METALLURGY IS FUNDAMENTAL TO THE CIRCULAR ECONOMY

Markus A. Reuter, Bart Blanpain, Annelies Malfliet

AGENDA

- The importance of metals in society
- The fundamental role of metals (incl. lead) in a circular society
- Metallurgical infrastructure criticality in a circular society

129 ORGANS BUILT BY MY FAMILY IN SILESIA (NOW IN POLAND)

Harmonious integrated system: Materials (e.g. wood), alloys (e.g. Pb, Sn, Cu, Zn), wind, organist, music…

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Precious Metals PMs

Platinum Group Metals PGMs

Light and Heavy Rare Earth Elements REEs

Semi-conductors

Light & Alkaline Earth Metals

Base, Carrier & Alloying Metals

Technology Elements

Halogens

Noble Gases

Alkaline Metals

Accompanying Elements

METALS ENABLE FUTURE®(METALLE VERNETZEN ZUNKUNFT®)

Abstract für einen Beitrag für die EMC 2019

Titel: Beitrag zur Vereinfachung der Struktur des Periodensystems - Metalle vernetzen Zukunft®

Rainer Buchholz, Sabine Flemming, Vedrana Lemor, Frank Neumann, Stefan Priggemeyer, Markus Reuter, Dirk Rode, Michael Sander, Marianne Schönnenbeck, Matthias Simon

GDB Gesamtverband der Deutschen Buntmetallindustrie

Aurubis

Initiative ZINK Innovation Performance Sustainability

wieland

Cu Deutsches Kupferinstitut Copper Alliance

WVMETALLE

RHEINZINK®

BERZELIUS METALL

Helmholtz Institute Freiberg for Resource Technology

HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF

TU BERGAKADEMIE FREIBERG

Base/Carrier Metals

Technology Elements

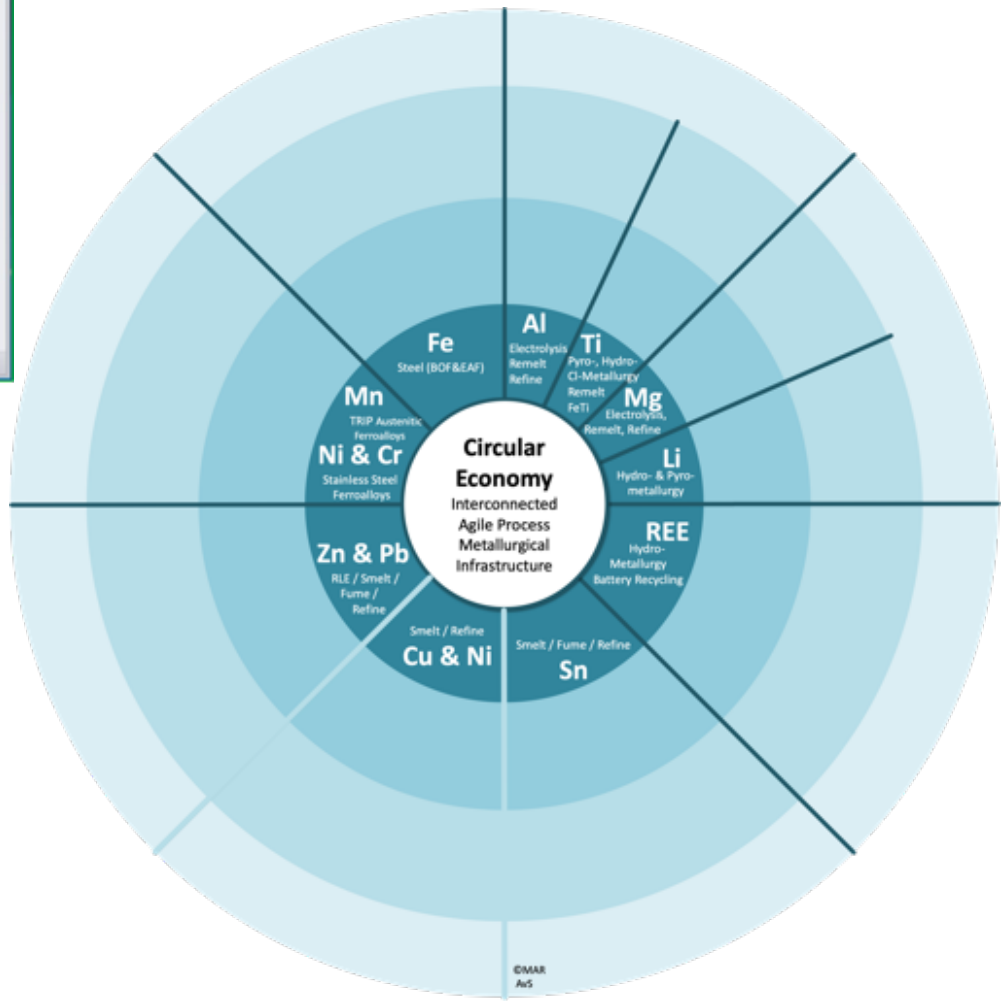
Accompanying (minor) elements

WHERE DO ALL ELEMENTS, COMPOUNDS GO IN THE SYSTEM?

Base/Carrier Metals

Technology Elements

Accompanying (minor) elements



Base/Carrier Metals

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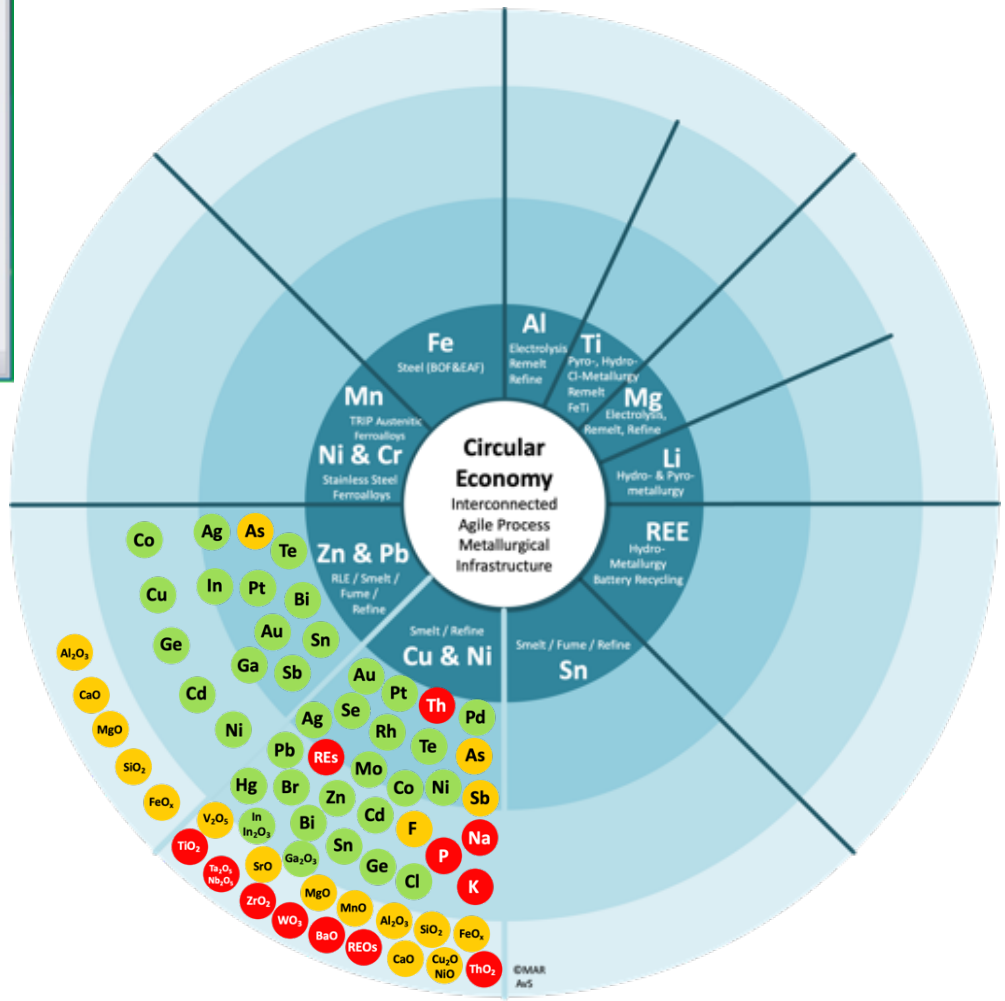
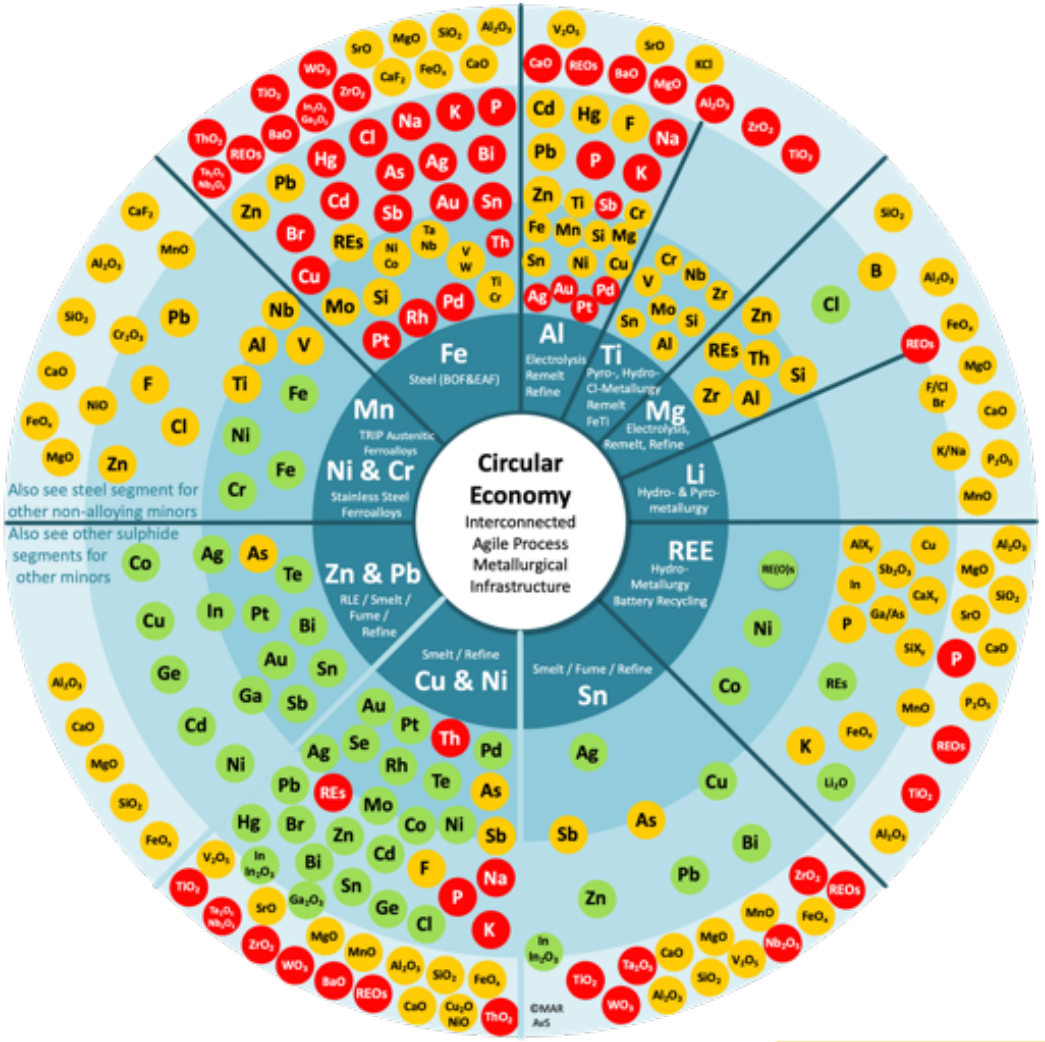
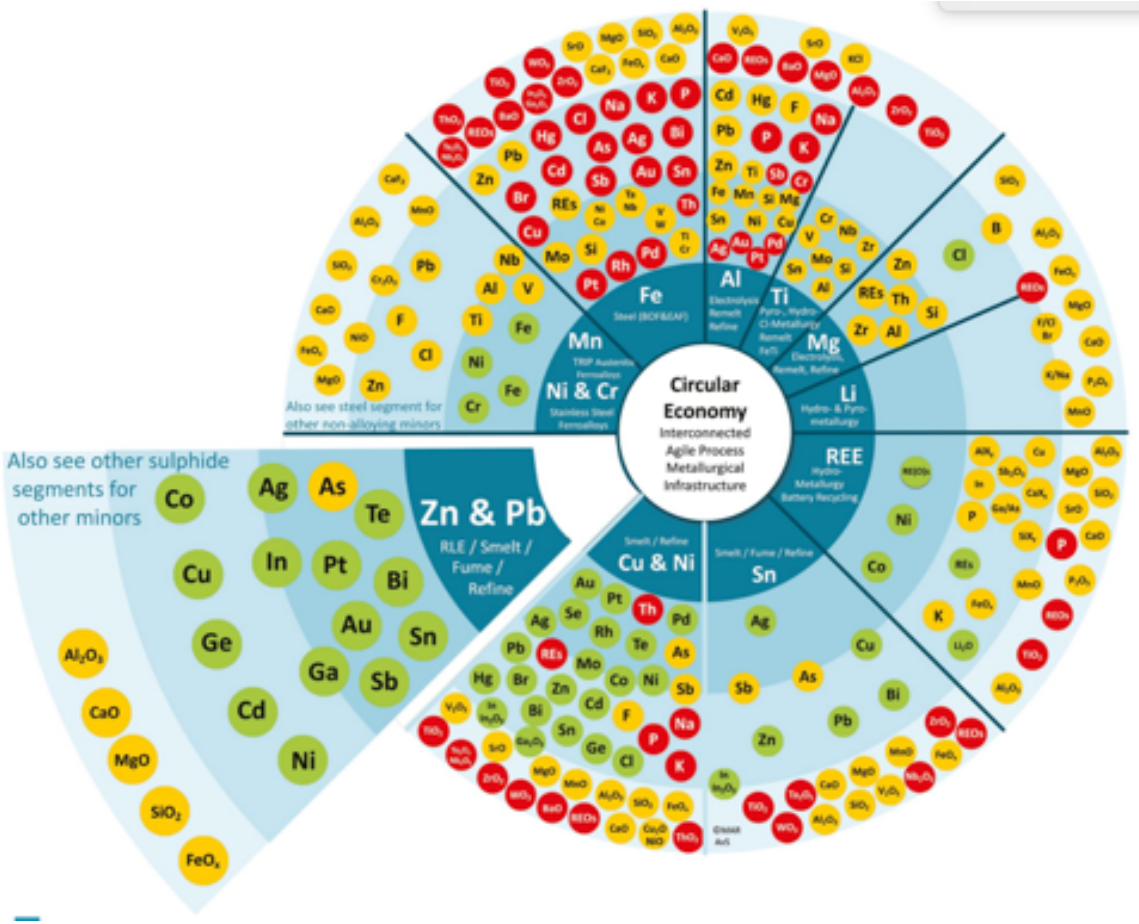
Accompanying (minor) elements



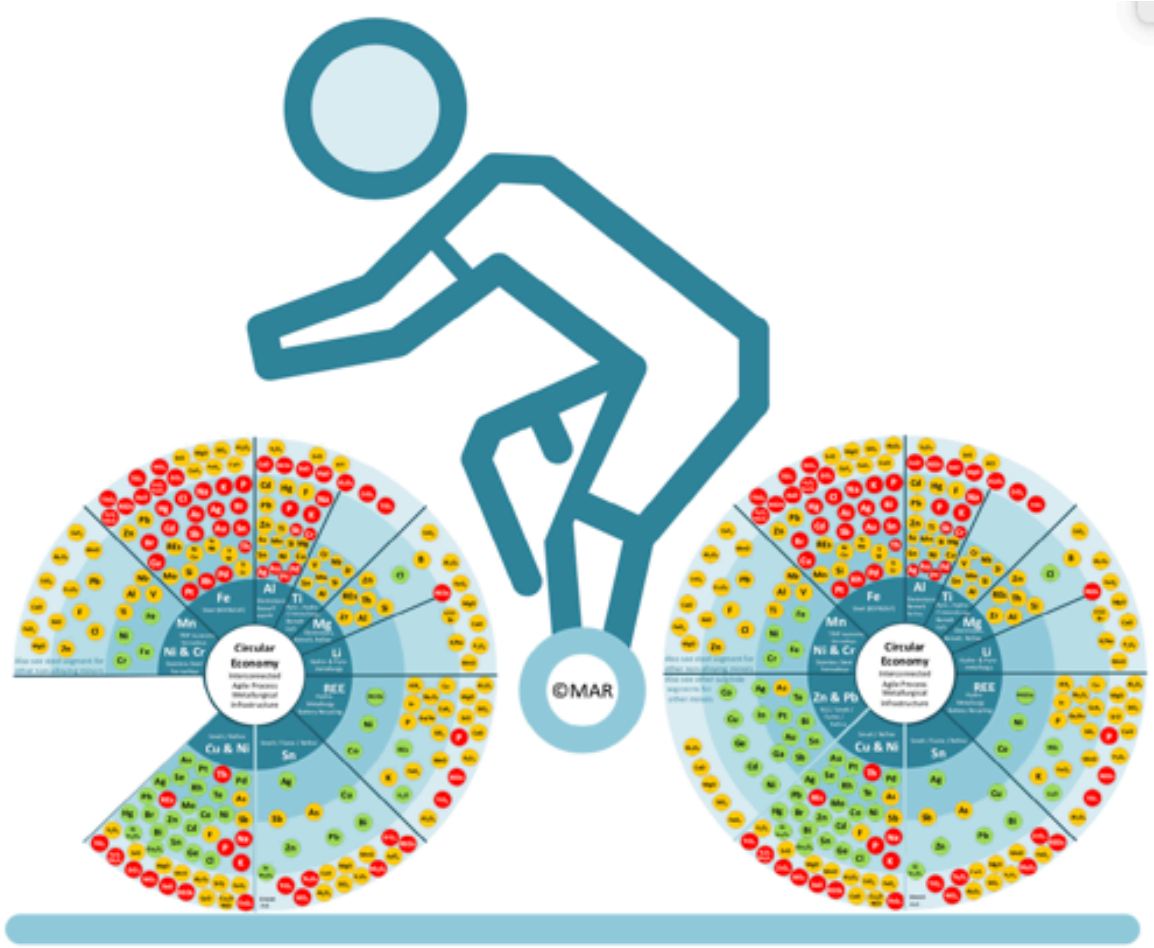
THE BEAUTY AND HARMONY OF METALLURGY



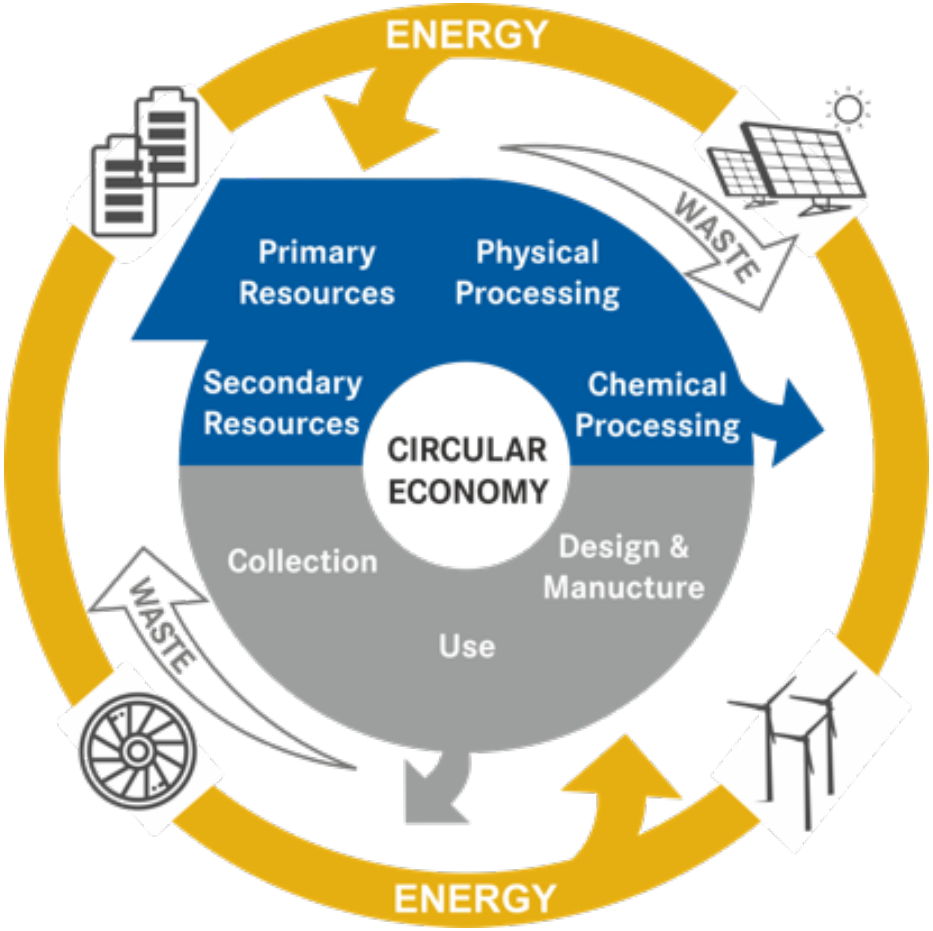
WHAT HAPPENS IF METALLURGY AND ITS INFRASTRUCTURE IS NOT PART OF THE CIRCULAR SOCIETY?

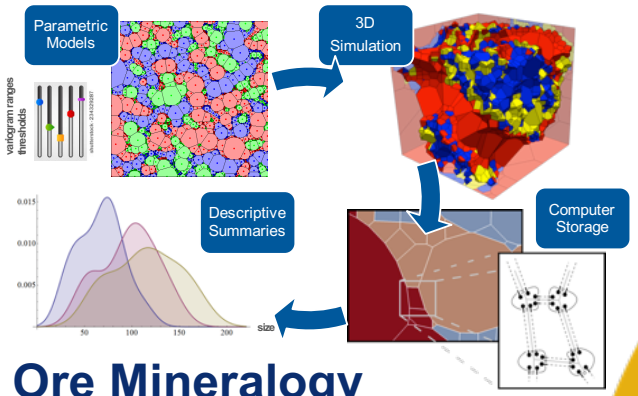


THE WHEELS DO NOT TURN ANYMORE WITHOUT LEAD



NEXUS RESOURCES, ENERGY, EXERGY & FOOTPRINT

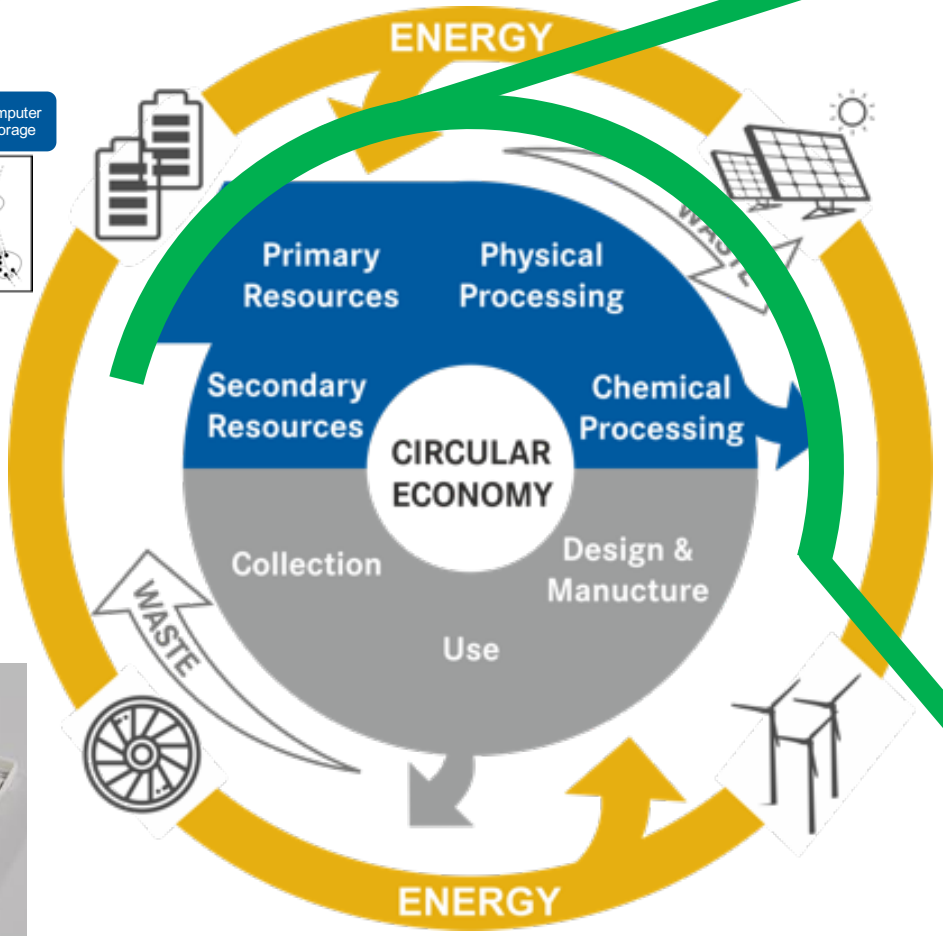


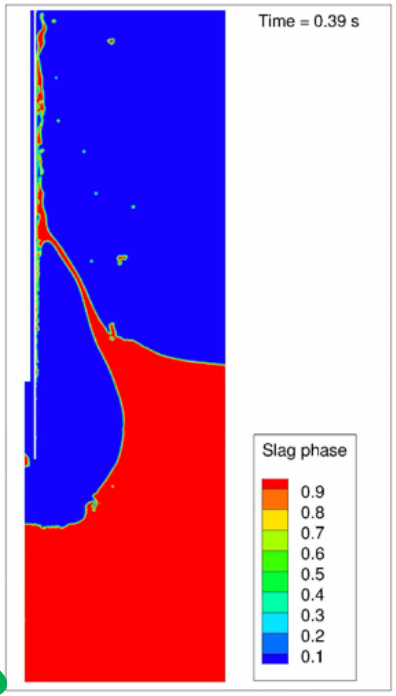


Ore Mineralogy

Minerals description & thermochemistry fundamentally link all stakeholders

Bill of Materials
Full Material Declaration





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Policy Brief

SCRATES Zero Waste
EU MSCA-ETN


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February 2019

Bart Blanpain
Markus Reuter
Annelies Malfliet

Lead Metallurgy is Fundamental to the Circular Economy

Metals are eminently recyclable, and by recycling and refining complex materials, the EU's interconnected metals sector is responding to the increasing scarcity of certain metals. In this way, we are delivering and recovering the technology and base metals for the EU's Circular Economy (CE). Moreover, metals are at the heart of the energy infrastructures that now run Circular Cities, and they will play an even greater part in the future. One of these metals is lead. With respect to this familiar metal, industry is fully aware that in order to keep on using it, the associated risks need to be well managed at all times. Importantly, lead is a key enabler in the CE, as it is capable of dissolving and carrying a multitude of technology elements. The recovery and recycling of several critical technology elements is based on refining them from lead through well-developed metallurgical processes in which the lead acts as a carrier metal. Limiting lead metallurgy would have a detrimental impact, not only on the lead industry itself, but on all the industries linked to it. It is therefore critical that we maintain and further develop the lead infrastructure and know-how in Europe. To put it simply, lead metallurgy is fundamental if the EU wants to retain its leading position in the global CE.

Executive Summary the 5 lessons learned:

- **Lesson1:** Lead is frequently seen as a problematic metal that can be detrimental to human health; what is much less well known is its fundamental role in extractive metallurgy and how this is closely associated with the Circular Economy.
- **Lesson 2:** Molten lead has unique properties that means it can act as an efficient liquid carrier for critical raw materials such as In, Bi, Cd and Te.
- **Lesson 3:** Restricting lead metallurgy in the EU would not only have a detrimental impact on the lead industry, but also on all the industries linked to it that work with elements like Ag, Cu, Sb, Sn, Te, and Zn.
- **Lesson 4:** The focus must be on correctly and comprehensively minimising the risks of lead-containing materials for society and carefully managing them, rather than attempting to ban the use of lead.
- **Lesson 5:** An environmentally friendly and energy-efficient lead infrastructure together with the associated research and know-how in Europe is absolutely vital if the continent is to maintain its global leadership in the Circular Economy.

European Commission

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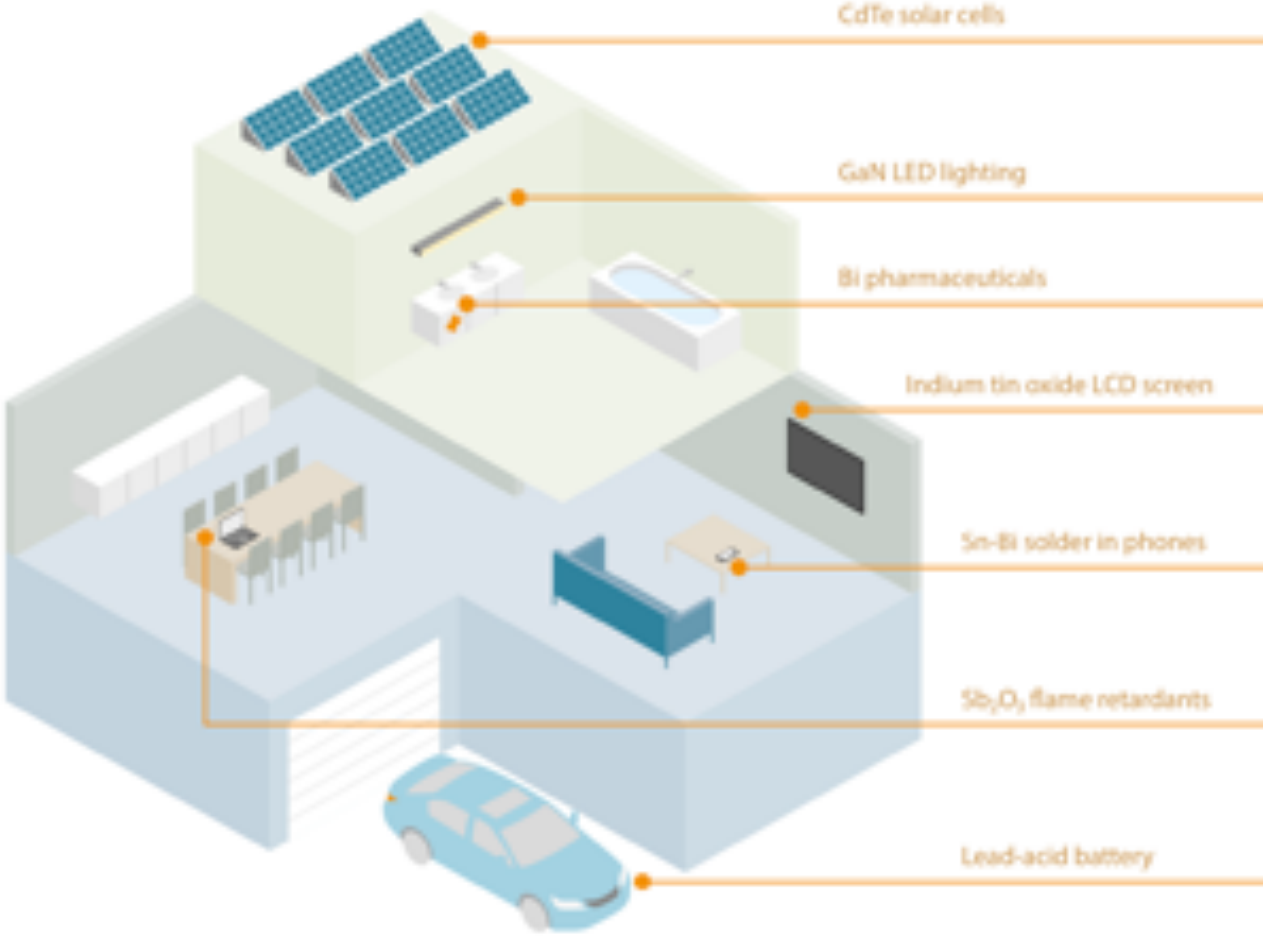
COMPLEXITY OF METALLURGY AND RECYCLING



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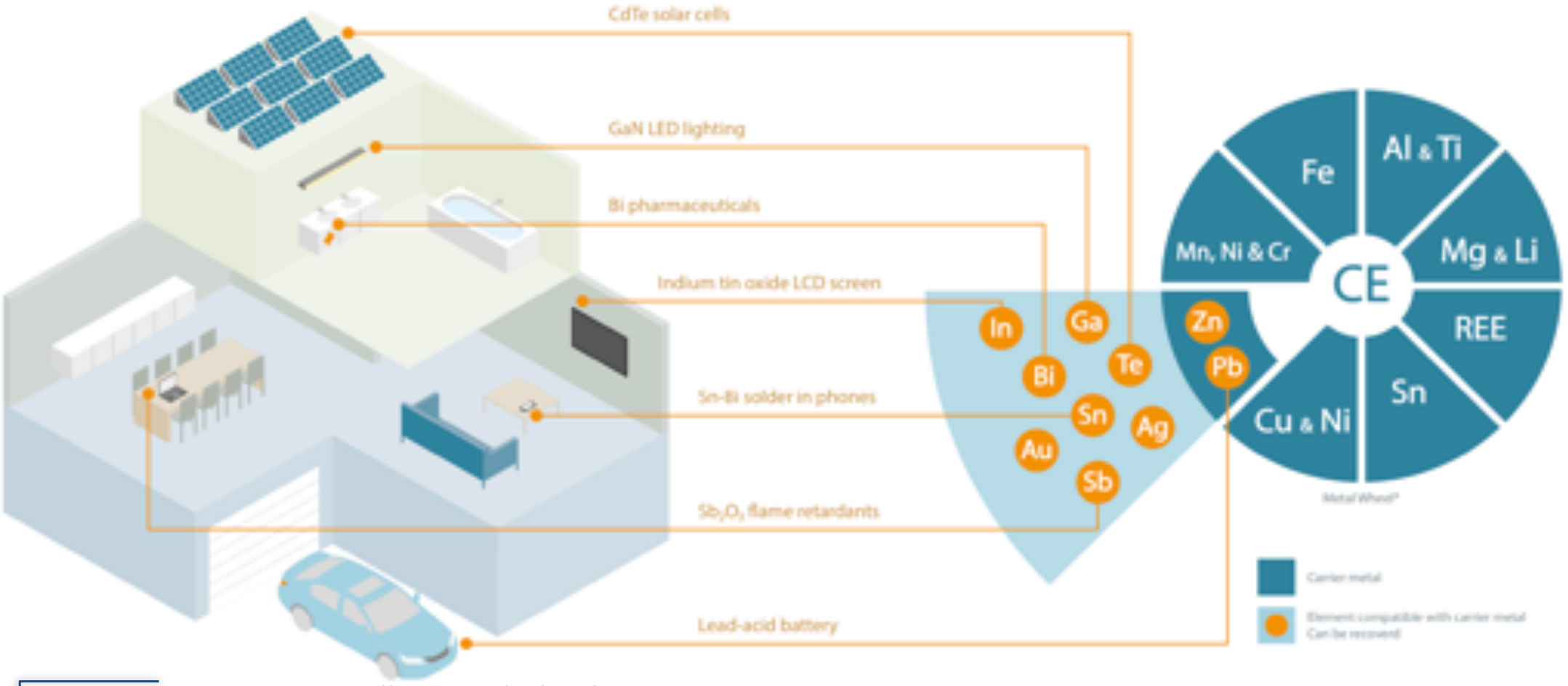

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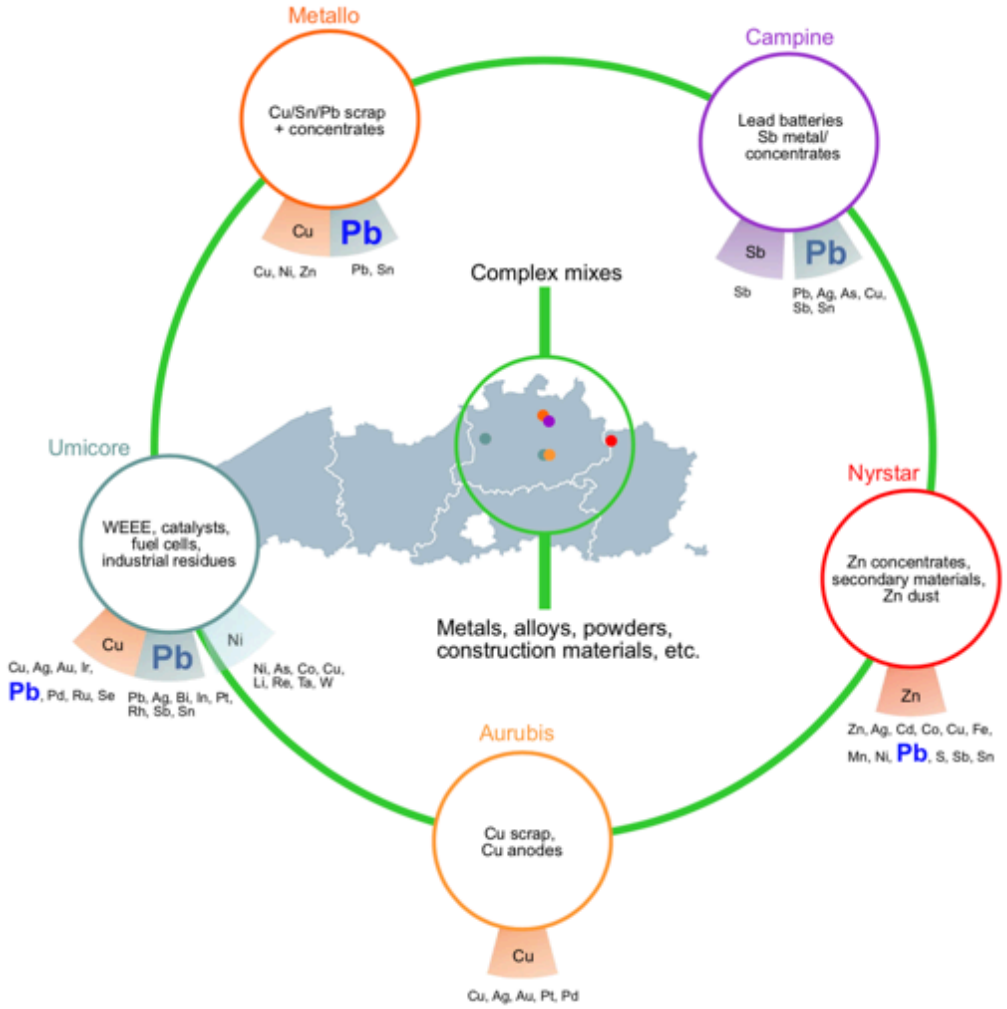
METALLURGICAL INFRASTRUCTURE CRITICALITY



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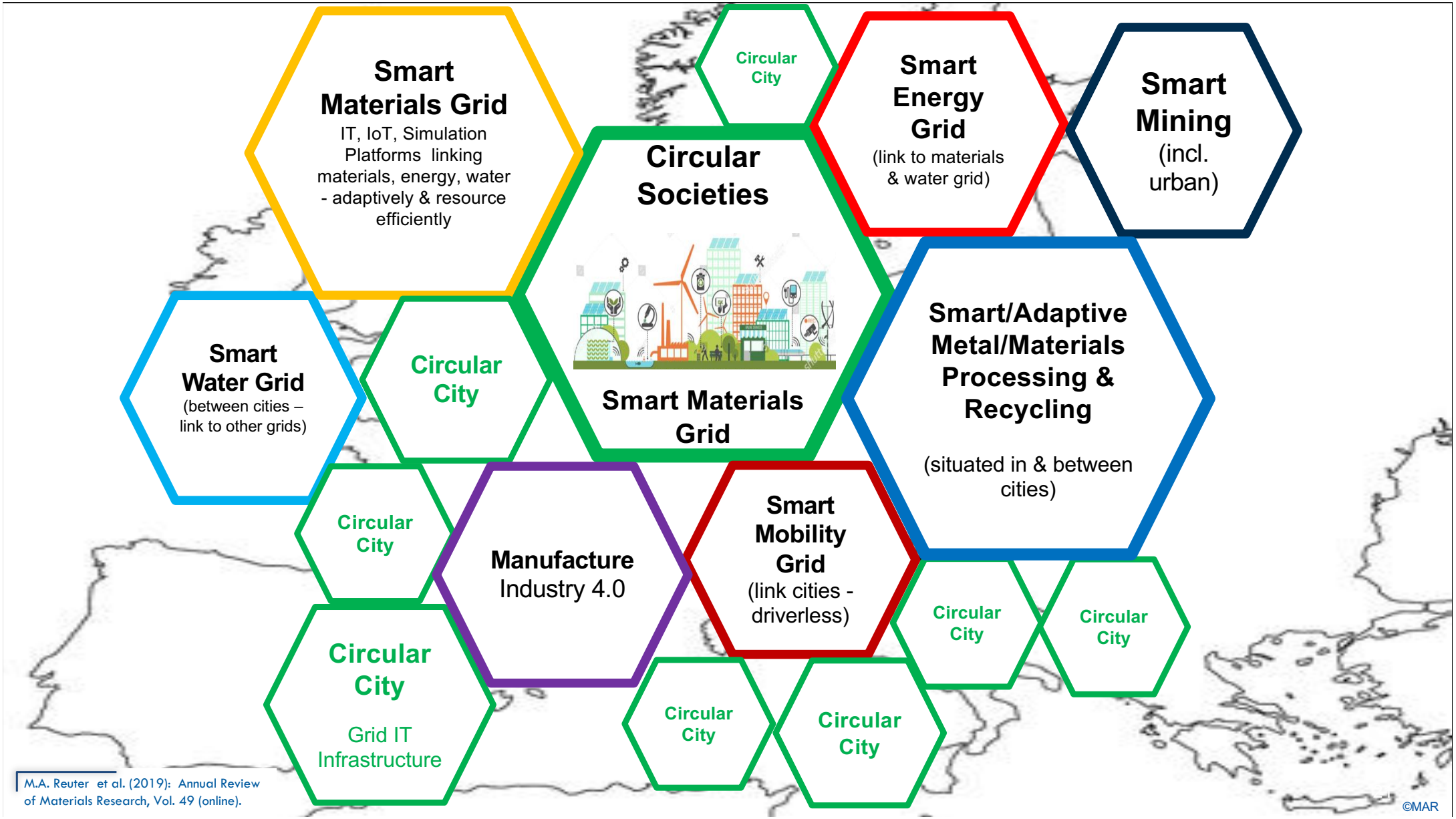

M.A. Reuter et al. (2019): Annual Review of Materials Research, Vol. 49 (online).

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