

# Critical Raw Materials Innovation Network

October 2014, Dr Susanne Coles

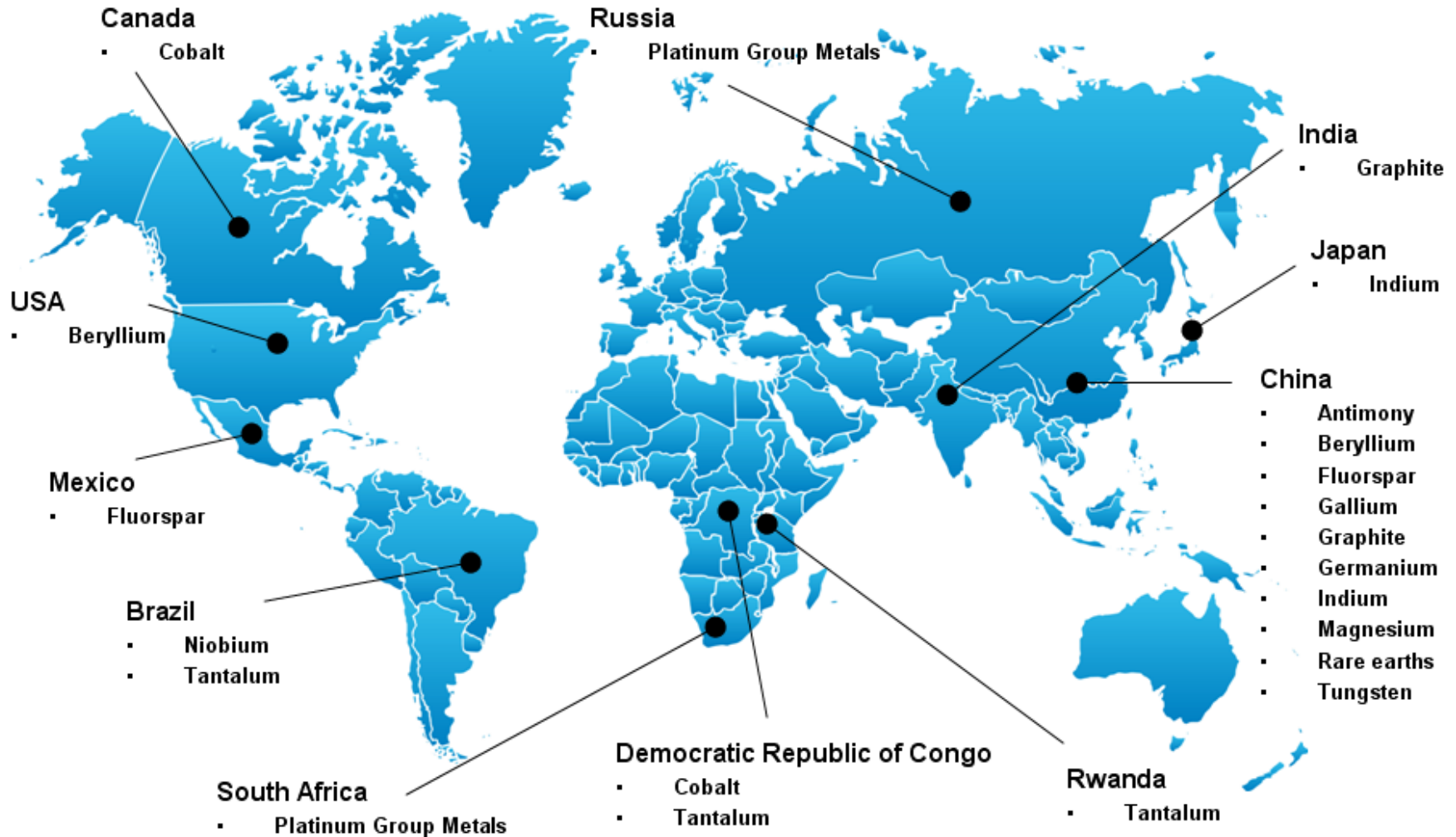


A large, diverse crowd of people is shown at an outdoor event. The crowd is dense, with many individuals wearing sunglasses and hats, suggesting a sunny day. The background is slightly blurred, focusing attention on the people in the foreground. Two semi-transparent text boxes are overlaid on the image, providing statistical information.

*9.5 billion people expected to live on the planet by 2050*

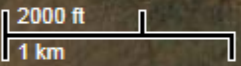
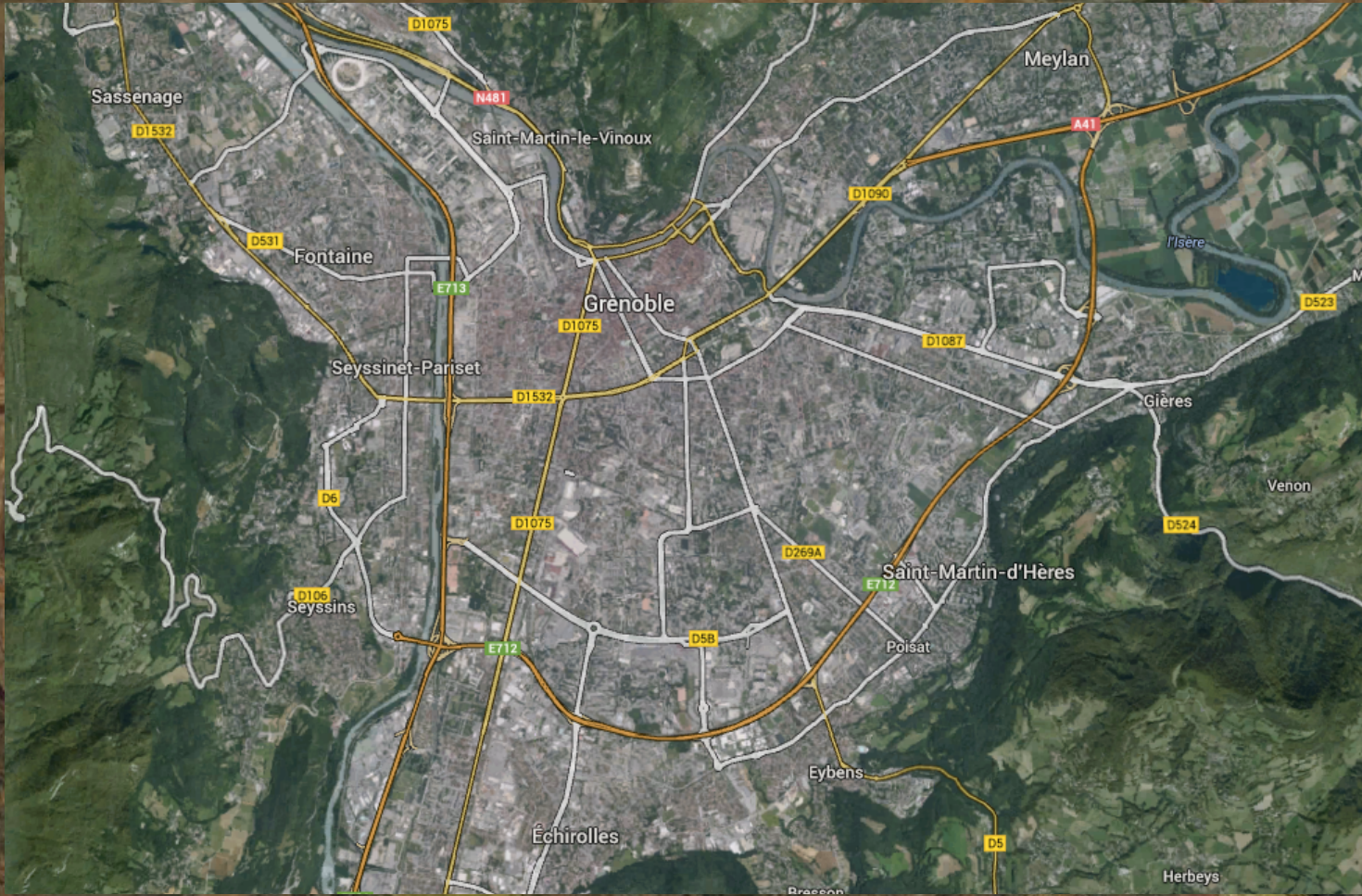
*3 billion more middle-class consumers forecast in the global economy by 2030*

# Concentration of critical minerals



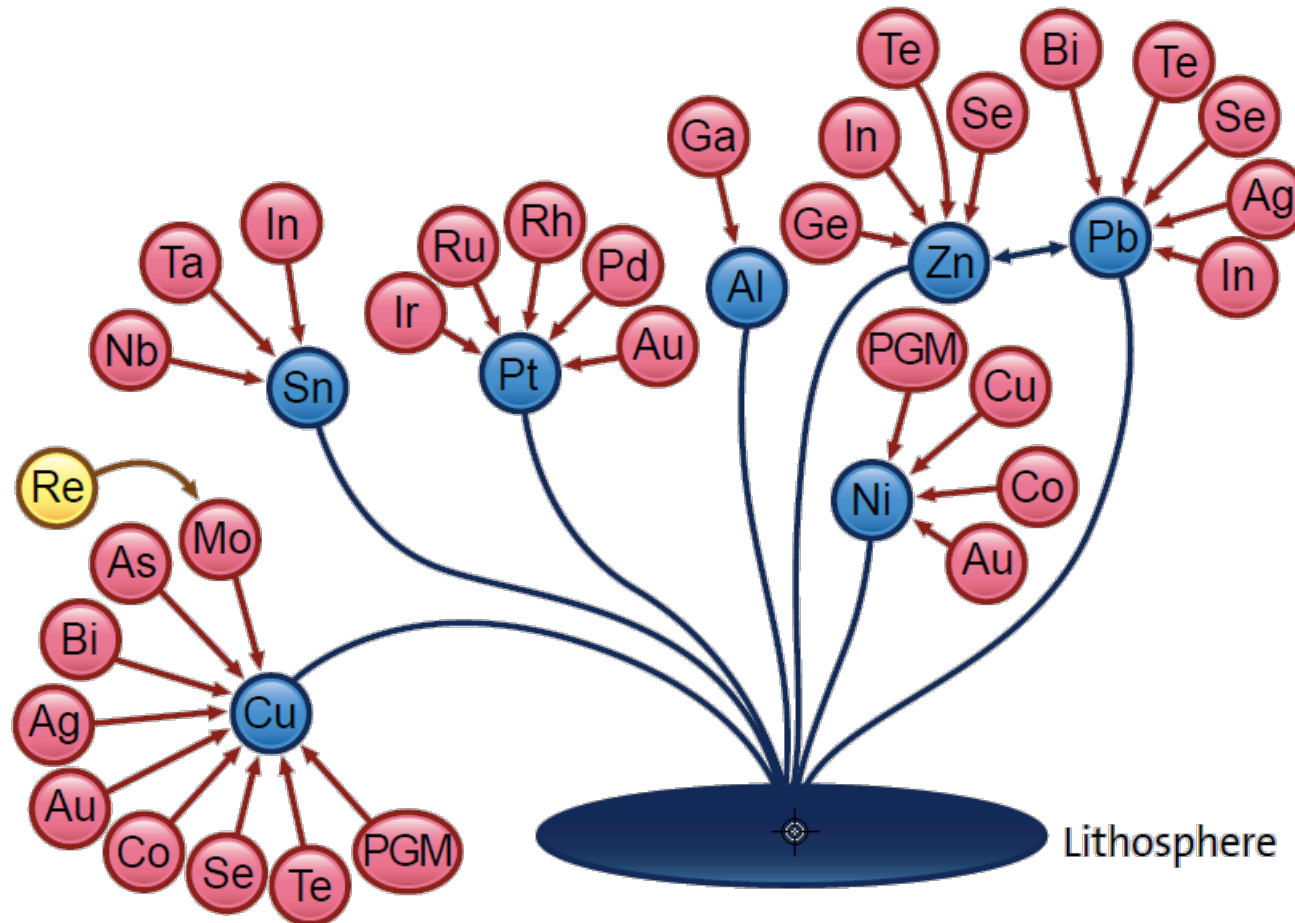


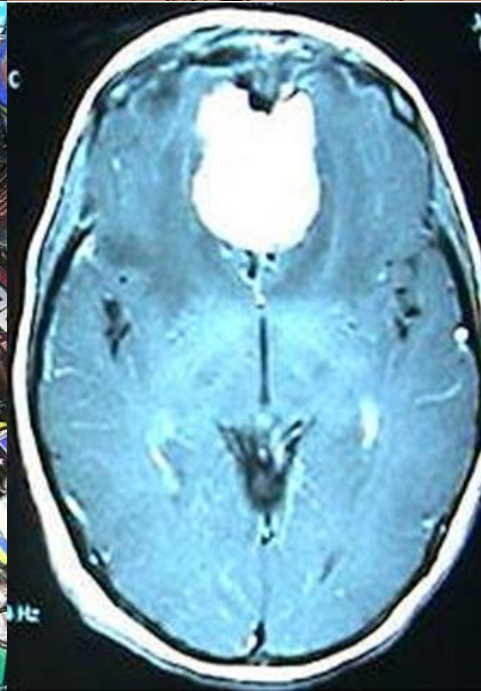
*Chuquicamata mine, Chile*



# Newman iron ore mine, Pilbara, Australia – Google Earth

# Secondary Metals





# 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.

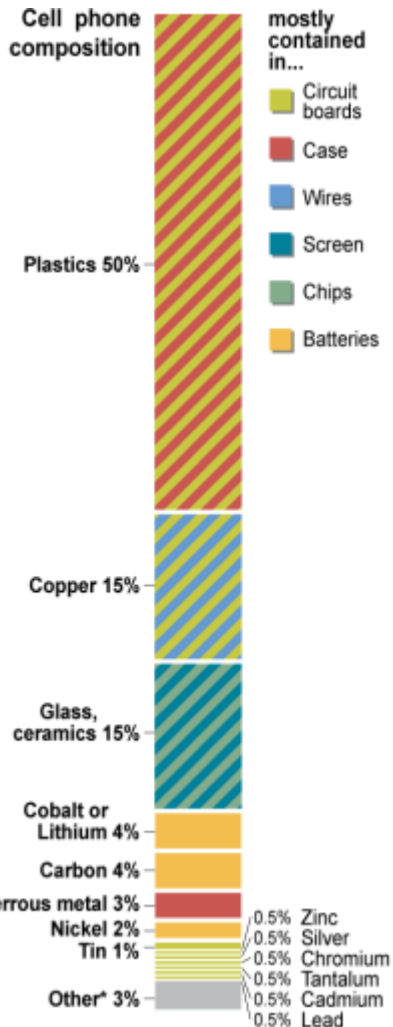
mobile phone weighing 100 grams, contains

13.7 g of copper

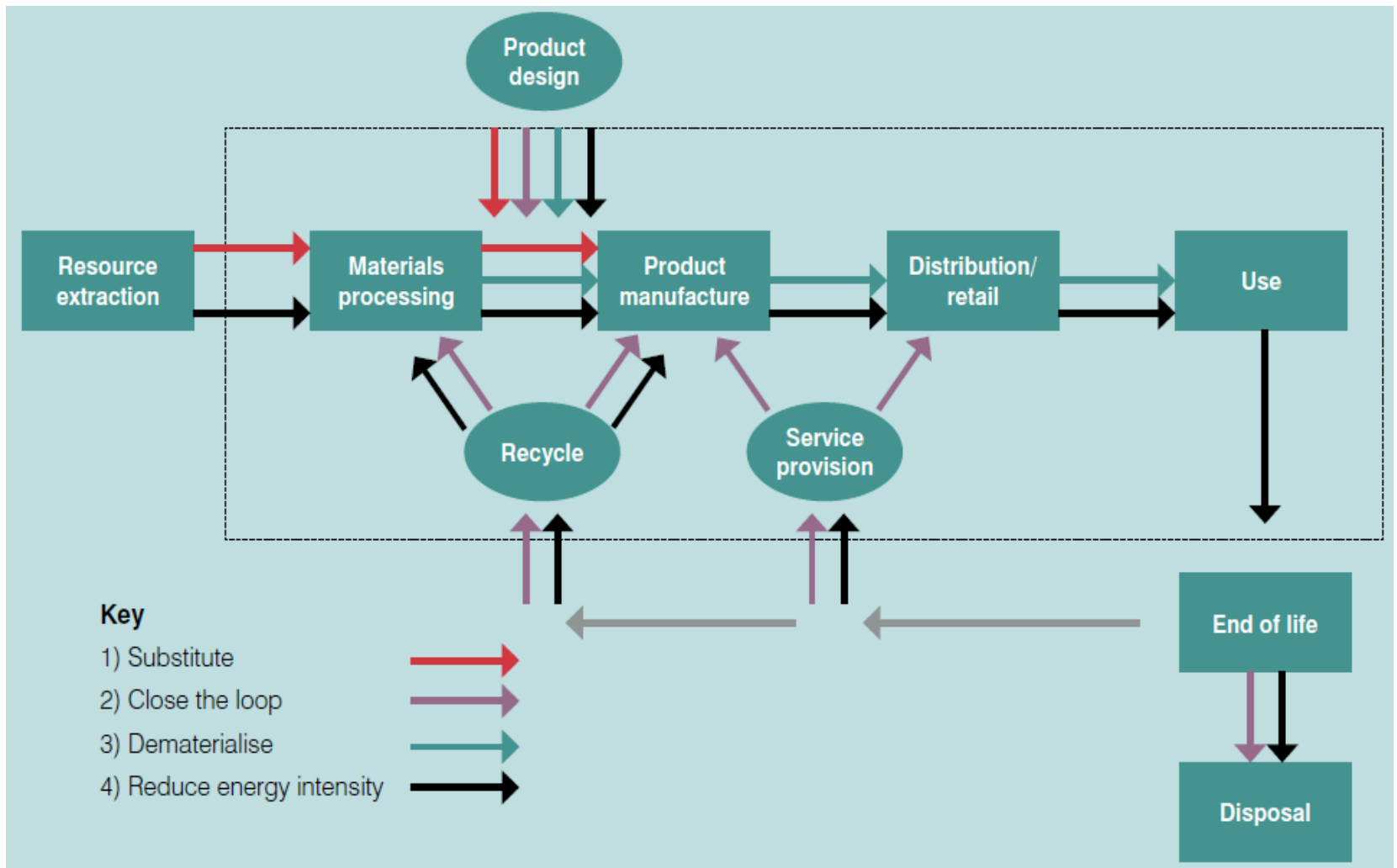
0.189 g of silver

0.028 g of gold

0.014 g of palladium



# Approaches





80% of senior executives from global manufacturing companies cite mineral and metals scarcity as a pressing issue (*PWC, Dec 2011*)

67% see this evolving into an area of opportunity, including the possibility of adopting alternative approaches or substitutes (*PWC, Dec 2011*)

# Consortium

**TNO** innovation  
for life

Knowledge  
Transfer  
Network

**D'APPOLONIA**



RINA  
GROUP



PNO



AeroSpace and Defence  
Industries Association of Europe



feiQue



swerea | MEFOS



# 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**.



# Substitution:



Substance for Substance



Service for Product



Process for Process



New Technology for Substance



**Mapping**  
current substitution  
technologies and initiatives



**Policy**  
recommendations



**Prioritisation**  
of applications under threat



**Networking**  
of the substitution  
stakeholder community



**Roadmap**  
for critical raw materials substitution



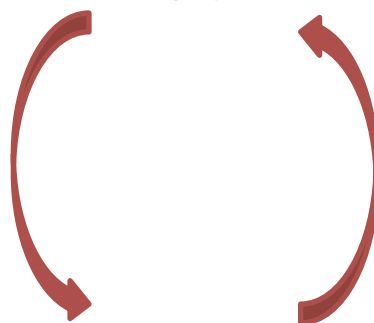
**Materials Mapping**  
current substitution technologies and initiatives



**Application Mapping**  
current substitution technologies and initiatives



**Prioritisation**  
of applications under threat



**Roadmap**  
for critical raw materials substitution



**Policy recommendations**



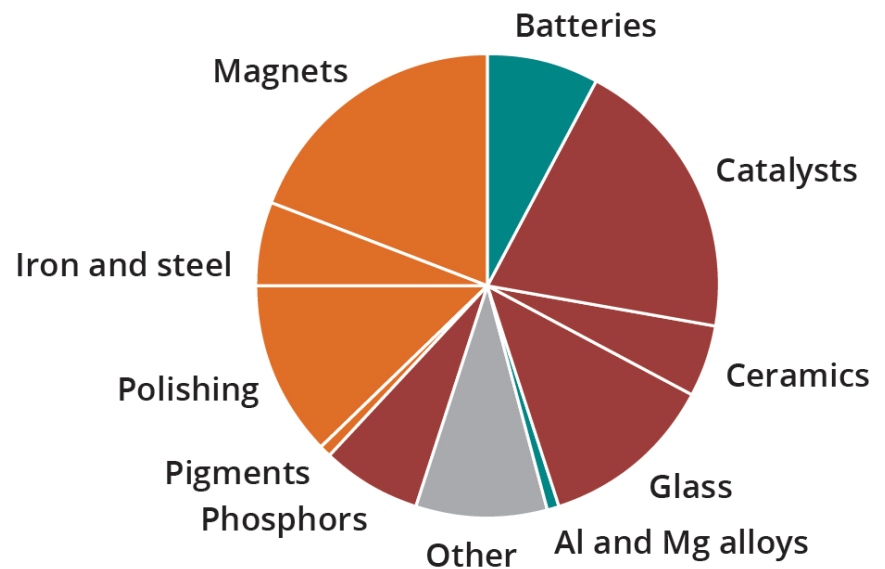
# Material-led approach

Mapping  
current substitution initiatives

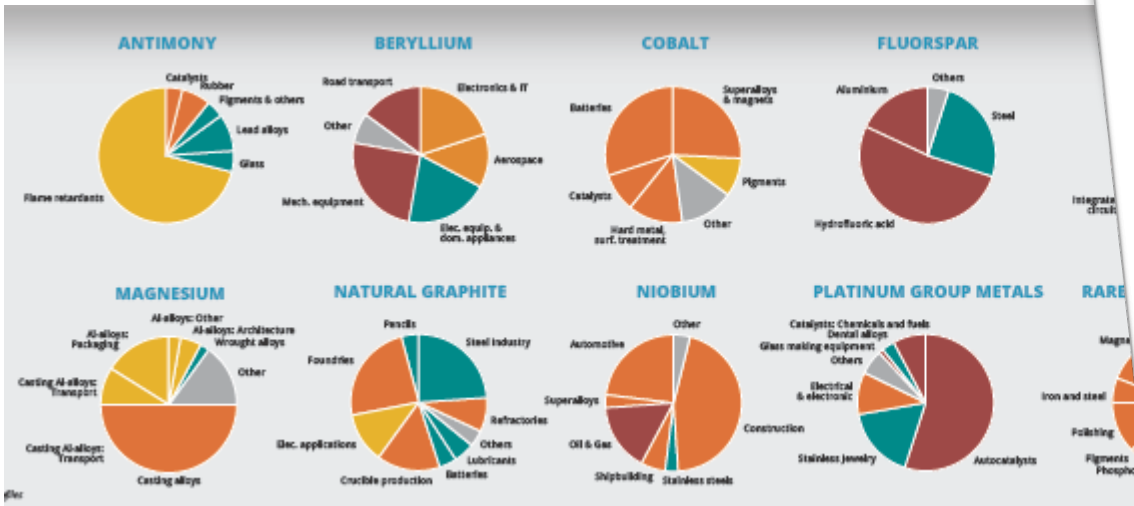


- What are the raw materials used for?
- Are there alternative materials or technologies?
- What are their relative merits?

## RARE EARTH ELEMENTS



# Materials mapping

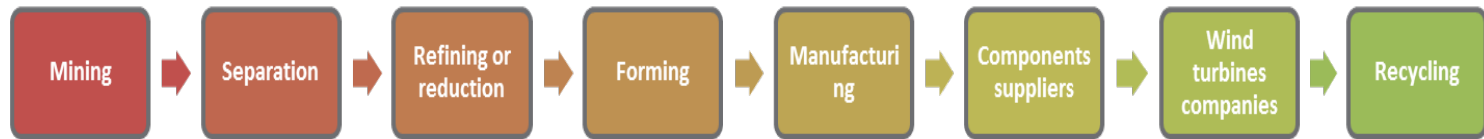


<http://www.criticalrawmaterials.eu/documents/>



# Application-led approach

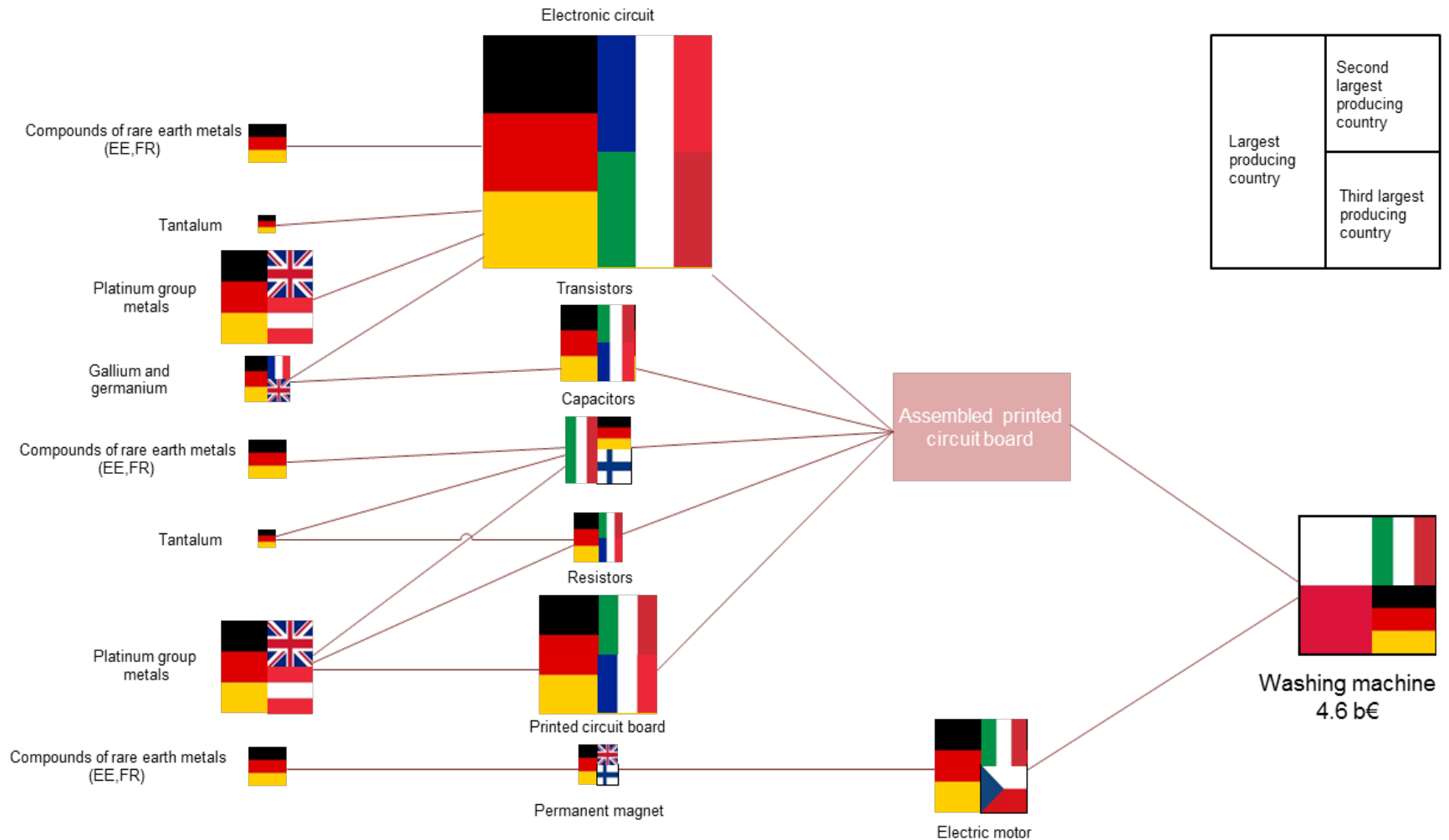
Mapping  
current substitution initiatives



- Energy
- ICT and Electronics
- Transport (Automotive and Aero)



# Example of statistical analysis



# Prioritisation

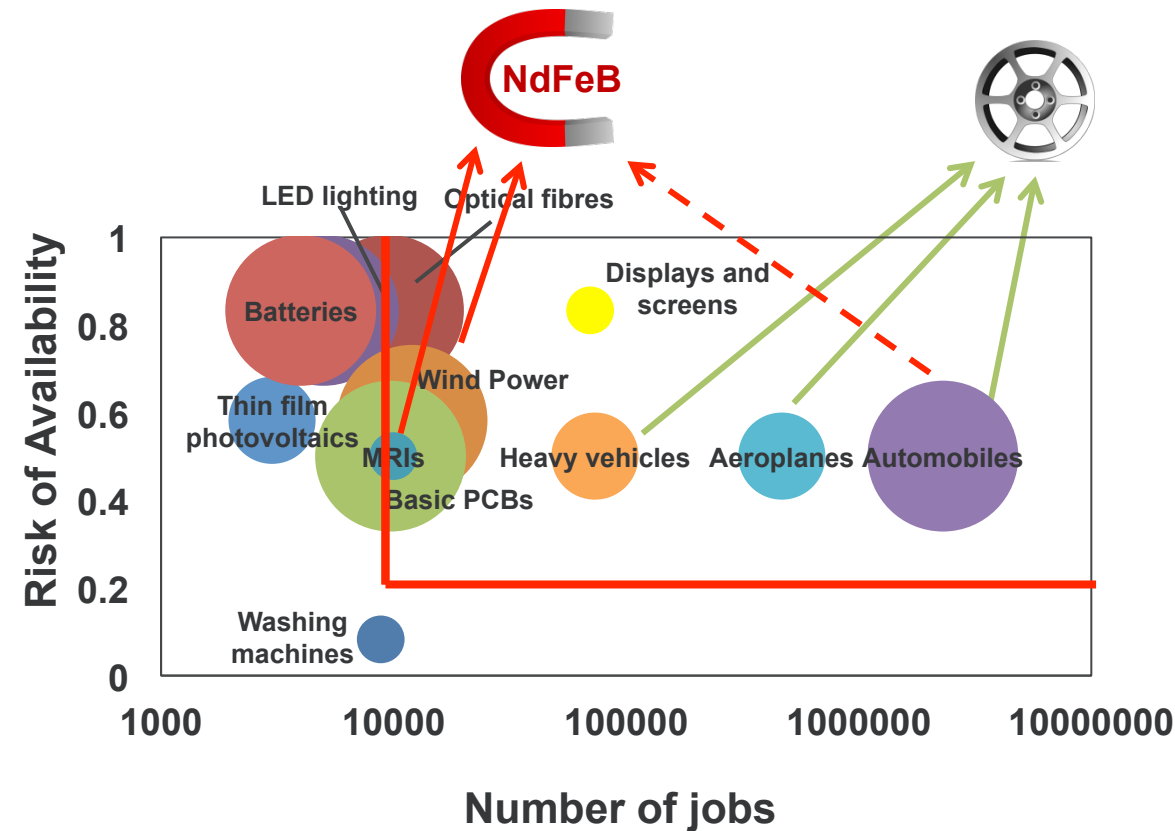
of applications under threat



Criterion	Sub-criteria
<b>Economic</b>	Global market share
	Jobs involved in the EU (excluding indirect jobs)
<b>Availability</b>	Amount of CRMs involved
	Expected future market development
	CRM function
	Availability and status of substitutes
<b>Strategic Relevance</b>	Associated to specific EU policies



# Prioritisation of roadmap themes



1. Motors and drives
2. High value alloys
3. PCBs and electronics
4. Batteries and accumulators
5. Photonics high end optics

In addition, all of these applications rely on complex electronics





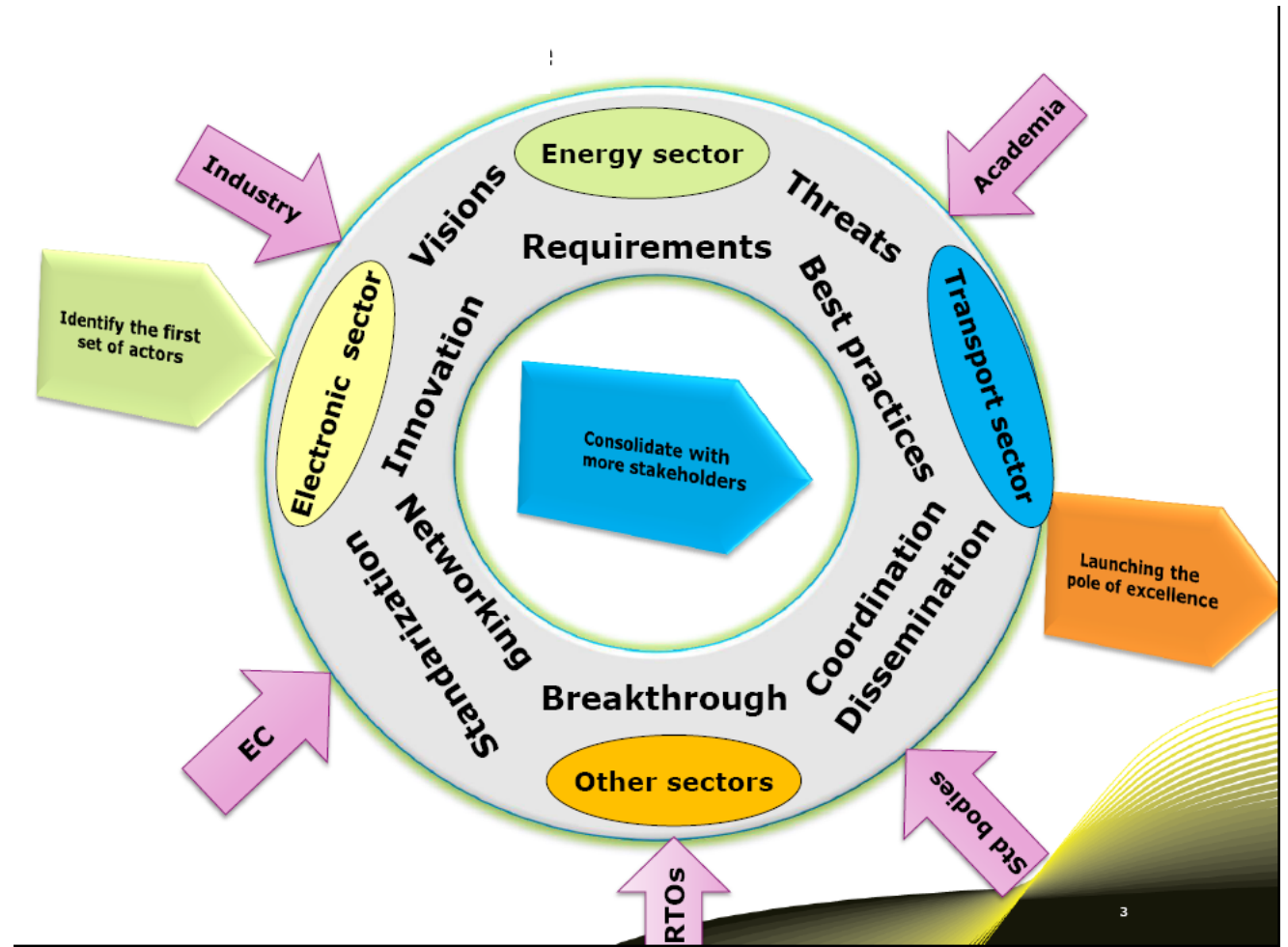
- Substitution strategies for CRM in priority sectors and applications
- To 2030 (by exception to 2050)
- Technical and Non-technical barriers

Policy  
recommendations



- Current Policies
- International learnings
- Success criteria for substitution
- Vision
- Political requirements

# Networking of the substitution stakeholder community



Roadmap  
for critical raw materials substitution



Roadmap  
Consultation

Networking  
of the substitution  
stakeholder community



3<sup>rd</sup> Innovation  
Network  
Workshop

Networking  
of the substitution  
stakeholder community



Final Project  
Conference

May  
2014

Nov - Dec  
2014

Jan  
2015

April  
2015



2<sup>nd</sup> Innovation  
Network  
Workshop

Networking  
of the substitution  
stakeholder community



Policy  
Workshop

Policy  
recommendations



# Project Website



Member Sign in | Not registered? [View benefits](#)



[Project Summary](#) [Innovation Network](#) [News & Events](#) [Project Objectives](#) [Documents](#) [Partners](#)

## Related initiatives

### First project workshop date announced!

Register today to attend a workshop to launch the project stakeholder network on Monday 15th April 2013 in Brussels.

[Read more](#)



CRM\_InnoNet (Critical Raw Materials Innovation Network) will drive innovation and influence policy in the field of **substitution** of critical raw materials for the benefit of EU industry.

CRM\_InnoNet is supported under the NMP (nanosciences, nanotechnologies, materials and new production technologies) theme of the European Commission 7th Framework Programme.

### News & Events



Innovation Network Workshop  
Mar 19, 2013, Comments are off

### Blog

Ongoing CRM\_InnoNet research from TU Delft in the Netherlands  
Mar 04, 2013, 0 Comment

### From Twitter

RT @Dr\_Catj: Transport, Aerospace, ICT or Energy company? Worried about materials security? Innovation Network for CRM can help

# www.criticalrawmaterials.eu



# **CRM\_InnoNet**

**Substitution of Critical Raw Materials**

[www.criticalrawmaterials.eu](http://www.criticalrawmaterials.eu)

susanne.coles@ktn-uk.org

claire.claessen@ktn-uk.org

Twitter: @CRM\_InnoNet



“It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change.” Charles Darwin

