FutuRam – Securing the supply of secondary & critical raw materials in the EU

FutuRaM

Future availability of secondary raw materials

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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

Funded by the European Union

SGU Geological Survey of Sweden

FutuRaM project: Overview

FutuRaM
Future availability of secondary raw materials

- *Horizon Europe, Research & Innovation project*
- *4 years duration (started June 2022)*
- *29 partners from 11 countries*

Partners

- *WEEE Forum*
- *Unitar*
- *University of Leiden*
- *EMPA*
- *BRGM*
- *SGU*
- *GTK*
- *GeoZS*
- *BGR*
- *UCL*
- *Vito*
- *SPI*
- *Ludwig Maximilian University of Munich*
- *Boliden Mineral*
- *TU Berlin - Fraunhofer*
- *Chalmers*
- *University of Belgrade*
- *Weeecycling*
- *Lovisagruvan*
- *Duncan Kushnir*
- *Recharge*

Objectives

- *To plan and map the supply of critical metals obtained from recycling of six waste streams.*
- *The FutuRaM project expands the knowledge about potential stocks of secondary raw materials (from recycling) in the European Union, with particular emphasis on critical raw materials (CRM).*
- *The project investigates the current situation concerning the recycling of CRM in different waste streams, and the potential for further exploitation in the EU. The aim is to enable evidence-based decision-making for the recovery and use of secondary materials inside the EU, and to disseminate the data generated via an accessible database developed as part of the project.*

https://futuram.eu/
https://twitter.com/FuturamProject
https://www.linkedin.com/company/futuram-project/

FutuRaM focuses on six waste streams:

- *Batteries (BAT)*
- *electrical and electronic equipment (WEEE)*
- *Vehicles (ELV)*
- *mining waste (MINW)*
- *slag and ash (SLASH)*
- *construction and demolition waste (CDW)*

Example for e-waste

SRM: bulk metals, relevant plastic fractions,
CRM: LREE, HREE, Mg, Nb, Ge, B, Sc, Sr, Co, PGM, graphite

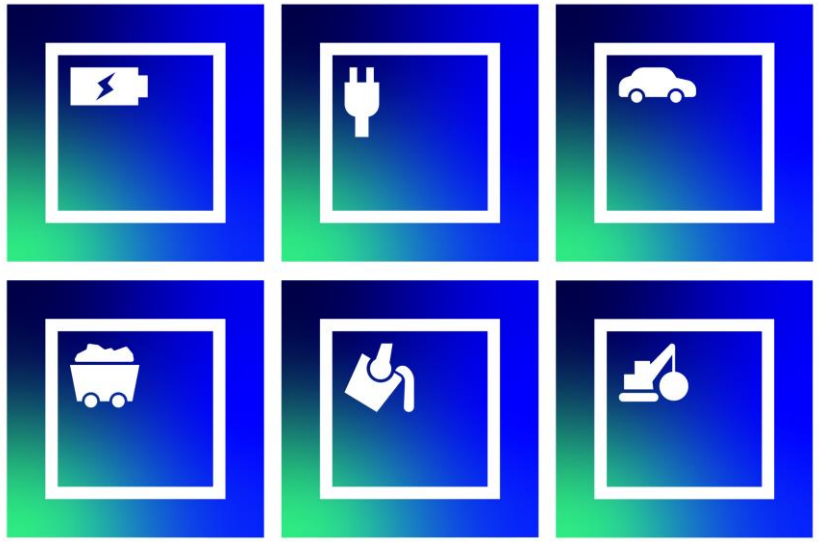
Expected results

- *Estimation of potential secondary raw material flows and stocks (methodology, reporting structure, and guidance) up to 2050 in the EU for batteries, vehicles, WEEE, mining waste, slag and ash, and construction waste.*

- *National accounting of the secondary resources produced from recycling.*

- *Dissemination of this information via a systematic and transparent Secondary Raw Materials Knowledge Base (SRM-KB) integrated with a pan-European overview of raw materials information systems such as RMIS or EGDI.*

- *Development of the UNFC methodology for assessing CRM recovery projects, with application to 15 case studies.*



8 Work Packages

WP1: *Conceptual and Methodological Development*

WP2: *Foresight on future SRMs demand and supply based on Circularity, Recoverability and Business-as-usual scenarios*

WP3: *Secondary Raw Material composition datasets for the six waste streams based on literature data, published datasets, and previously undisclosed in-situ datasets*

WP4: ***Stock and flow characterisation*** *(Consistent datasets in EU27+4 +Balkans on SRMs and CRMs found in the six waste streams)*

WP5: ***Secondary Raw Material availability assessment in alignment with the UNFC*** *(site-specific MINW case study will be used as a pilot study to test the applicability of the draft UNFC methodology approach)*

WP6: *Development of data information system for EU (Secondary Raw Material-Knowledge Base, SRM-KB)*

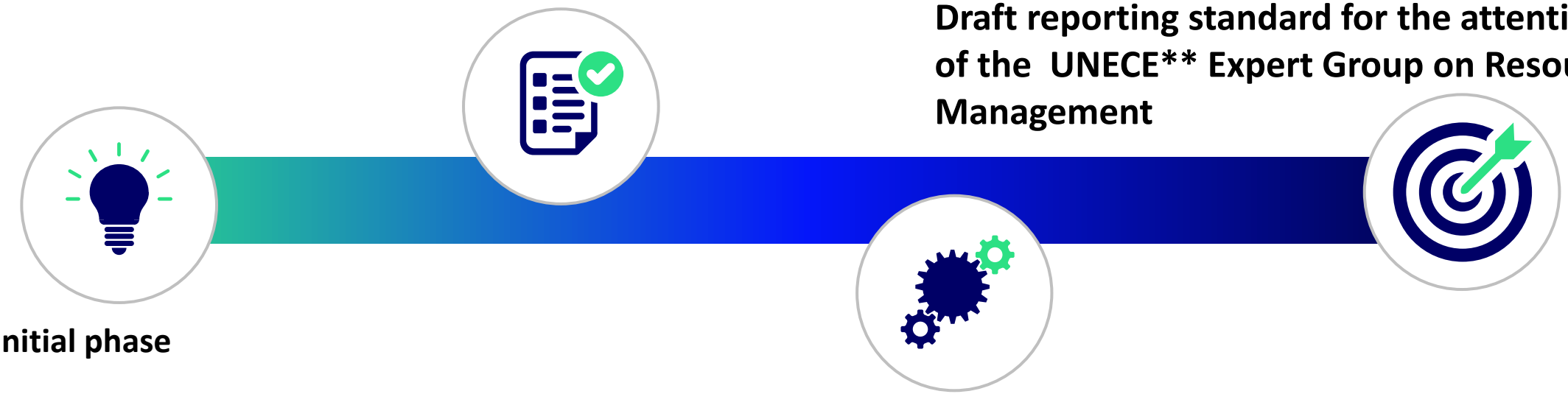
WP7: *Communication, Dissemination & Exploitation*

WP8: *Project Management*

FutuRaM & UNFC: Roadmap

Develop of a consistent procedure to assess and classify SRM recoverability in line with the UNFC*

Draft reporting standard for the attention of the UNECE Expert Group on Resource Management**

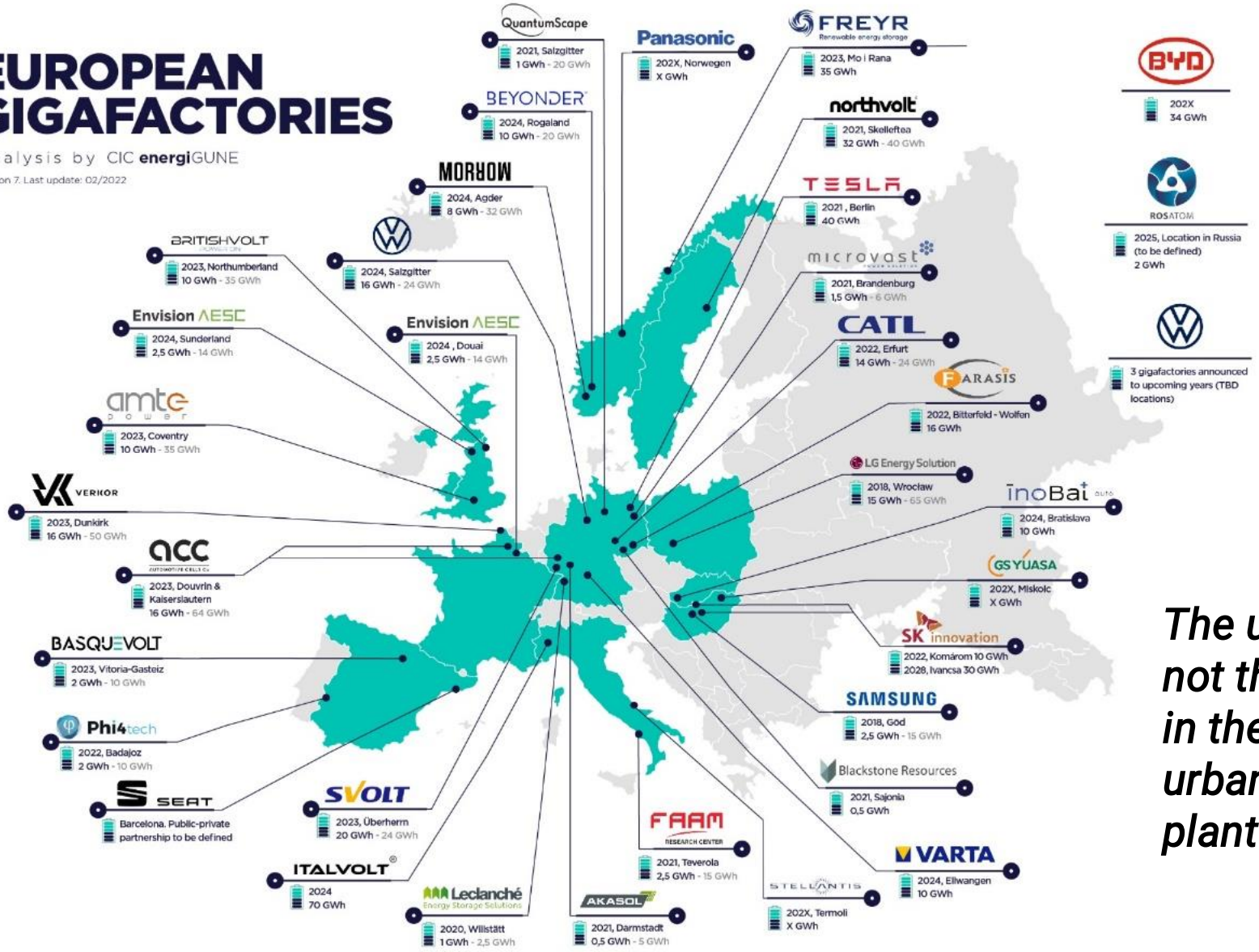


Initial phase

15 case studies to test, develop, validate and demonstrate the procedure in line with the UNFC

*UNFC: United Nations Framework Classification for Resources United Nations Framework Classification for Resources (UNFC) | UNECE
**UNECE: United Nations Economic Commission for Europe https://unece.org/

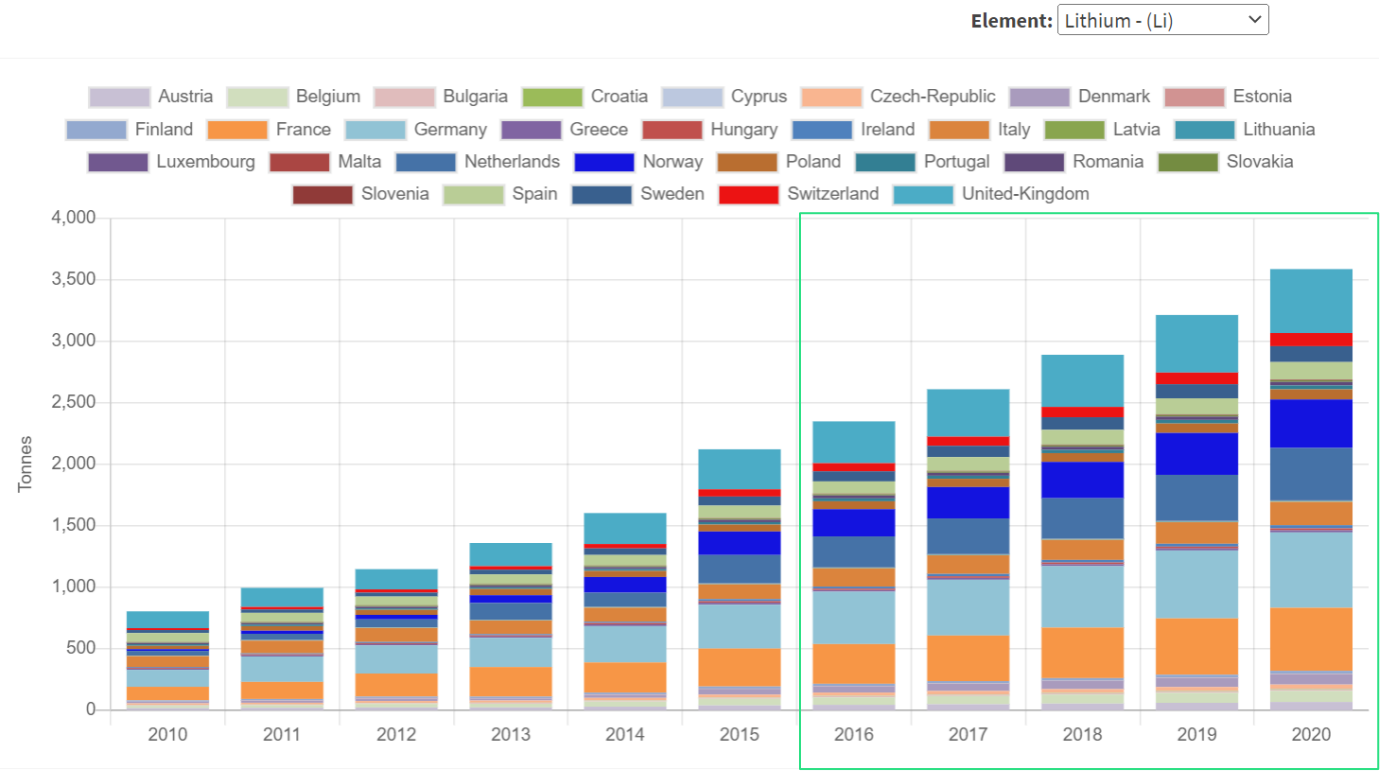
Map of recycling plants



The urban mine in fact is not the stock of materials in the anthroposphere. The urban mine is the recycling plant!

ProSUM – Urban Mine Platform

LITHIUM IN BATTERIES PUT IN THE MARKET IN EUROPE



Forecast

- ***3 main waste streams covered:***

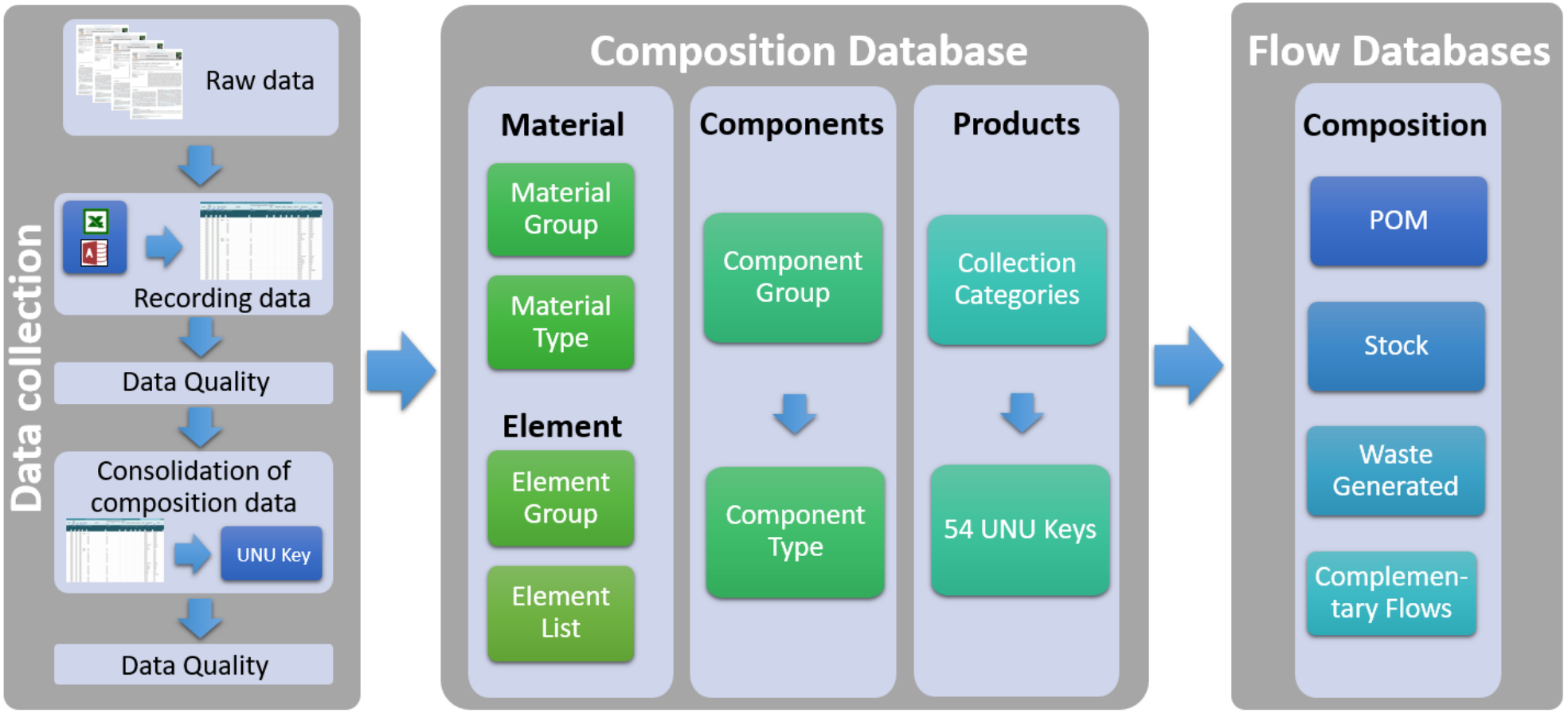
Batteries

Vehicles

WEEE

- ***Heterogeneity between inflows and outflows***
  - *Inflows in terms of products, product composition and substances present in products*
  - *Outflows (wastes)*

ProSUM Methodology for Batteries, ELV and WEEE



2000-now

- *Extend time series ProSUM method*
- *WEEE in cars*
- *WEEE in C&D*
- *Novel products relevant for low-carbon and circular economy transitions*

Future:

- *Methodological simplifications*
- *Extrapolations or setting stock constraints, remodel consumption*

M. A. Wagner, J. Huisman, A. N. Løvik, H. Habib, P. Mählitz, and E. van der Voet, "Methodology to prospect electronics compositions and flows, illustrated by material trends in printed circuit boards," *Journal of Cleaner Production*, vol. 307, p. 127164, Jul. 2021, doi: 10.1016/j.jclepro.2021.127164.

Mining Waste (MinW)

Data Collection
- Mining waste data: Eurostat: W12A, etc Data from Geological Surveys
- Data quality

Data modelling
- Data imputation and balancing
- Transfer coefficients per primary mining commodity

Compositions
- Mining commodity waste
- Elements
- Bulk materials

Flow database
- Yearly waste from mining flows

Tailings and waste rock from current and new mining activities

Data Collection
- National inventories (Geo Surveys)
- Historical production
- Data quality

Data modelling
- Data imputation and balancing
- Historical transfer coefficients

Compositions
- Selected Elements
- Materials

Flow database
- CRM stocks in landfilled SLASH

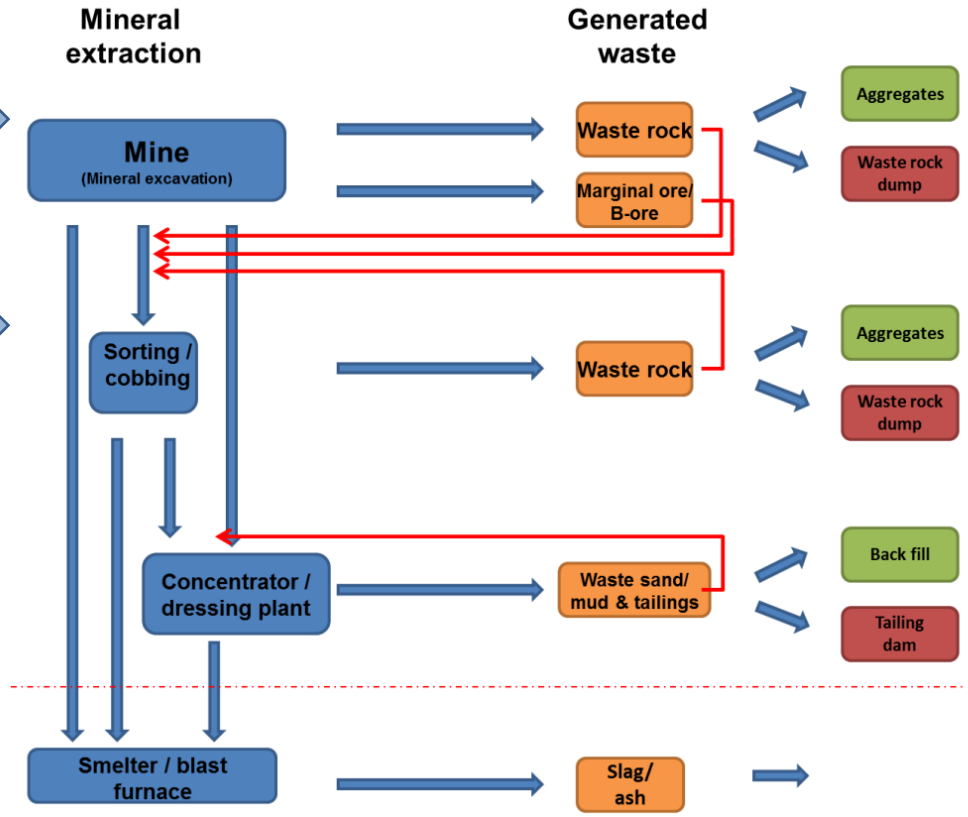
Tailing and waste rock stocks

Mining Waste Flow

Exploration	Mining	Remediation
Determine resource and matrix	Produced of economic extractable RM	Area is restored as agreed for after use

Permitting

Stakeholder dialogue



Mining Waste – case studies

Case

Håkansboda	*Sweden*	*Cu, Co, complex*	*Field visit, sampling for beneficiation test in autumn 2022, field work - spring 2023*
Lece tailings	*Serbia*	*In, Au,…*	*Planned for 2023*
Otanmäki	*Finland*	*Ilmenite (Ti)*	*Started, m3D model, drilling fall 2022*
Large tailings	*Sweden*	*Pb, Zn, F, Ba, Fe, REE, Co...*	*Drilling: autumn 2022, first results*
Salau	*France*	*W*	*Planned winter 2022/2023*

Tools

Exploration, recoverability, processes, stakeholder interactions

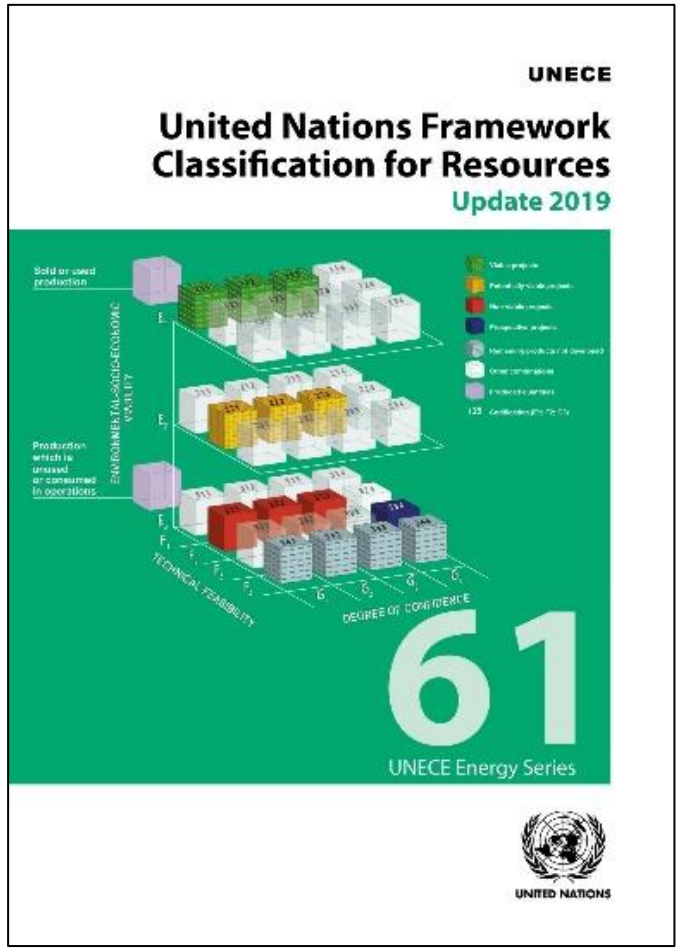
Aim

How to explore and extract the waste (technology, policy legislation, investments, environment, stakeholders)

UNFC

UNFC & Anthropogenic Resources

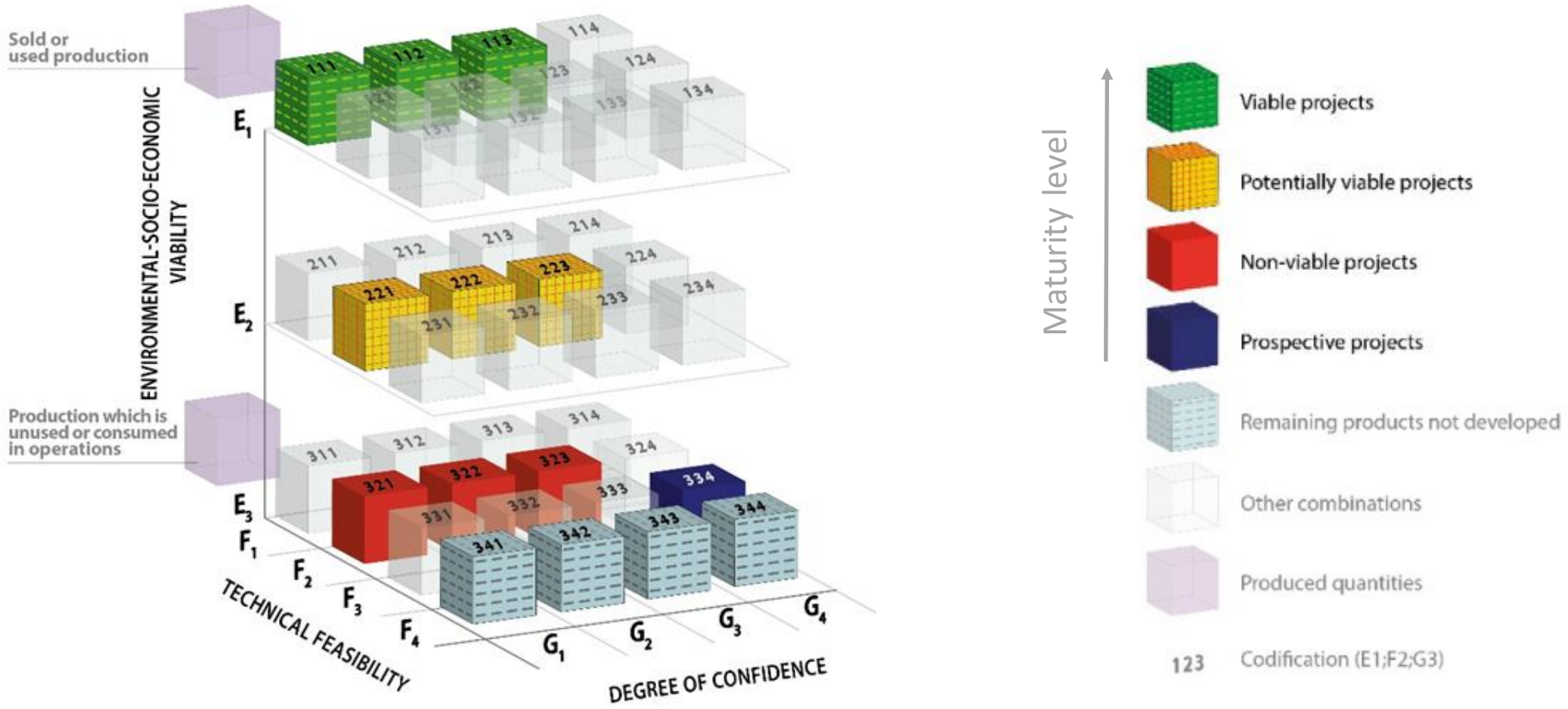
United Nations Framework Classification for Resources



*A global standard for **communicating recoverable quantities** based on the **maturity level of the recovery project***

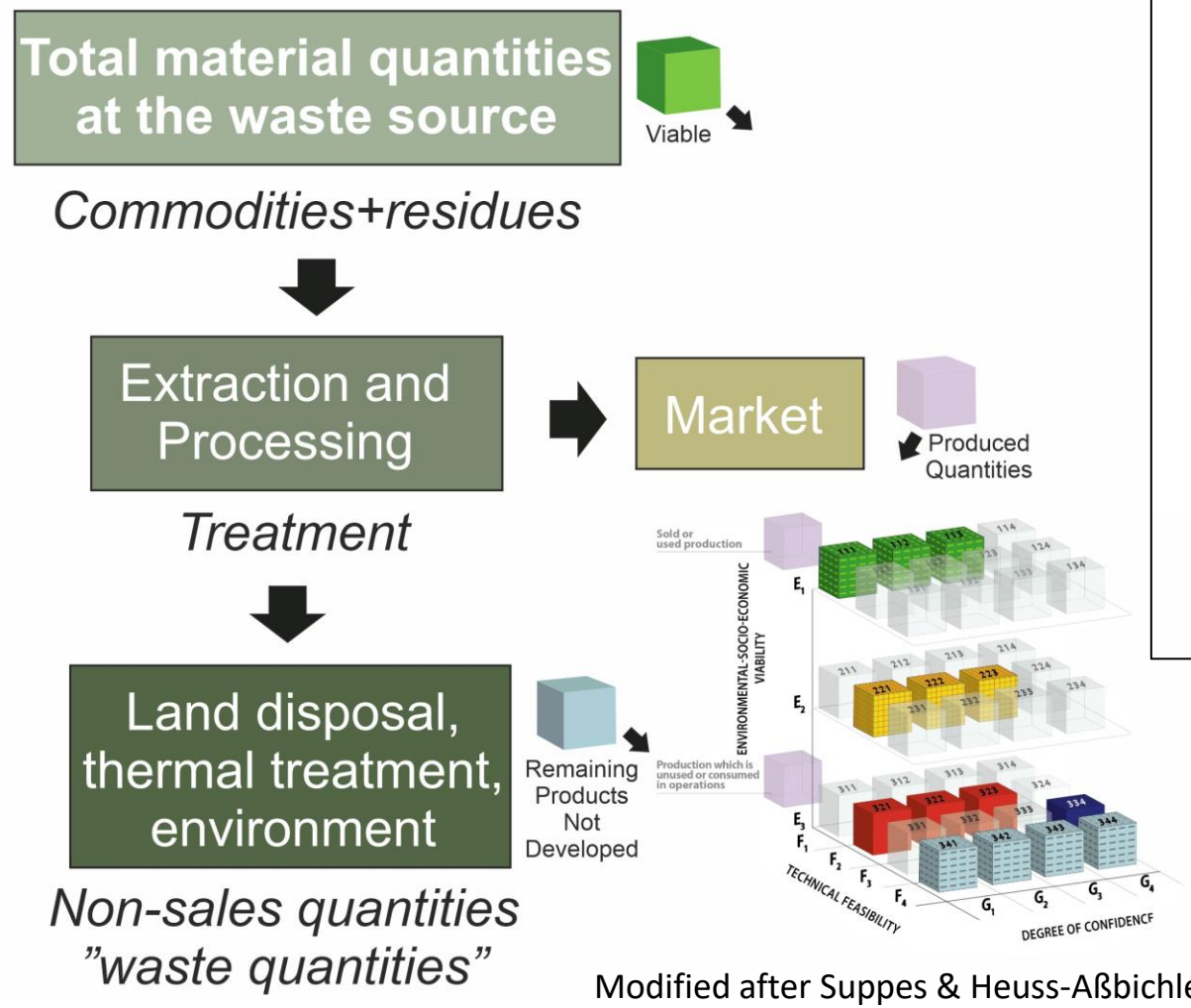
- *universally acceptable*
- *internationally applicable*

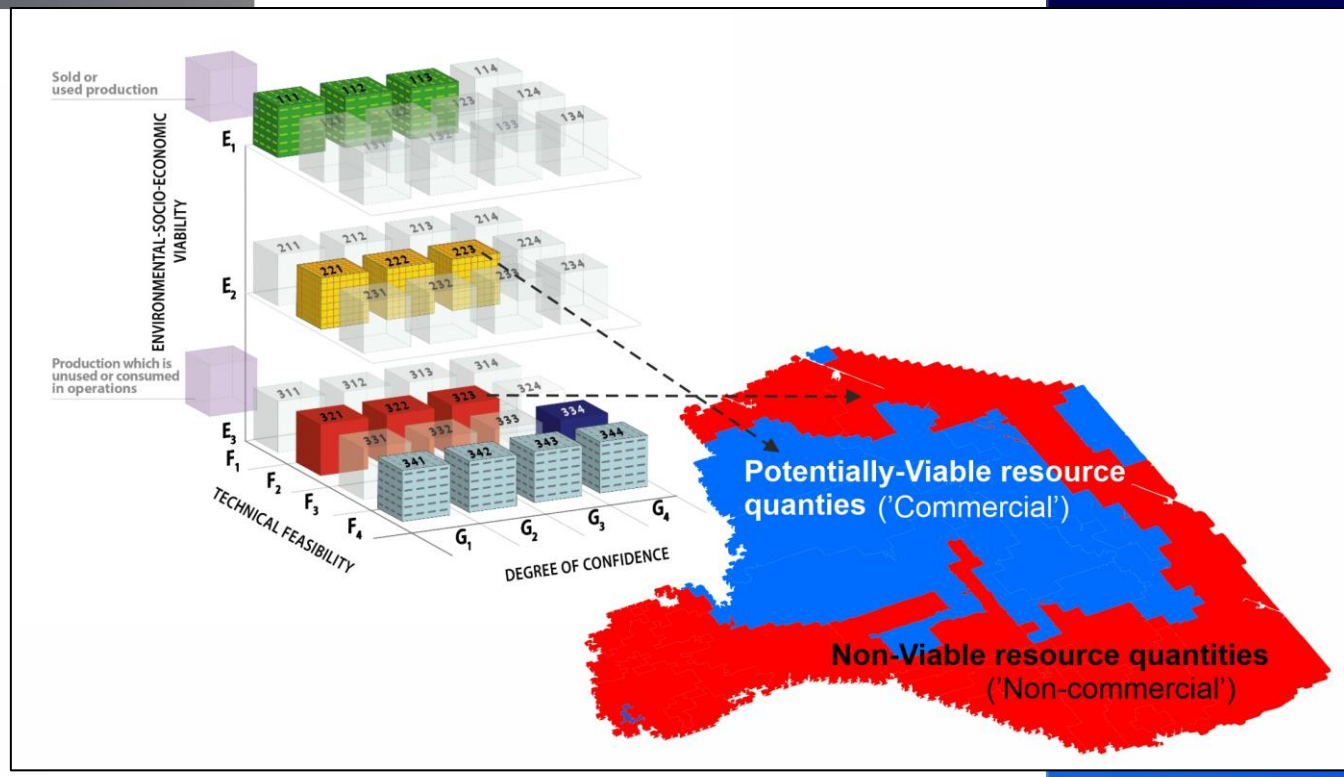
UNFC & Anthropogenic Resources



UNFC (2019)

UNFC in Tailings Projects





Modified after Suppes & Heuss-Aßbichler 2021

FutuRaM

Future availability of secondary raw materials

Thank you !

FutuRaM.eu

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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

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