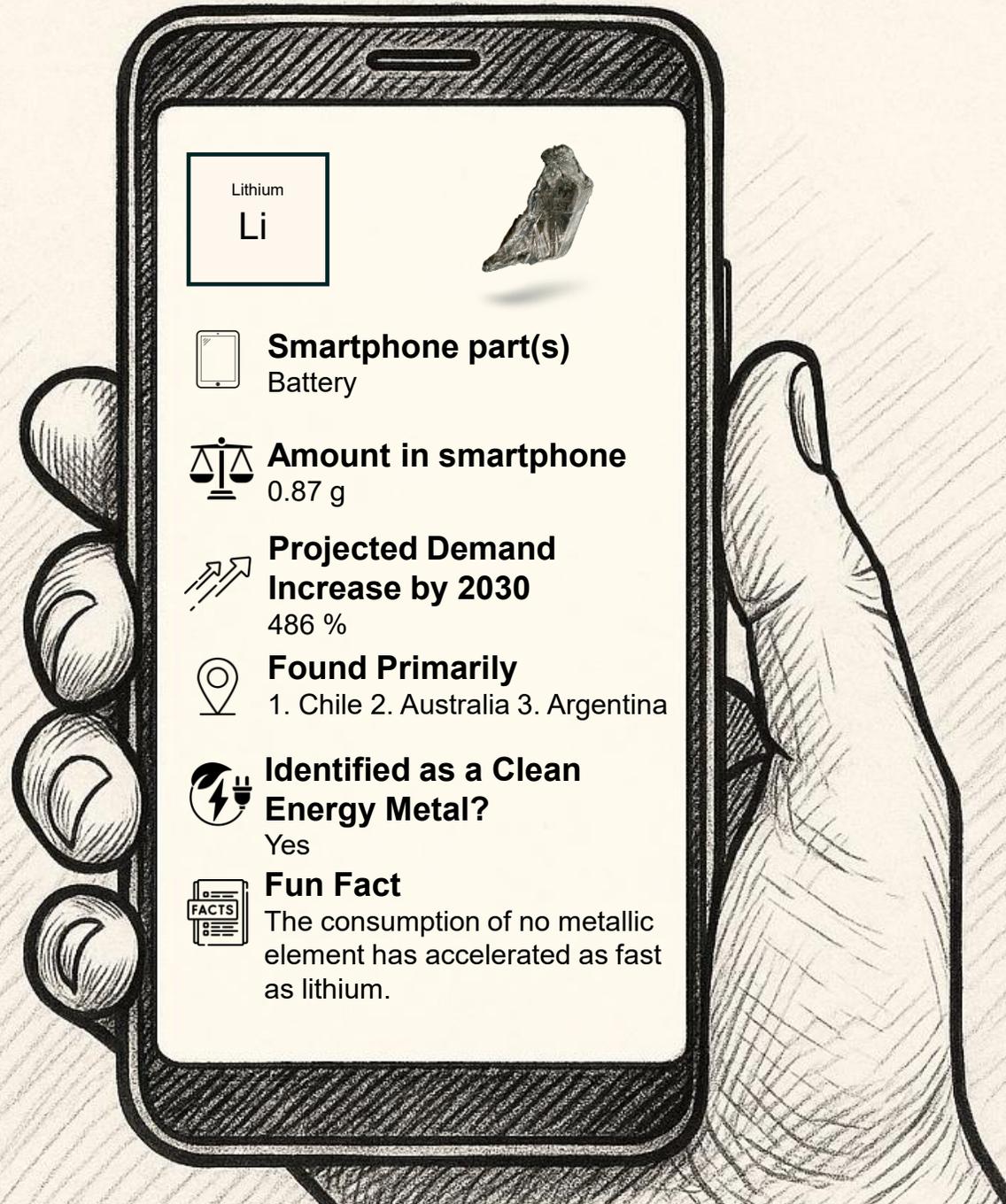
 **Found Primarily**
1. Chile 2. Australia 3. Peru

 **Identified as a Clean Energy Metal?**
Yes

 **Fun Fact**
The Bronze Age was launched by Cu, but its role in driving global electrification over the next 20 years will be key to achieving the Energy Transition.

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Lithium



Smartphone part(s)
Battery



Amount in smartphone
0.87 g



Projected Demand Increase by 2030
486 %



Found Primarily
1. Chile 2. Australia 3. Argentina



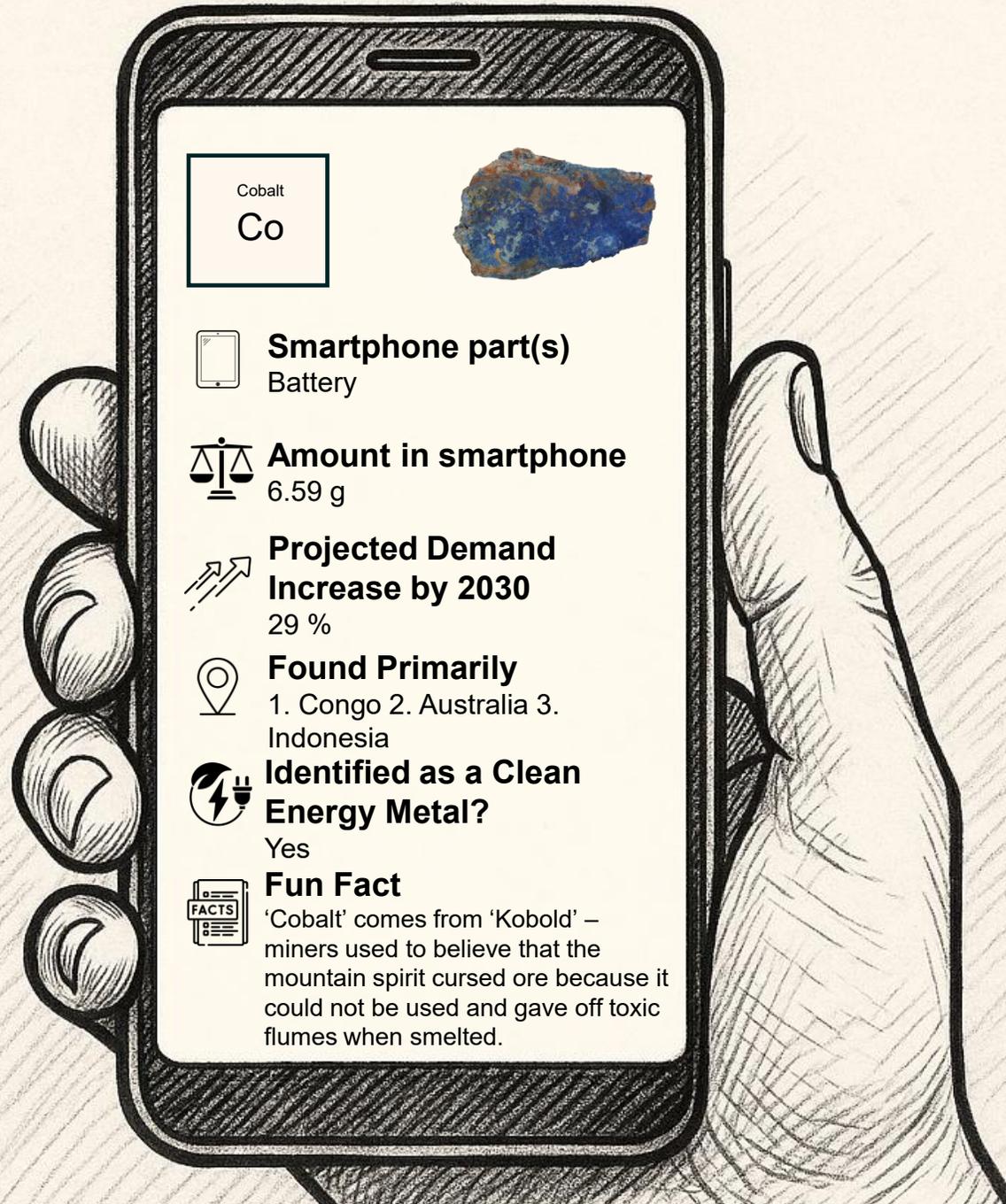
Identified as a Clean Energy Metal?
Yes



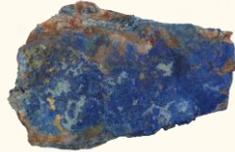
Fun Fact
The consumption of no metallic element has accelerated as fast as lithium.

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Overview





Cobalt
Co



Smartphone part(s)
Battery



Amount in smartphone
6.59 g



Projected Demand Increase by 2030
29 %



Found Primarily
1. Congo 2. Australia 3. Indonesia



Identified as a Clean Energy Metal?
Yes

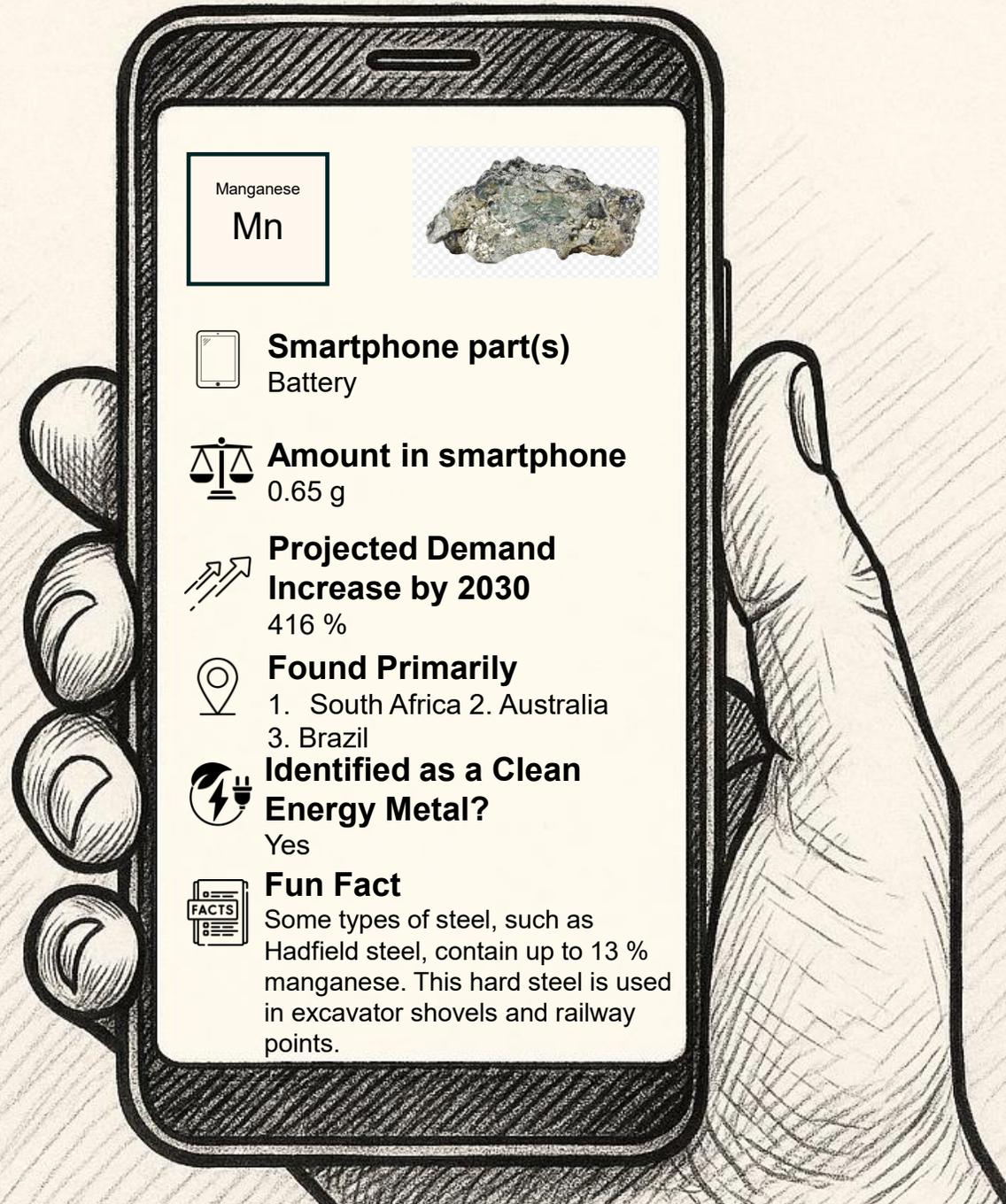


Fun Fact
'Cobalt' comes from 'Kobold' – miners used to believe that the mountain spirit cursed ore because it could not be used and gave off toxic fumes when smelted.

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Overview



Manganese



Manganese
Mn



 **Smartphone part(s)**
Battery

 **Amount in smartphone**
0.65 g

 **Projected Demand Increase by 2030**
416 %

 **Found Primarily**
1. South Africa 2. Australia
3. Brazil

 **Identified as a Clean Energy Metal?**
Yes

 **Fun Fact**
Some types of steel, such as Hadfield steel, contain up to 13 % manganese. This hard steel is used in excavator shovels and railway points.

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Praseodymium



Praseodymium
Pr



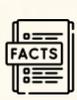
 **Smartphone part(s)**
Speakers, Microphones

 **Amount in smartphone**
N/A

 **Projected Demand Increase by 2030**
195 %

 **Found Primarily**
1. China 2. Vietnam
3. Brazil

 **Identified as a Clean Energy Metal?**
Yes

 **Fun Fact**
It is combined with neodymium to create powerful magnets used in wind turbines, and it gives glass a bright green or yellow tint, as found in sunglasses and welding visors.

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Replacing an intact smartphone

¹ Click here to find out why is it important to extend the life of a smartphone?



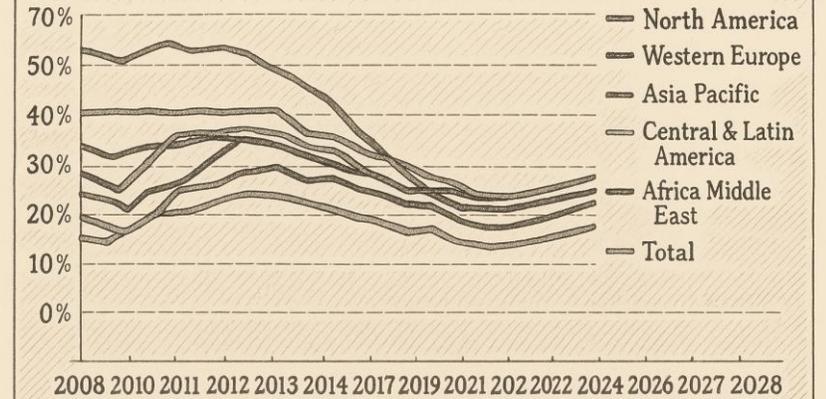
The smartphone replacement cycle in the US has extended to 2.6 years in 2025

After declining at the beginning of the 2010s, the average selling price has been rising again since 2016, thus offsetting the falling sales figures.

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Global Smartphone Replacement Rate by Region:



In 2011, the replacement rate was about 66 %. This means that two-thirds were replaced, so the average usage time was 1.5 years.

Extending the life of a smartphone

¹ Click here to see how high Recycling rates are 

Why is it important to extend the life of a smartphone?

The longer a technical product remains in use, the more sustainable it becomes.

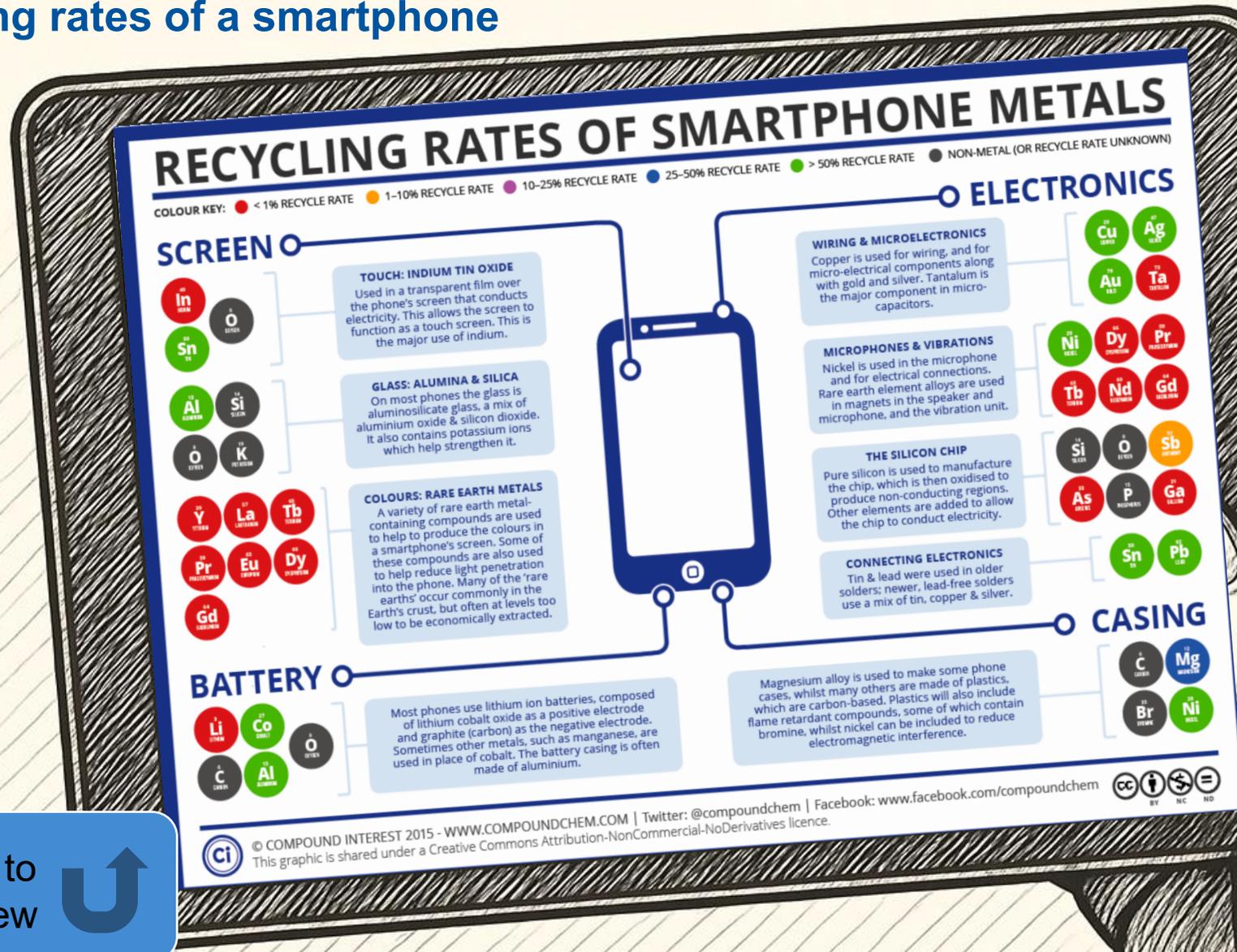


Political initiatives in the EU

-  Strengthen consumer rights
-  Establish European standards for devices.
-  Provide knowledge about device maintenance and repair.
-  Provide financial incentives for repairs.
-  Make repair services accessible.
-  A clear distinction between contracts and devices, as well as innovative bonuses for contract extensions, such as battery or display replacement.

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Recycling rates of a smartphone

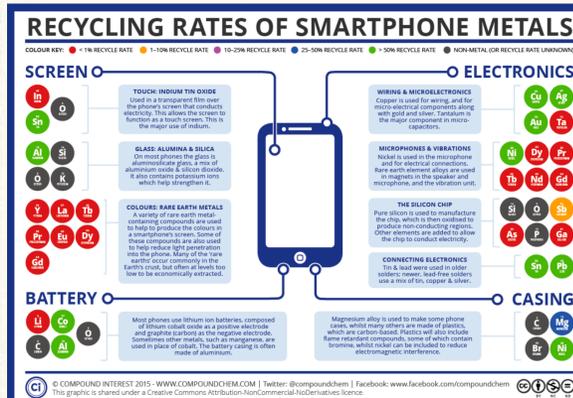


1 Click here to know why this low recycling rates are a problem 

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Challenges

The problem of low recycling rates



- Most metals in smartphones are not recycled at the end of their life cycle.
- Rare earths have a recycling rate of less than 1%, despite their high relevance.
- Main problems: lack of return, inefficient processes and economic barriers.
- Smartphones are considered unused 'urban mines' with high raw material potential.
- Growing scarcity is likely to drive innovation in recycling technologies.

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Key takeaways



A smartphone is a global product – its materials come from nearly every continent.



More **than 50 metals** are hidden in a device weighing just 110 g.



Recycling rates for many Metals are below 1 %, especially rare earths.



Extend device lifespans – keeping devices longer in use reduces resource demand.



Return old devices – they are valuable urban mines.