Critical Raw Materials Innovation Network

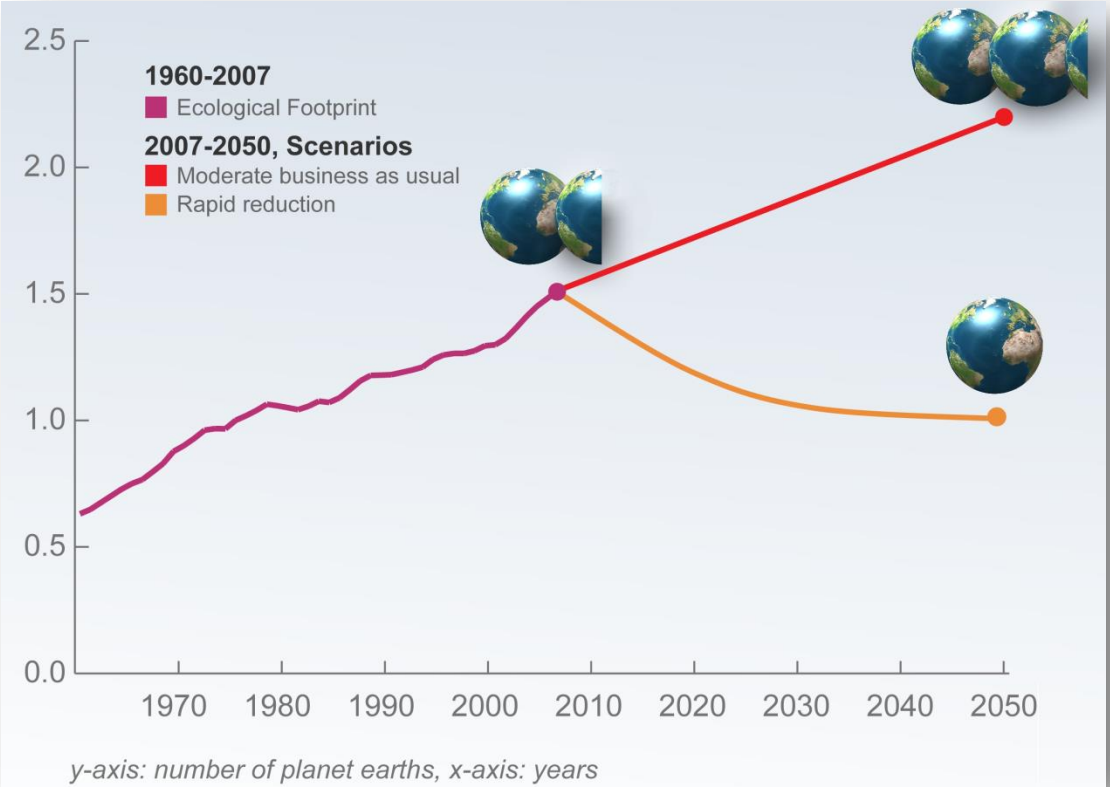
E-MRS Spring Meeting May 2013,
Dr. Pablo Tello (PNO Consultants)
“Europe in Motion” Workshop



SEVENTH FRAMEWORK PROGRAMME

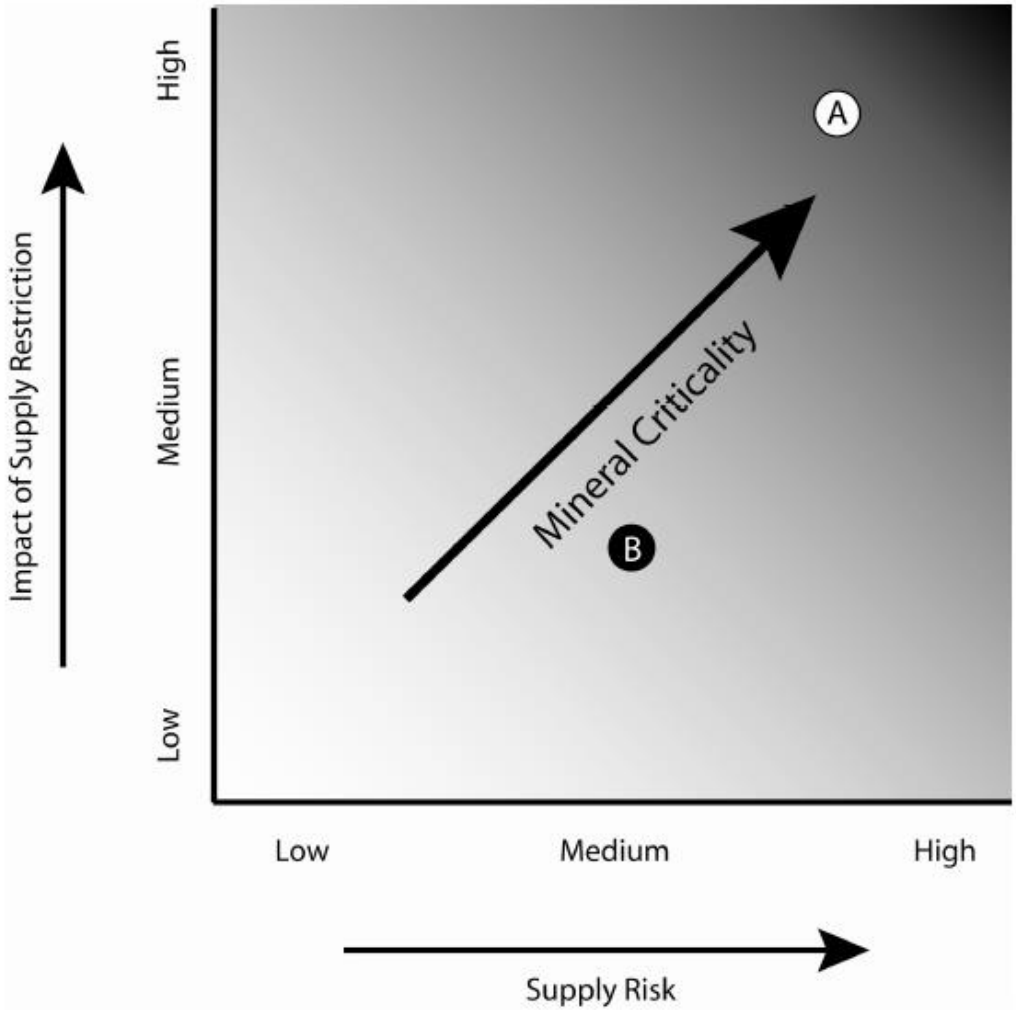
CRM_InnoNet
Substitution of Critical Raw Materials

Where we are and where will be with no action on energy and resource consumption rates



- Today humanity uses the equivalent of 1.5 planets to provide the resources we use and absorb our waste.
- Moderate UN scenarios suggest that if current population and consumption trends continue, by the 2030′s, we will need the equivalent of two Earths to support us.

Critical Raw Materials



- One of the most crucial resources we need are the so call Critical Raw Materials.
- Critical Raw Materials are those which are both essential in use and subject to the risk of supply restriction.

U.S. National Research Council, 2008. Minerals, Critical Minerals, and the U.S.Economy. Washington, D.C., National Academies Press

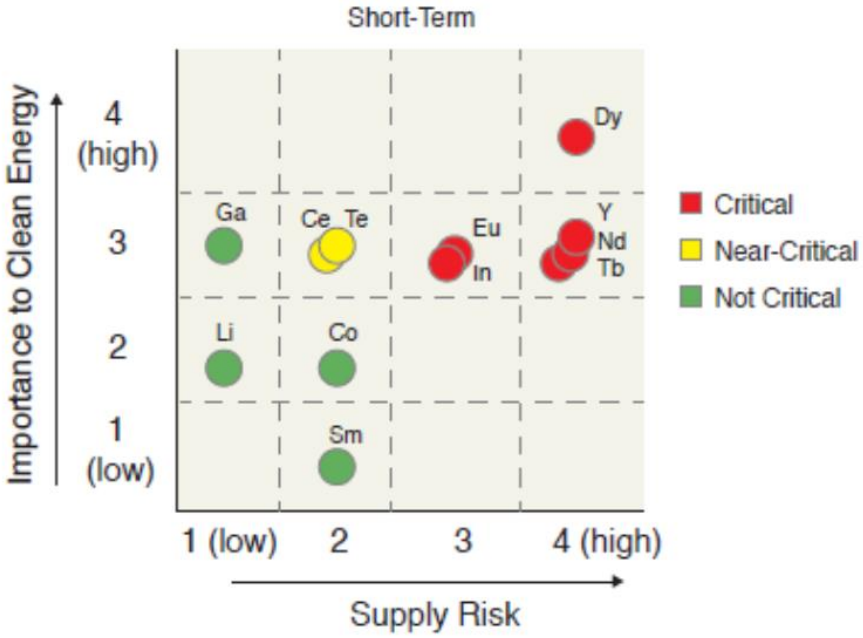
Europe's technological sustainable future depends on Critical Raw Materials

- Wind Turbines (permanent magnets).
- Electric Vehicles (permanent magnets & advanced batteries).
- Solar Cells (thin film semi conductors).
- Energy Efficient Lighting (LEDs).
- ICT Components (flat screens, advanced chips)
- Aerospace (turbine blade alloys)

Critical Materials Found in Clean Technologies		
Technology	**Component**	**Material**
Wind	Generators	Neodymium
		Dysprosium
Vehicles	Motors	Neodymium
		Dysprosium
	Li-ion Batteries (PHEVs and EVs)	Lithium
		Cobalt
	NiMH Batteries (HEVs)	Rare Earths: Cerium, Lanthanum, Neodymium, Praseodymium
		Cobalt
PV Cells	Thin Film PV Panels General*	Tellurium
		Gallium
		Germanium
		Indium
		Selenium
		Silver
		Cadmium**
	CIGS Thin Films	Indium
		Gallium
	CdTe Thin Films	Tellurium
Lighting (Solid State and Fluorescent)	Phosphors	Rare Earths: Yttrium, Cerium, Lanthanum, Europium, Terbium
Fuel Cells*	Catalysts and Separators	Platinum, Palladium and other Platinum Group Metals, Yttrium

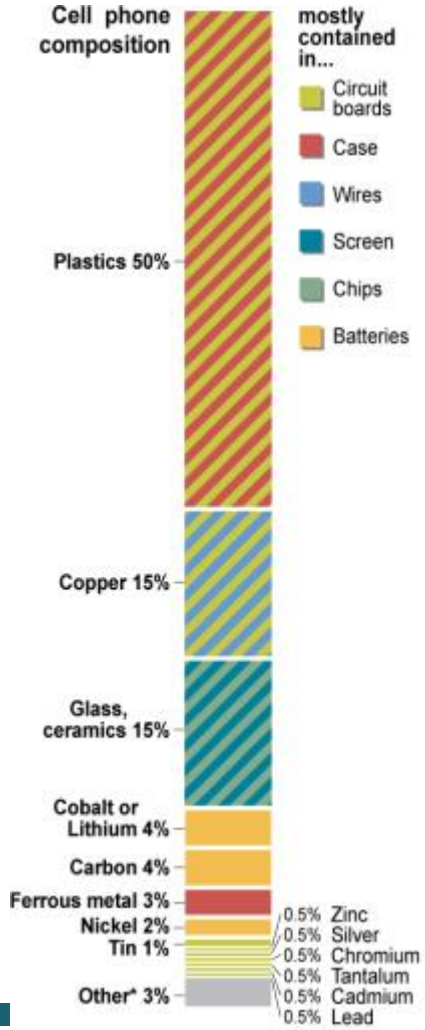
*Sources: Table data extracted from Bauer, 2011 (20) and expanded upon with data from other sources per asterisks. *APS/MRS, 2011 (2). **Lifton, 2011 (10)*

Critical Materials found in Clean Energy Technologies



CRM_InnoNet
Substitution of Critical Raw Materials

Elements in a Mobile Phone

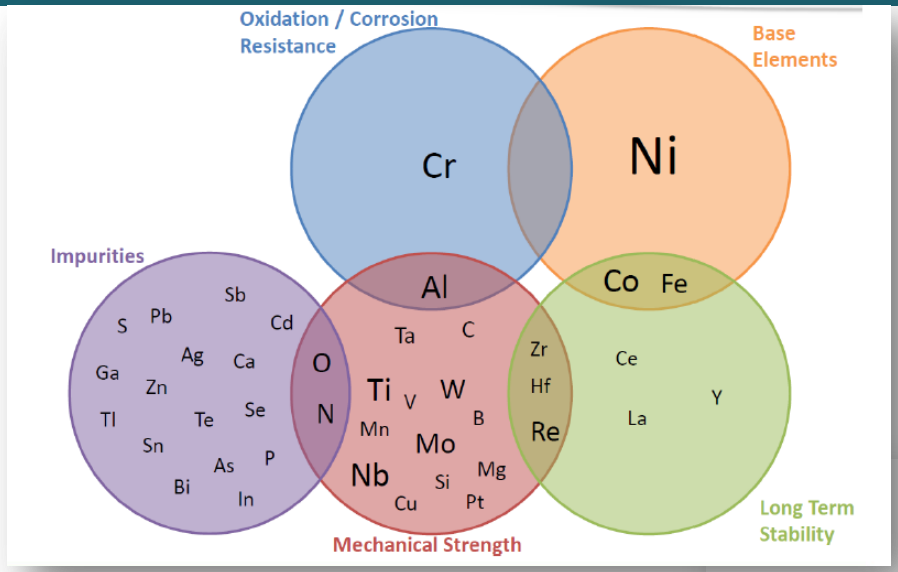


Roughly 40 different elements

H, Li, Be, C, N, O, F, Al, Si, S, Cl, K, Ca, Ti, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Br, Sr, Y, Zr, Ru, Pd, Ag, Cd, In, Sn, Sb, Ba, Ta, W, Pt, Au, Hg, Pb, Bi, Nd.

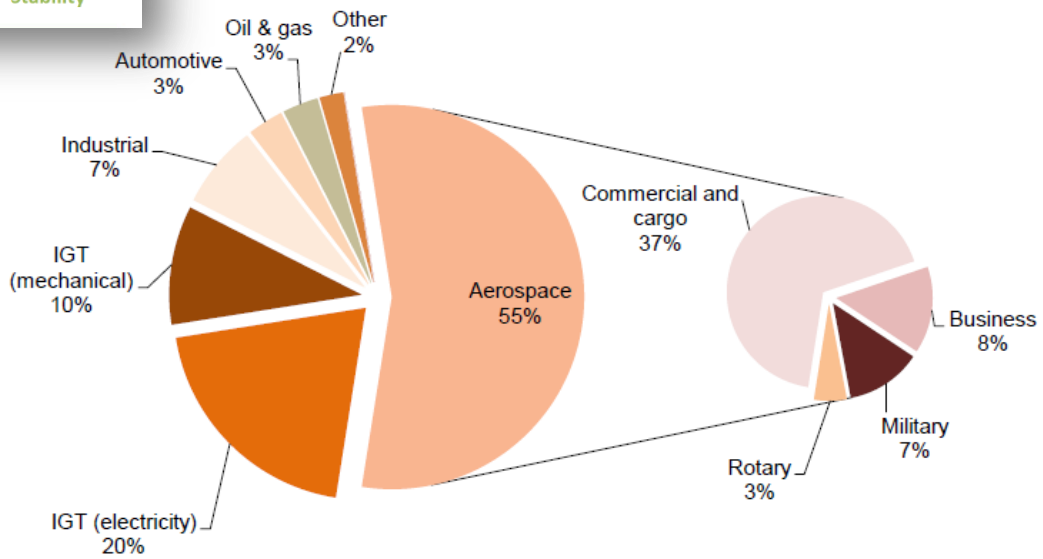
mobile phone weighing 100 grams, contains

- 13.7 g of copper
- 0.189 g of silver
- 0.028 g of gold
- 0.014 g of palladium

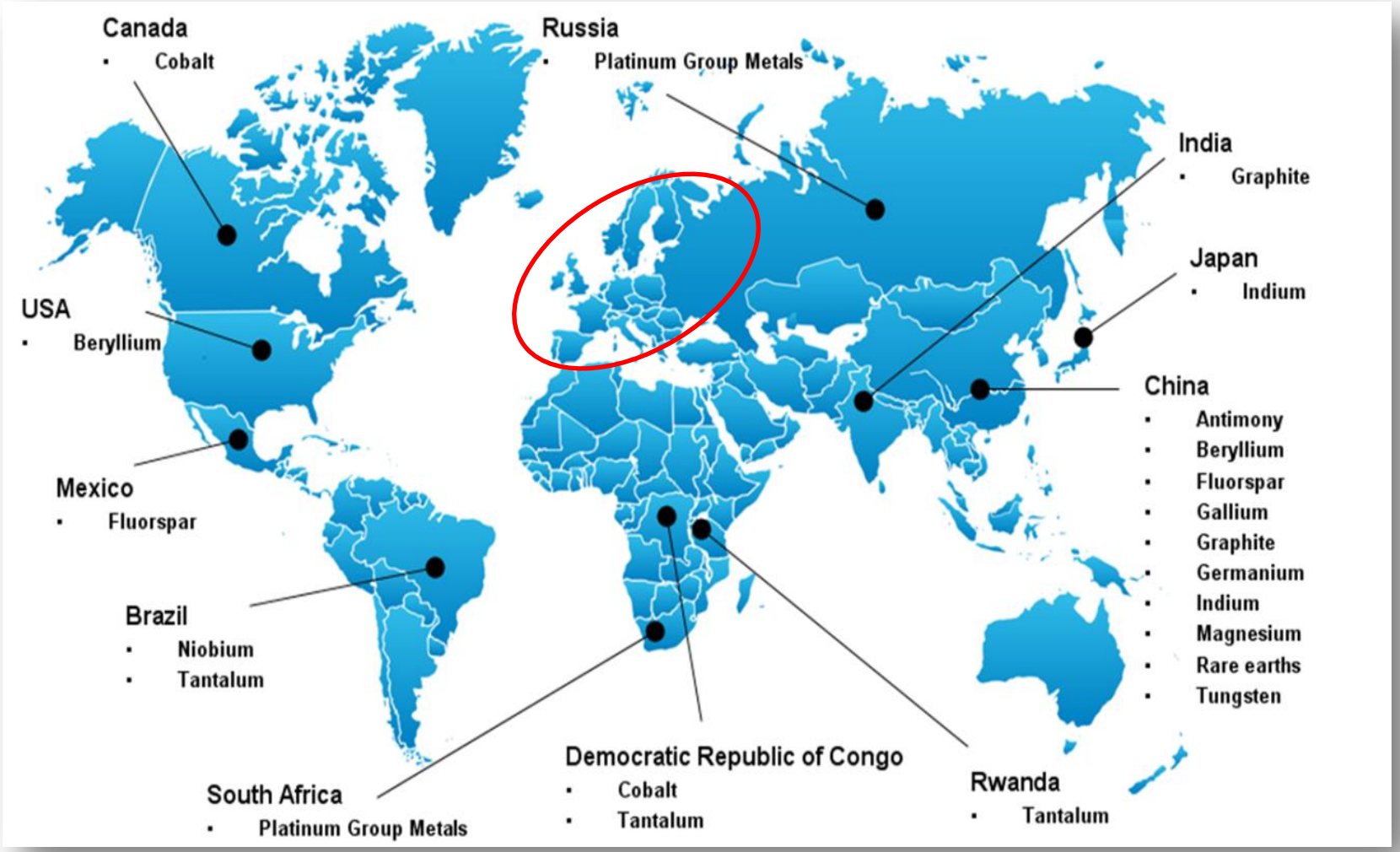


Critical Raw Materials are used in superalloys to provide with unique properties.

Superalloys are crucial for key industrial sectors worldwide.



Source: Roskill Information Services Ltd.



…BUT their availability IS A FUNDAMENTAL PROBLEM…especially for EUROPE

EU Critical Raw Materials

Critical Raw Materials at EU level

EU Raw Materials Initiative, June 2010

- Antimony
- Beryllium
- Cobalt
- Fluorspar
- Gallium
- Germanium
- Graphite
- Indium
- Magnesium
- Niobium
- Platinum Group Metals
  (Pt, Pd, Ir, Rh, Ru, Os)
- Rare Earths
  (Y, Sc, La, Ce, Pr, Nd, Pm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu)
- Tantalum
- Tungsten

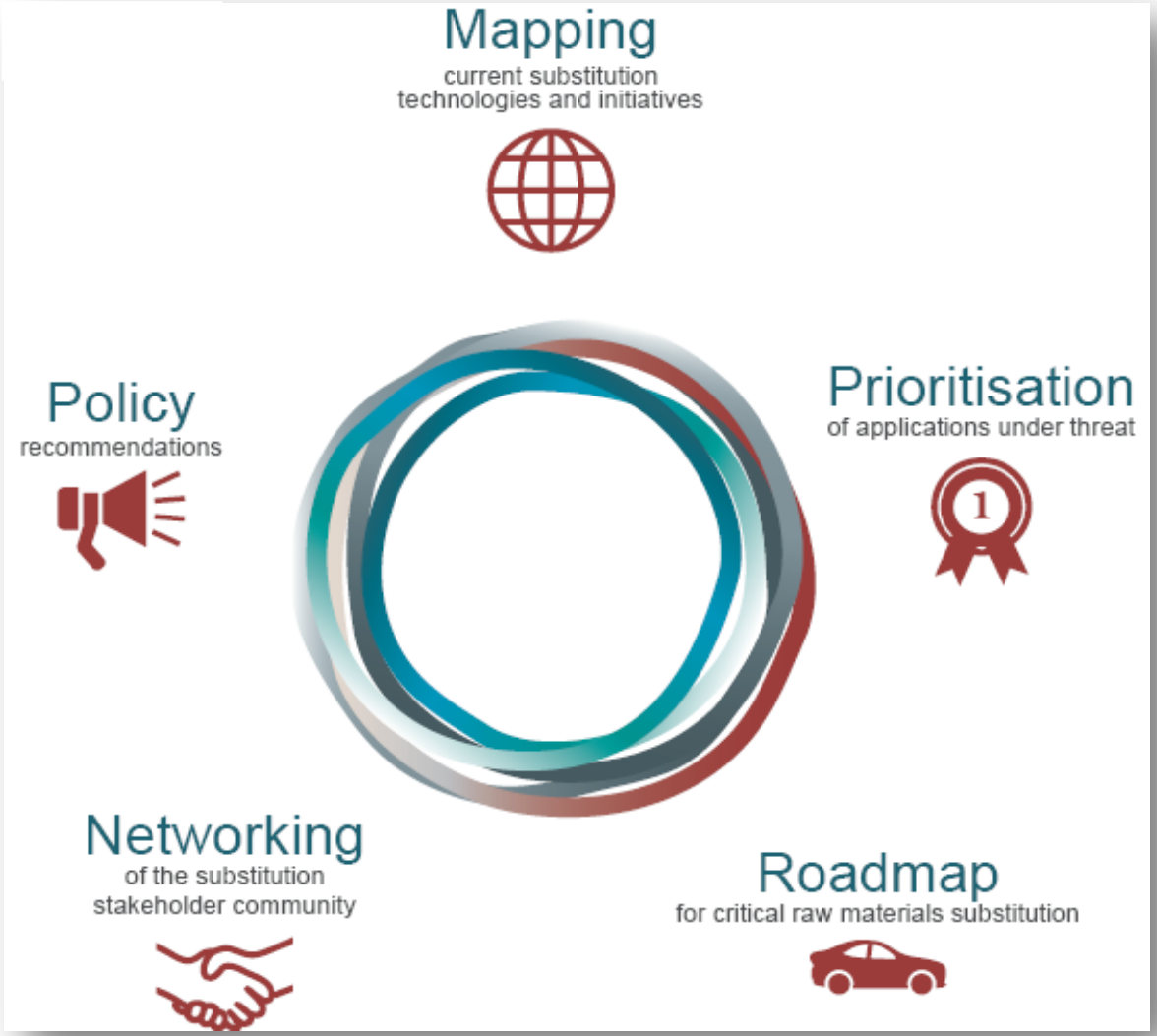
CRM_InnoNet

Critical Raw Materials Innovation Network Towards an integrated community driving innovation in the field of critical raw material **substitution** for the benefit of EU industry.

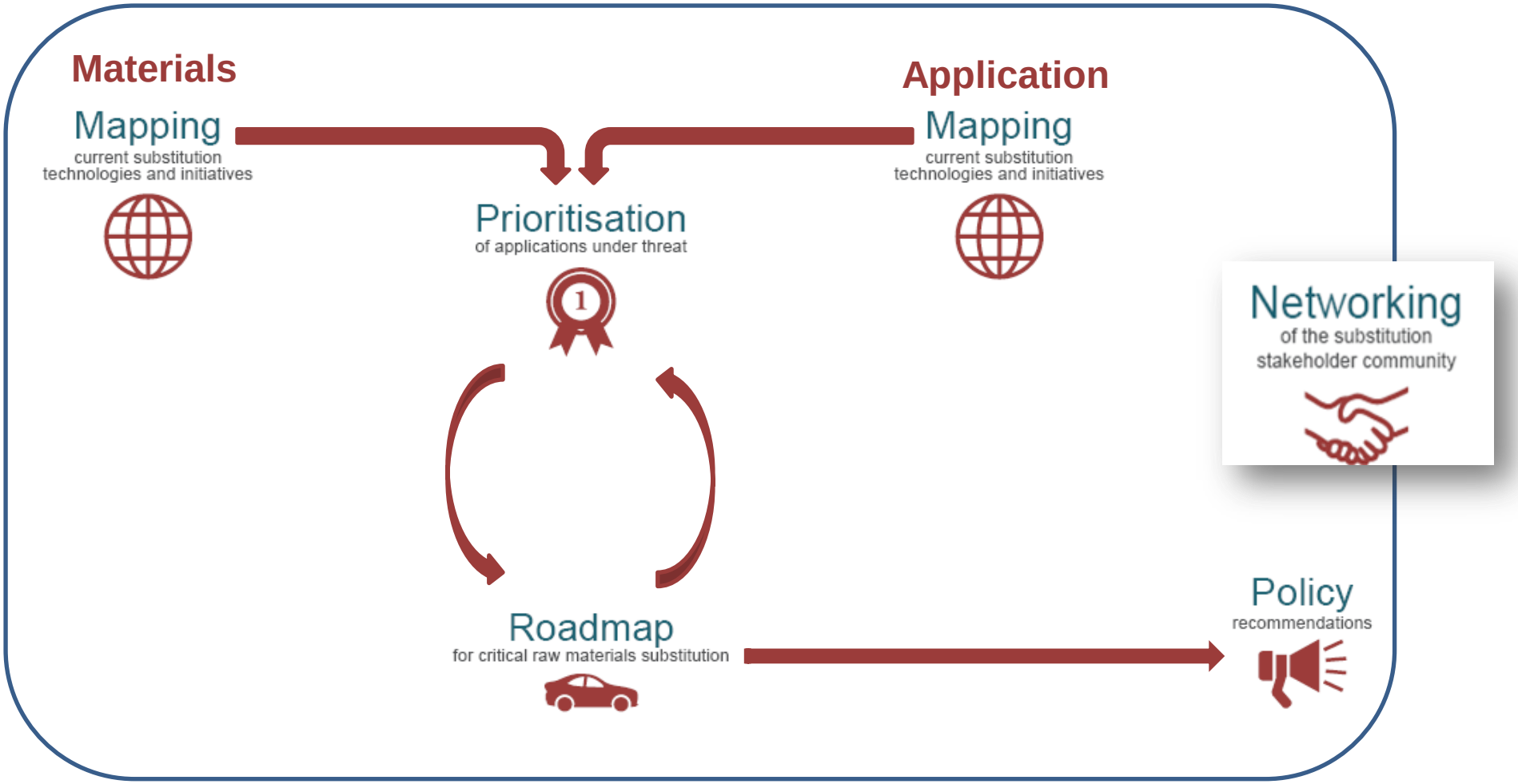
Alternative materials for certain applications;
or
Replacement those applications with an alternative technology not dependent on key raw materials.

CRM-InnoNet Consortium

CRM-InnoNet: Main Objectives



CRM-InnoNet: Project Structure



CRM_InnoNet Innovation Network: main objectives

- CRM_InnoNet will set up the basis for a Network of key stakeholders interested in the substitution of critical raw materials.
- The Innovation Network will constitute a dynamic, open and proactive platform for the entire stakeholder community.
- A feasibility study will be undertaken considering the potential models and routes for this Network to continue after the project termination and to decide upon concrete future actions in this respect.

Innovation Network timeline

SETTING THE SCENE
- Initial steps for identifying and gathering the EU «substitution community»
- First feedback.
- Project awareness.

CONSOLIDATION
- EU «substitution community» collaborating among themselves and with the project.
- Sessions/activities targeting specific needs/requests.

CONTINUATION
- EU «substitution community» established and fully cooperative.
- Identified sustainable continuation paths and associated actions.

1st Innovation Network Workshop (April 2013)

2nd Innovation Network Workshop (May 2014)

3rd Innovation Network Workshop (April 2015, CRM_InnoNet ends)

CRM_InnoNet Expected Impact

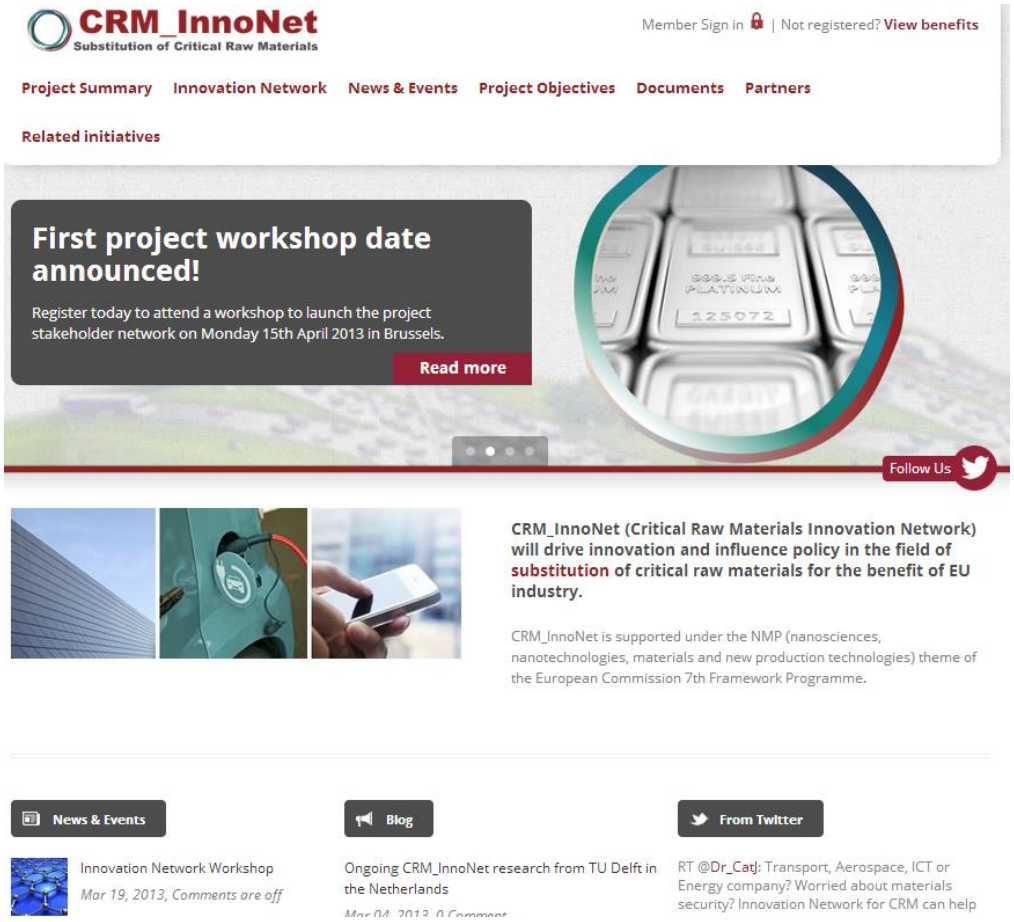
- **Generate** ideas for possible novel funding actions.
- **Prioritise** R&D needs in order to support the EU strategic approach.
- **Improve** coordination in R&I actions in the field of raw materials substitution.
- **Increase** efficiency and effectiveness of the EU research activities in this field.
- **Recommend** actions for policy-makers.
- **Create** one (or more) Innovation Network on substitution of Critical Raw Materials.

Contribute to the successful implementation of the **EU Raw Materials Initiative**

CRM_InnoNet responds to “Europe in Motion”

- Constitutes and example towards the International Materials Community that Europe is at the forefront on fostering initiatives for materials across the innovation value chain.
- Through its Innovation Network contributes for an effective single European space for RDT in the field of materials.
- Through the elaboration of Critical Raw Materials roadmap contributes to define future R&I activities in Europe.
- Offers recommendations to policy makers for future strategic European Science Policy scenarios.

Project Website



www.criticalrawmaterials.eu

SEVENTH FRAMEWORK PROGRAMME

CRM_InnoNet
Substitution of Critical Raw Materials

CRM_InnoNet Key Contacts

General Enquiries: crm@ciktn.co.uk

Mapping
current substitution technologies and initiatives

Value chain mapping:

Transport
Conny Haraldsson
Conny.haraldsson@sp.se

Energy
Aymeric Brunot
aymeric.brunot@cea.fr

ICT and Electronics
Ulla-Maija Mroeuh
Ulla-Maija.Mroueh@vtt.fi

Materials mapping:

Luis Tercero
Luis.Tercero@isi.fraunhofer.de

Roadmap
for critical raw materials substitution

Policy
recommendations

Daniela Velte
daniela.velte@tecnalia.com

Networking
of the substitution stakeholder community

Pablo Tello
pablo.tello@pnoconsultants.com

Thank you for your attention

Any questions?