

Futu

Future availability
of secondary
raw materials

RaM

Current and future supply and demand of
Critical raw Materials of discarded products,
industrial residues, and demolished
infrastructure across Europe

Dr. Kees Baldé

17th June 2026 – Metals Recycling Track



**Funded by
the European Union**



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
**State Secretariat for Education,
Research and Innovation SERI**

EU Framework Programmes



**UK Research
and Innovation**



unitar
United Nations Institute for Training and Research

Sustainable Cycles (SCYCLE) Programme



Funding



Horizon Europe



**Funded by
the European Union**

Swiss Government



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,
Education and Research EAER
**State Secretariat for Education,
Research and Innovation SERI**

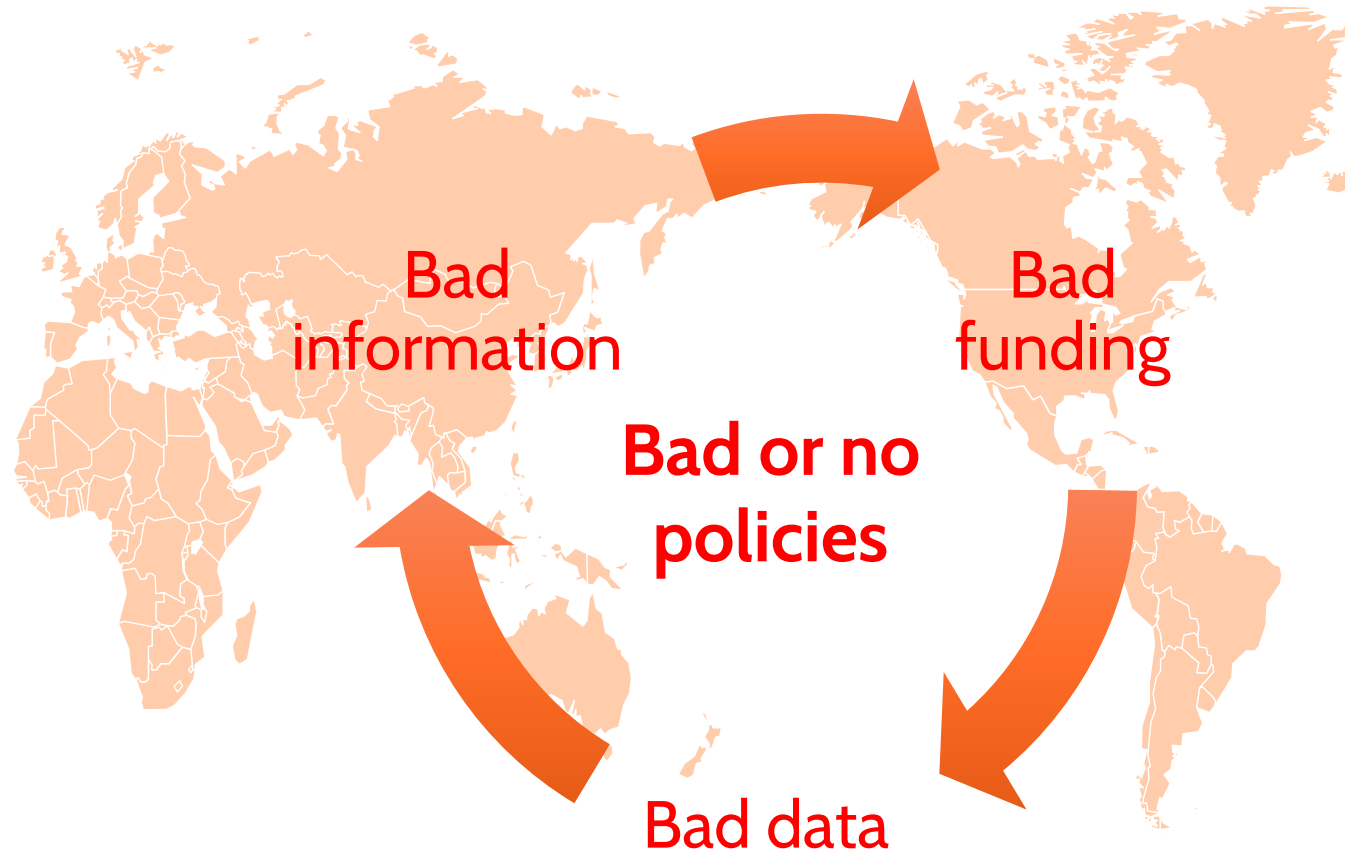
EU Framework Programmes

UK Government

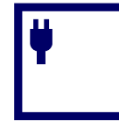


**UK Research
and Innovation**

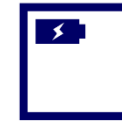
Need for Data



42 Critical Raw Materials were mapped in six waste streams



WEEE



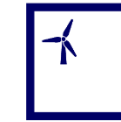
Batteries



Vehicles



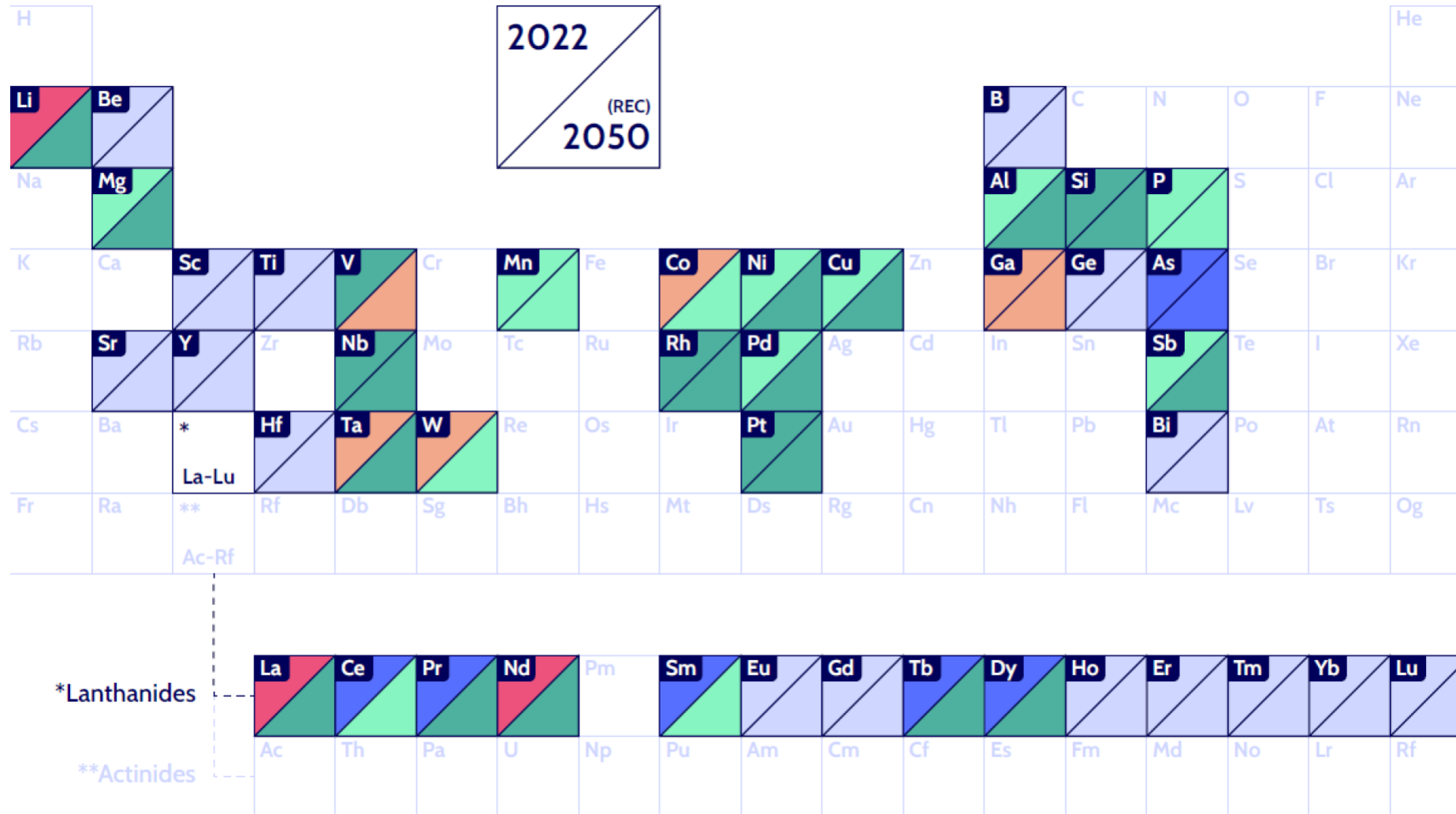
Demolition



Wind
Turbines



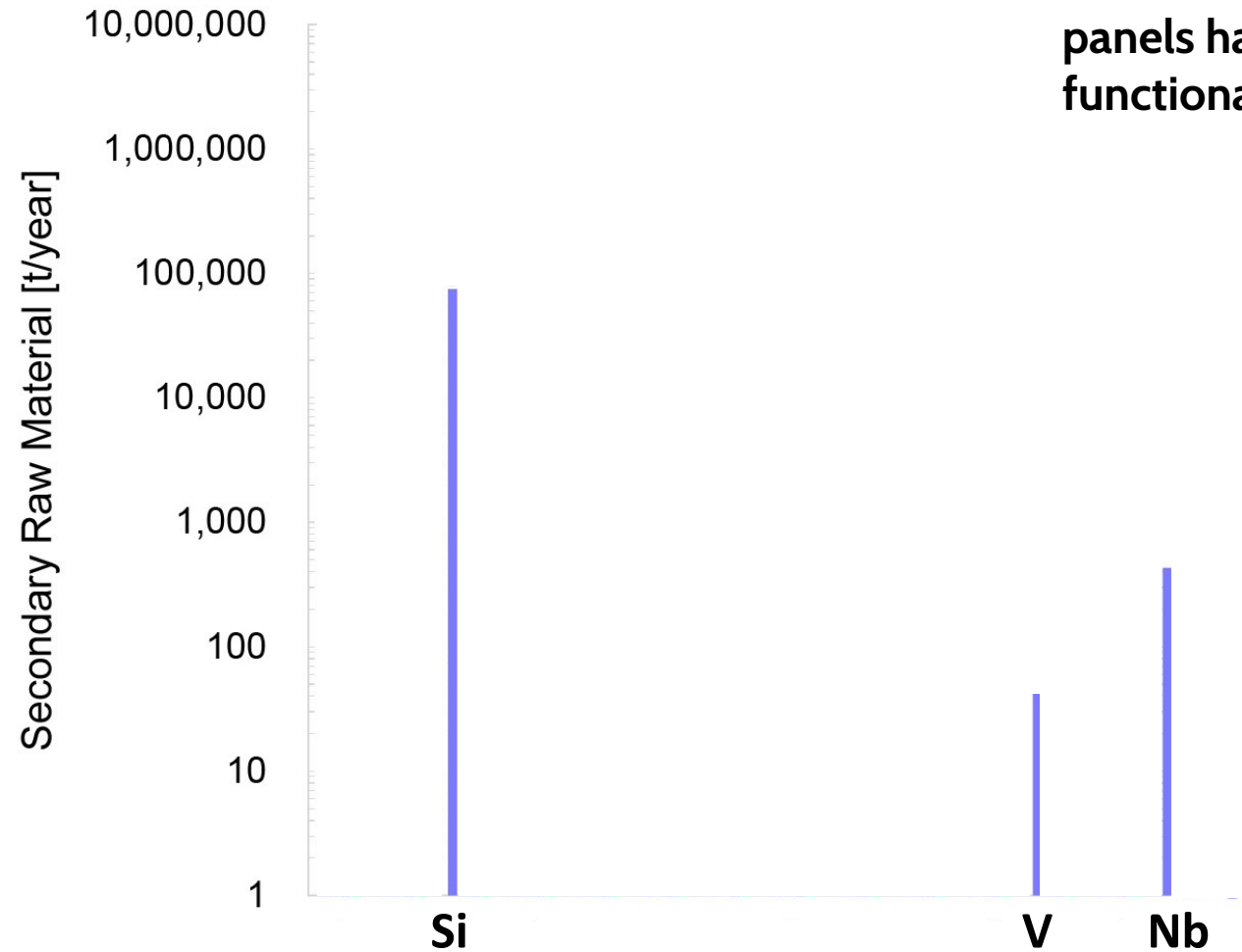
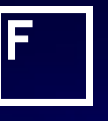
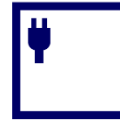
Slags &
Ashes



Critical Raw Materials - 2022

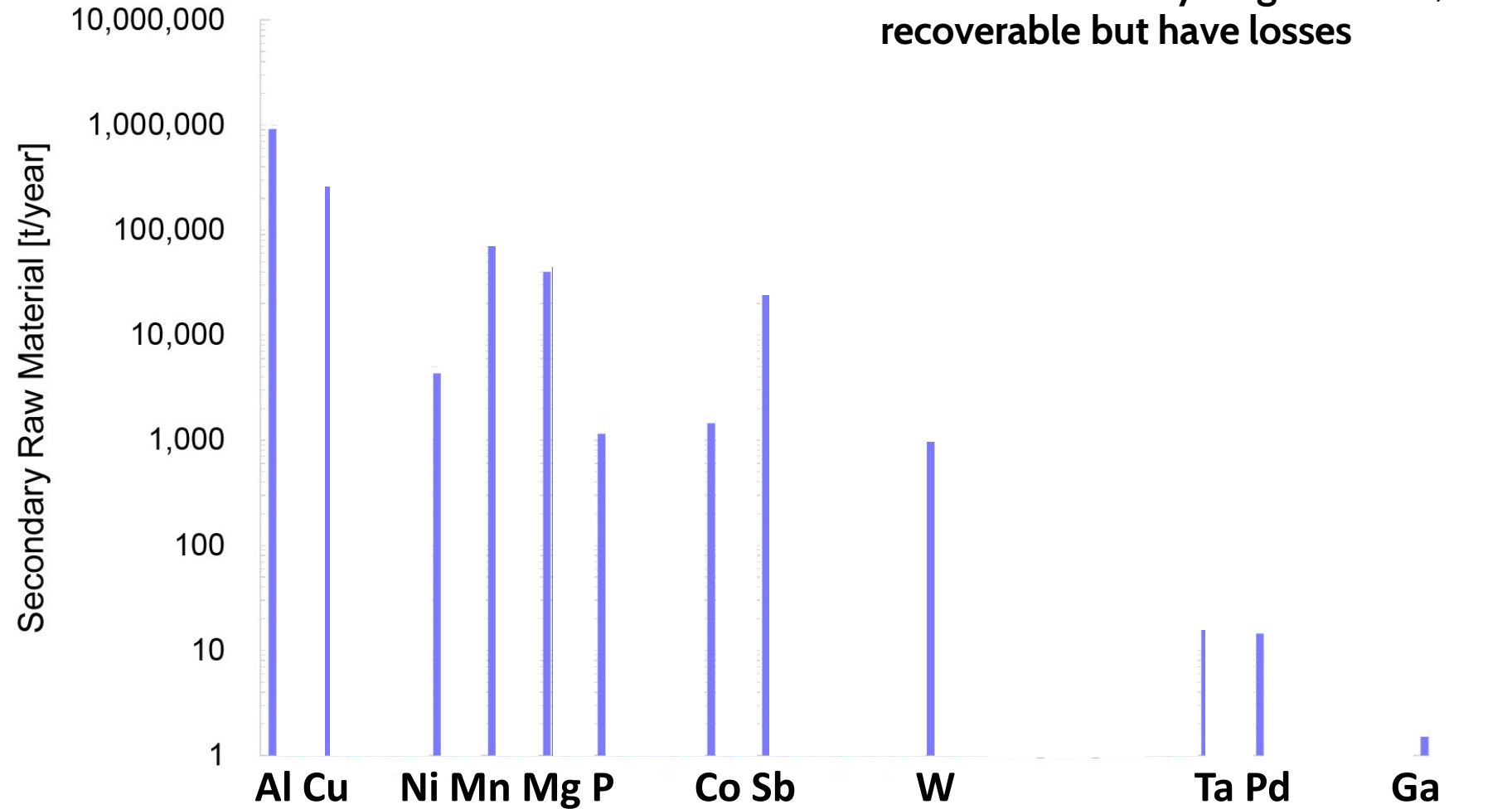
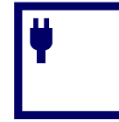


Critical Raw Materials - 2022

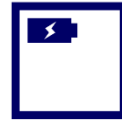
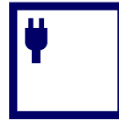


3 CRMs found in steel, and photovoltaic panels have high collection rates but no functional recovery

Critical Raw Materials - 2022

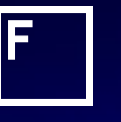
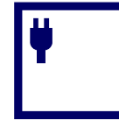


Critical Raw Materials - 2022

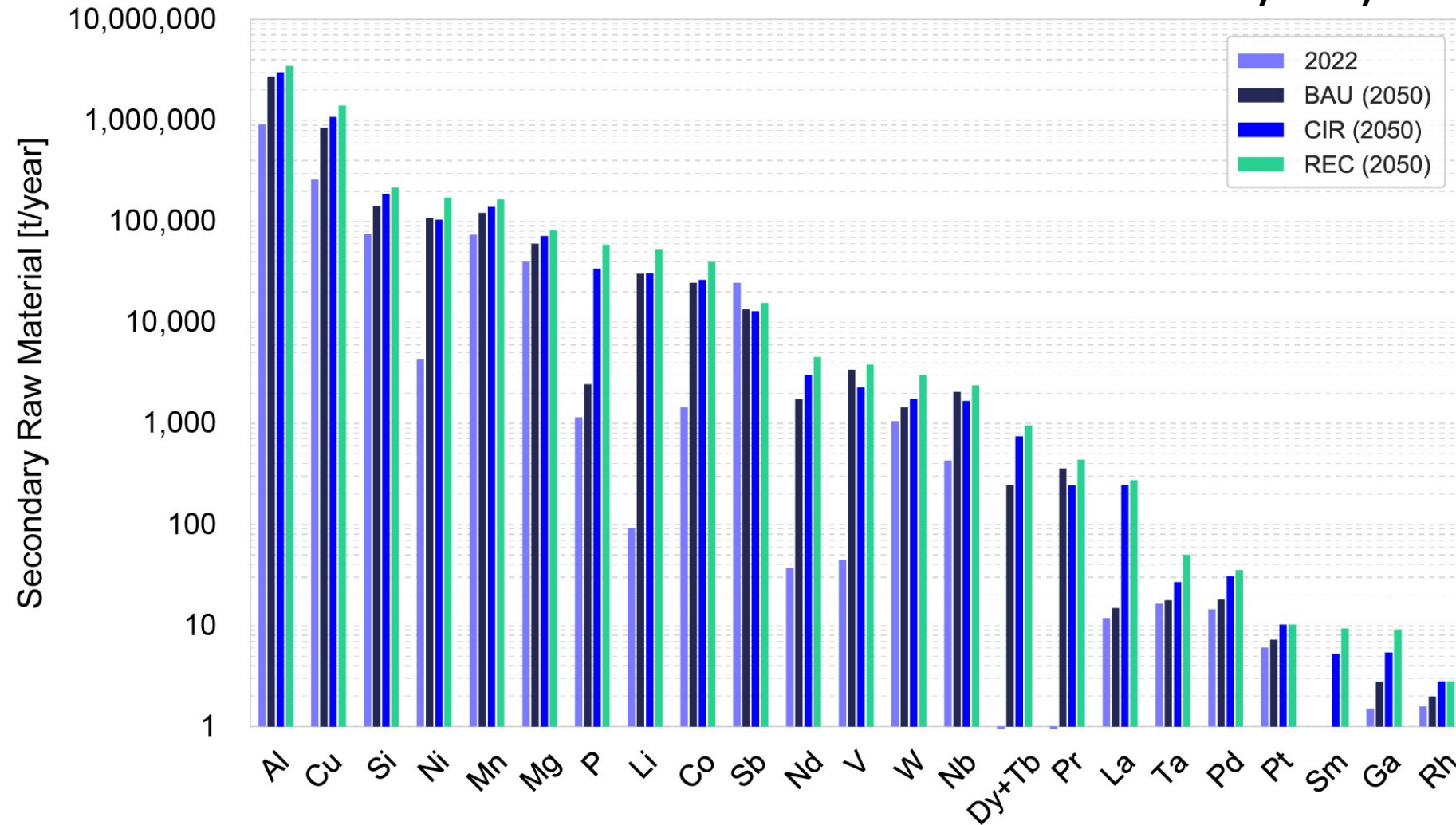


25 CRMs have no, or limited recovery to date, such as rare earth metals

Critical Raw Materials - 2050



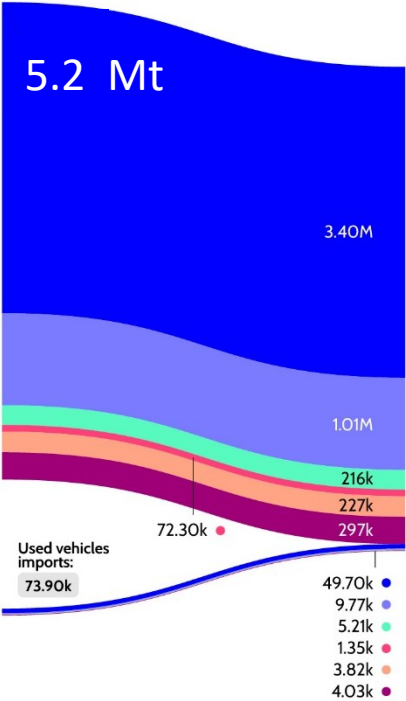
24 Critical Raw Materials have recovery >1t by 2050



CRMs in EU27, UK, NO, CH, IS – 2022



Placed on Market

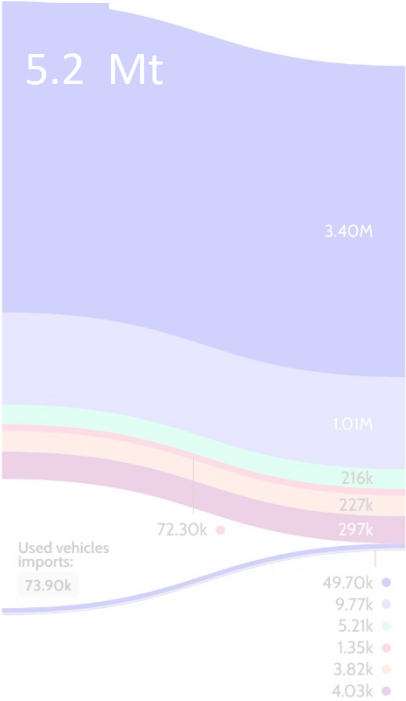


- Aluminium (Al)
- Copper (Cu)
- Manganese (Mn)
- Nickel (Ni)
- Other
- Silicium (Si)

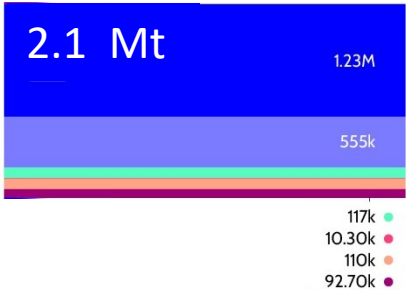
CRMs in EU27, UK, NO, CH, IS – 2022



Placed on Market



Waste Generation

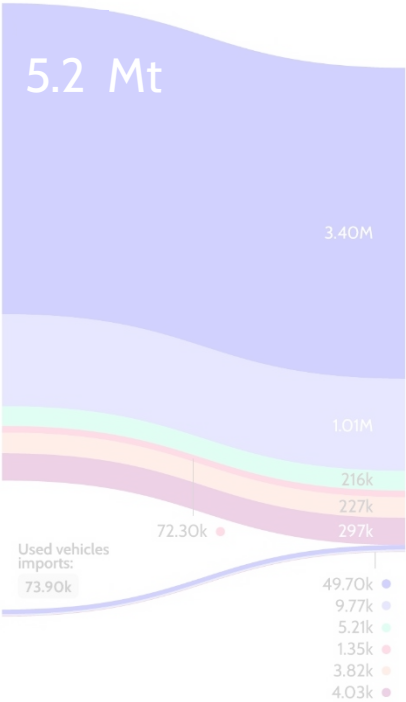


- Aluminium (Al)
- Copper (Cu)
- Manganese (Mn)
- Nickel (Ni)
- Other
- Silicium (Si)

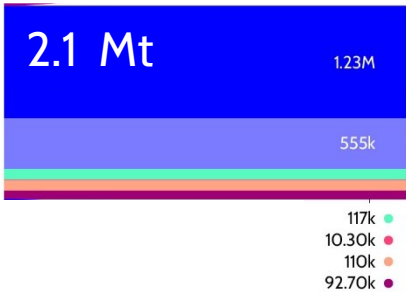
CRMs in EU27, UK, NO, CH, IS – 2022



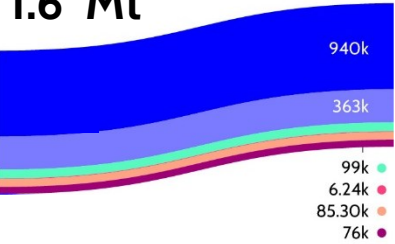
Placed on Market



Waste Generation



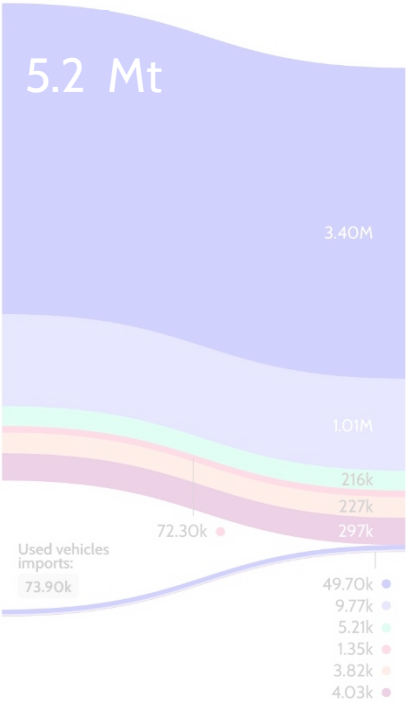
Waste Collected



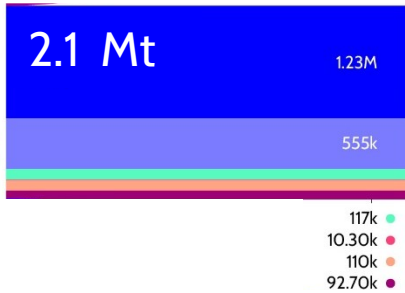
CRMs in EU27, UK, NO, CH, IS – 2022



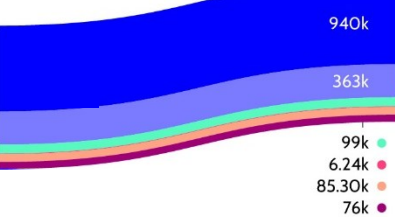
Placed on Market



Waste Generation



Waste Collected



Al	908k
Cu	254k
Mn	78k
Ni	4.31k
Other e.g. Mg, Mn, P, Sb, V, Ti, Nb, Pd, Pt, Rh	68.90k
Si	74.60k

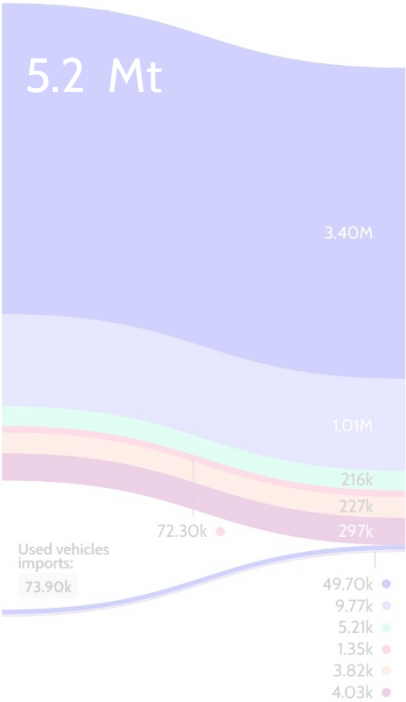
**Secondary
Raw
Materials
1.4 Mt**



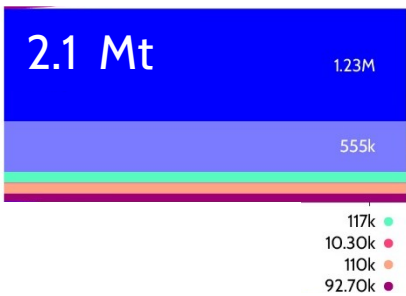
CRMs in EU27, UK, NO, CH, IS – 2022



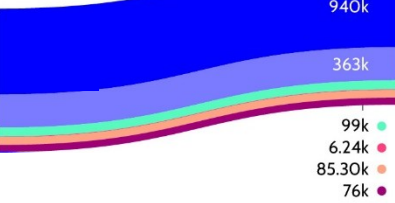
Placed on Market



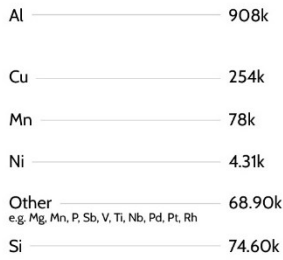
Waste Generation



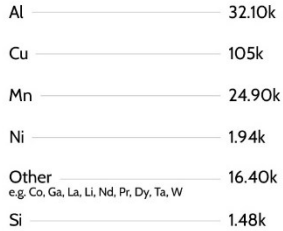
Waste Collected



Secondary Raw Materials



Waste treatment losses



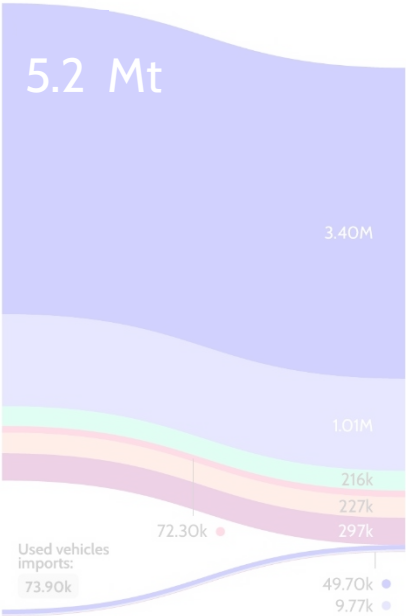
All rare earth elements



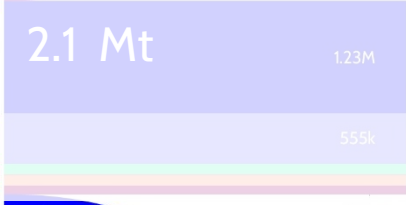
CRMs in EU27, UK, NO, CH, IS – 2022



Placed on Market

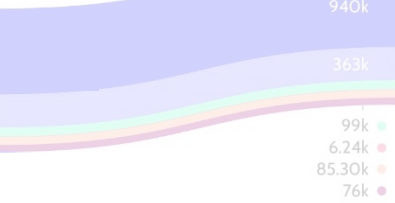


Waste Generation



0.2 Mt
Export used
vehicles +
batteries

Waste Collected



Al	908k
Cu	254k
Mn	78k
Ni	4.31k
Other e.g. Mg, Mn, P, Sb, V, Ti, Nb, Pd, Pt, Rh	68.90k
Si	74.60k

Secondary
Raw
Materials
1.4 Mt

Al	32.10k
Cu	105k
Mn	24.90k
Ni	1.94k
Other e.g. Co, Ga, La, Li, Nd, Pr, Dy, Ta, W	16.40k
Si	1.48k

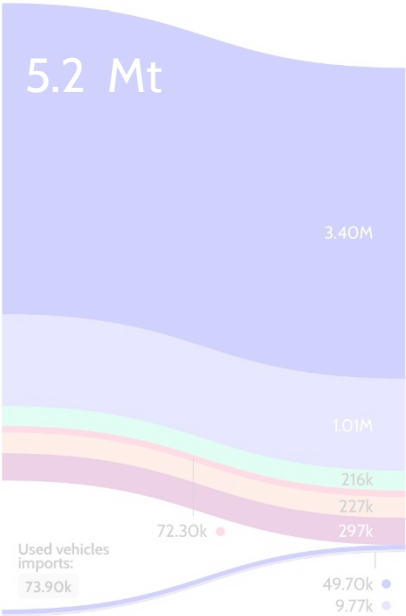
Waste
treatment
losses
0.2 Mt

- Aluminium (Al)
- Copper (Cu)
- Manganese (Mn)
- Nickel (Ni)
- Other
- Silicium (Si)

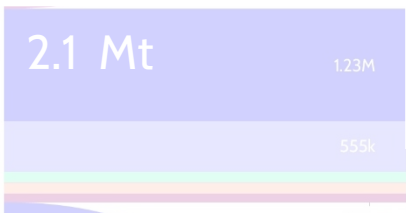
CRMs in EU27, UK, NO, CH, IS – 2022



Placed on Market

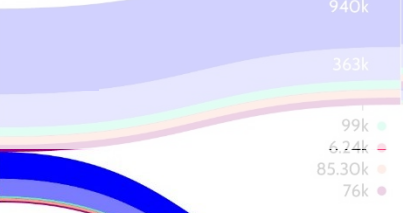


Waste Generation

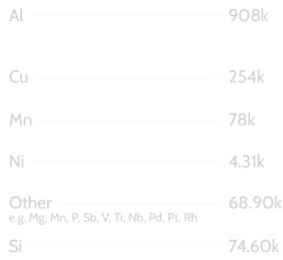


0.2 Mt
Export used
vehicles +
batteries

Waste Collected



0.5 Mt
Waste not
Collected



Secondary
Raw
Materials
1.4 Mt



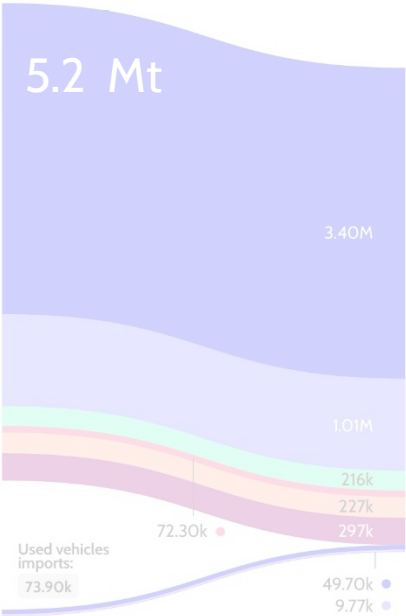
Waste
treatment
losses
0.2 Mt



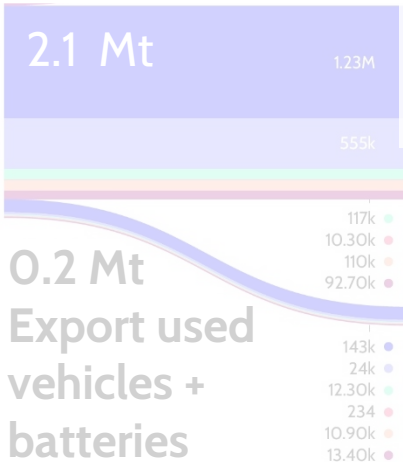
CRMs in EU27, UK, NO, CH, IS – 2022



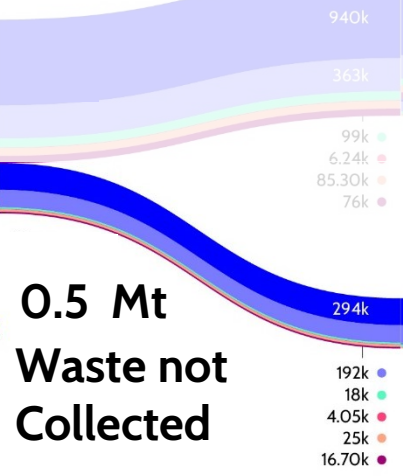
Placed on Market



Waste Generation



Waste Collected



Al	908k
Cu	254k
Mn	78k
Ni	4.31k
Other e.g. Mg, P, Sb, V, Ti, Nb, Pd, Pt, Rh	68.90k
Si	74.60k

Secondary
Raw
Materials
1.4 Mt

Al	32.10k
Cu	105k
Mn	24.90k
Ni	1.94k
Other e.g. Co, Ga, La, Li, Nd, Pr, Dy, Ta, W	16.40k
Si	1.48k

Waste
treatment
losses
0.2 Mt

Al	293k
Cu	192k
Mn	17.90k
Ni	3.87k
Other	24.30k
Si	16.70k

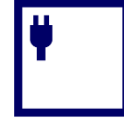
Non
compliant
0.5 Mt
(>80%
WEEE)

Al	213
Cu	311
Mn	120
Ni	184
Other	631

Used EEE &
embedded
battery
exports
2 kt



CRMs Over Lifecycle (Mt)



Placed
on the market

2022

5.2

CRMs Over Lifecycle (Mt)



Placed
on the market



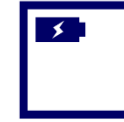
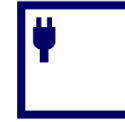
Waste
Generated

2022

5.2

2.1

CRMs Over Lifecycle (Mt)



Placed
on the market



Waste
Generated



Not collected
nor Recovered

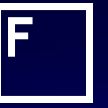
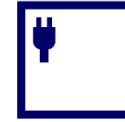
2022

5.2

2.1

0.7

CRMs Over Lifecycle (Mt)



Placed
on the market



Waste
Generated



Not collected
nor Recovered



Secondary
raw materials*

2022

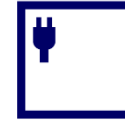
5.2

2.1

0.7

1.4

Substitution Potential



Placed
on the market



Waste
Generated



Not collected
nor Recovered



Secondary
raw materials*

2022

5.2

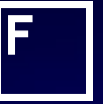
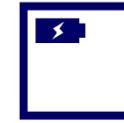
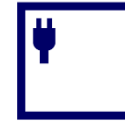
2.1

0.7

1.4

Up to **27%**

Substitution Potential



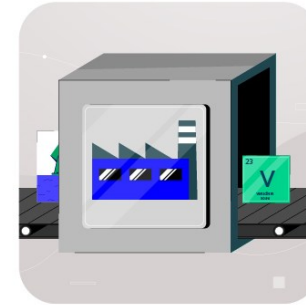
Placed
on the market



Waste
Generated



Not collected
nor Recovered



Secondary
raw materials*

2022

5.2

2.1

0.7

1.4

Up to **27%**

2050 BAU

12.2

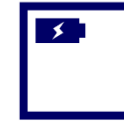
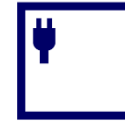
6.4

2.3

4.1

Up to **33%**

Substitution Potential



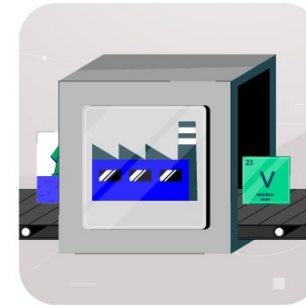
Placed
on the market



Waste
Generated



Not collected
nor Recovered



Secondary
raw materials*

2022

5.2

2.1

0.7

1.4

Up to **27%**

2050 BAU

12.2

6.4

2.3

4.1

Up to **33%**

2050 REC

12.2

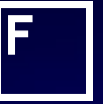
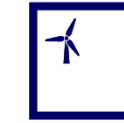
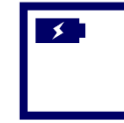
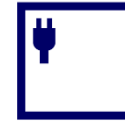
6.4

0.7

5.7

Up to **47%**

Substitution Potential



Placed
on the market



Waste
Generated



Not collected
nor Recovered

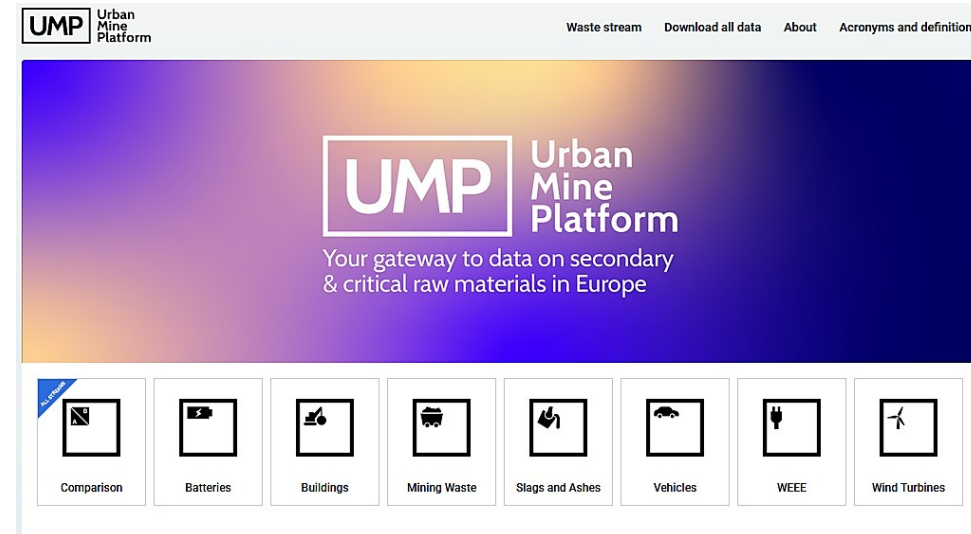


Secondary
raw materials*

2022	5.2	2.1	0.7	1.4	Up to 27%
2050 CIR	8.4	5.2	0.5	4.7	Up to 56%
2050 BAU	12.2	6.4	2.3	4.1	Up to 33%
2050 REC	12.2	6.4	0.7	5.7	Up to 47%

Urban Mine Platform

- Evolution of produced in the **ProSUM project (2017)**
- **Evolution to :**
 - 7 Waste streams
 - 31 Countries: EU27+4
 - 2010 to 2050 (3 three scenarios)
- **Access to clear and structured data:**
 - Secondary raw materials
 - Strategic and critical raw materials
- **Features:**
 - Interactive graphics data from the UMP database to the charts and fact sheets
 - Data download – All data (FutuRaM Zenodo); Selected data from graphs



Urban Mine Platform: Mining wastes



- Mining waste sites: georeferenced => **interactive map**
- Capitalised in the **European Mineral Resource Database MIN4EU** (primary and secondary)
- Contents accessible on **UMP** are **automatically updated**

Mining Waste ▾

Country ▾ Waste type ▾ Inspire commodity ▾ apply [reset filters](#)

Map of historical mining waste sites by waste type in Europe

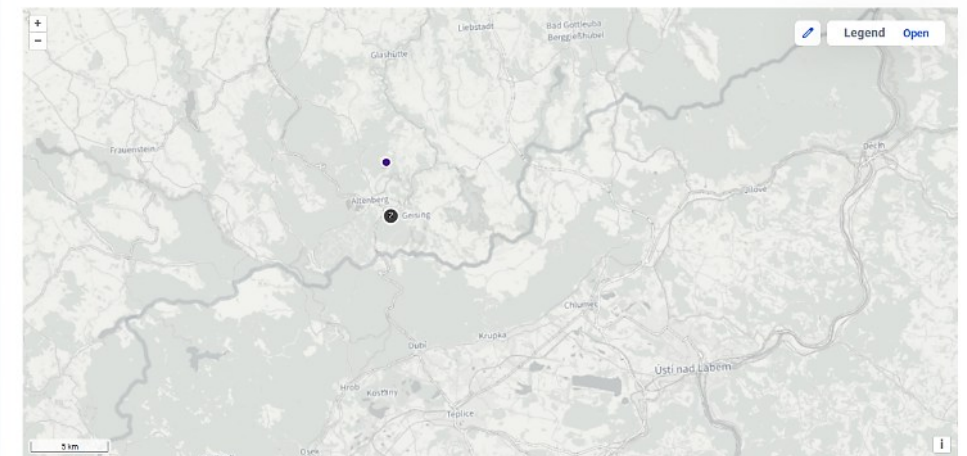
[download all data](#)



This interactive map presents selected mining waste sites in Europe. Several countries do not present ore grade data or do not have significant historical mining activity. The data is collected and capitalised through a joint activity by FutuRaM and GSEU projects ([Geological Service for Europe](#)). [Read more](#)

Map of historical mining waste sites by waste type in Europe

[download all data](#)



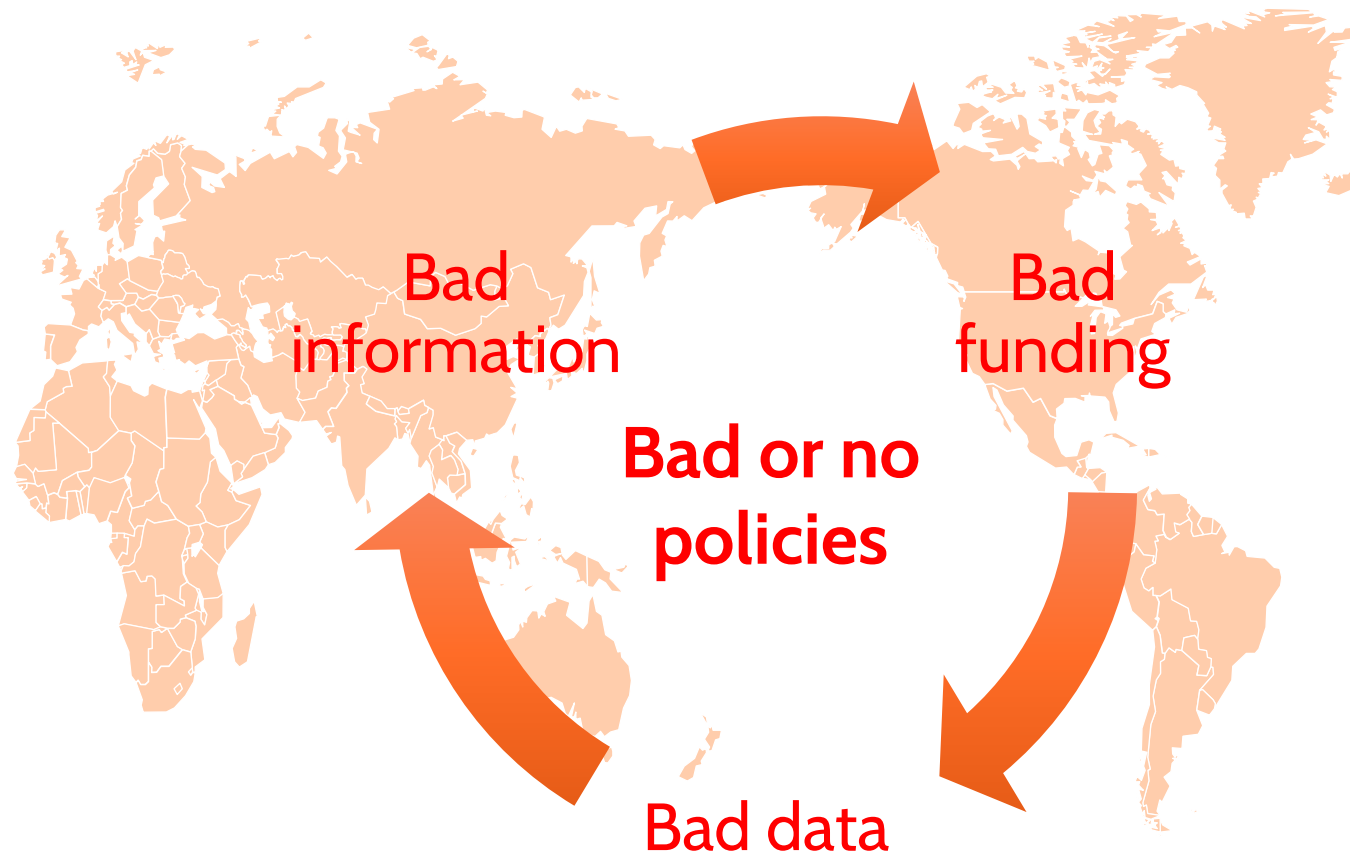
☒ Hide empty data (27 of 40 fields displayed)

[CSV](#) [JSON](#) [Expand table](#)

ry	inspire_commodity	commodity_portal	uomamount	uomgrade	min_commodity_amount	max_commodity_amount	mingrade	maxgrade	miningwast
any	Tin (metal)	Tin	t	ppm	22840	22840	1420	1420	non compli
	Lithium (metal)	Lithium	t	ppm	11000	11000	680	680	non compli
	Molybdenum (metal)	Molybdenum		ppm			0	100	non compli
	Bismuth (metal)	Bismuth		ppm			0	200	non compli

This interactive map presents selected mining waste sites in Europe. Several countries do not present ore grade data or do not have significant historical mining activity. The data is collected and capitalised through a joint activity by FutuRaM and GSEU projects ([Geological Service for Europe](#)). [Read more](#)

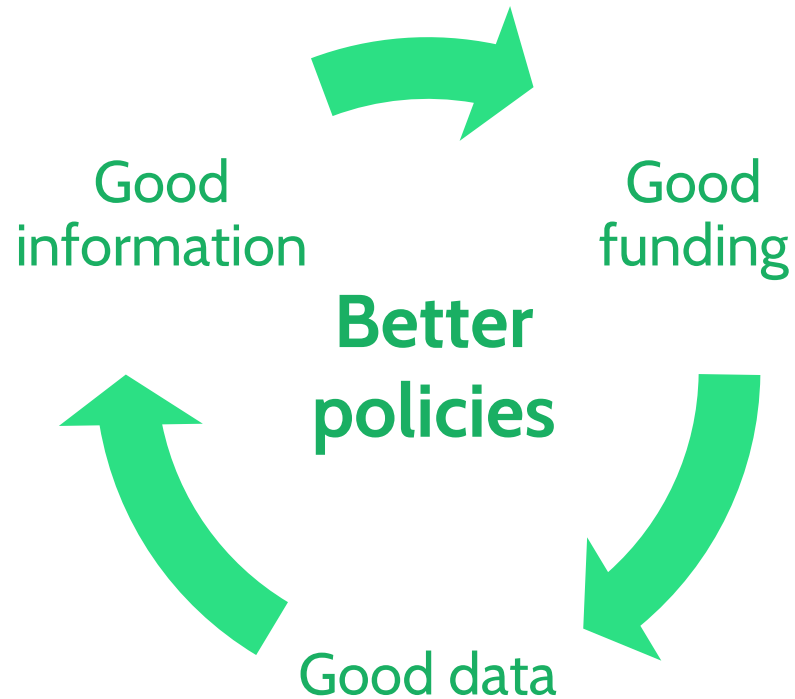






Let's continue exploring the urban mine

Wrap up



- Huge potential:
 - Up to 24 CRMs could be sourced from the seven waste streams covered
 - Cater up to 56% of CRM demand by 2050
- Visit the Final Report from FutuRaM: [FutuRaM Project Final Report](#) and the [Urban Mine Platform](#)
- Contact: balde@unitar.org