



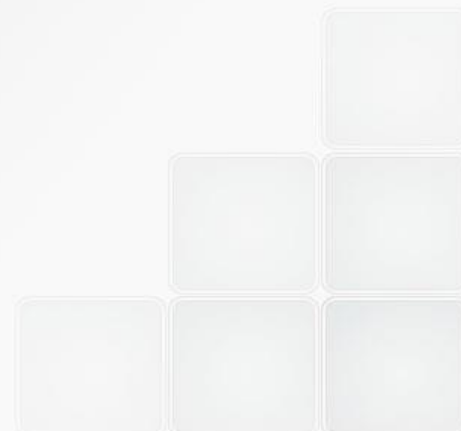
Coming up in Rome: the workshop SMETCH, an opportunity for students and PMI to meet and create ideas in the sustainable use of raw materials

Dario della Sala

ENEA

Responsabile Divisione «Tecnologie dei Materiali e dei Processi per la Sostenibilità»

Nano Rome, 20-23 September
2016 Innovation
Conference & Exhibition

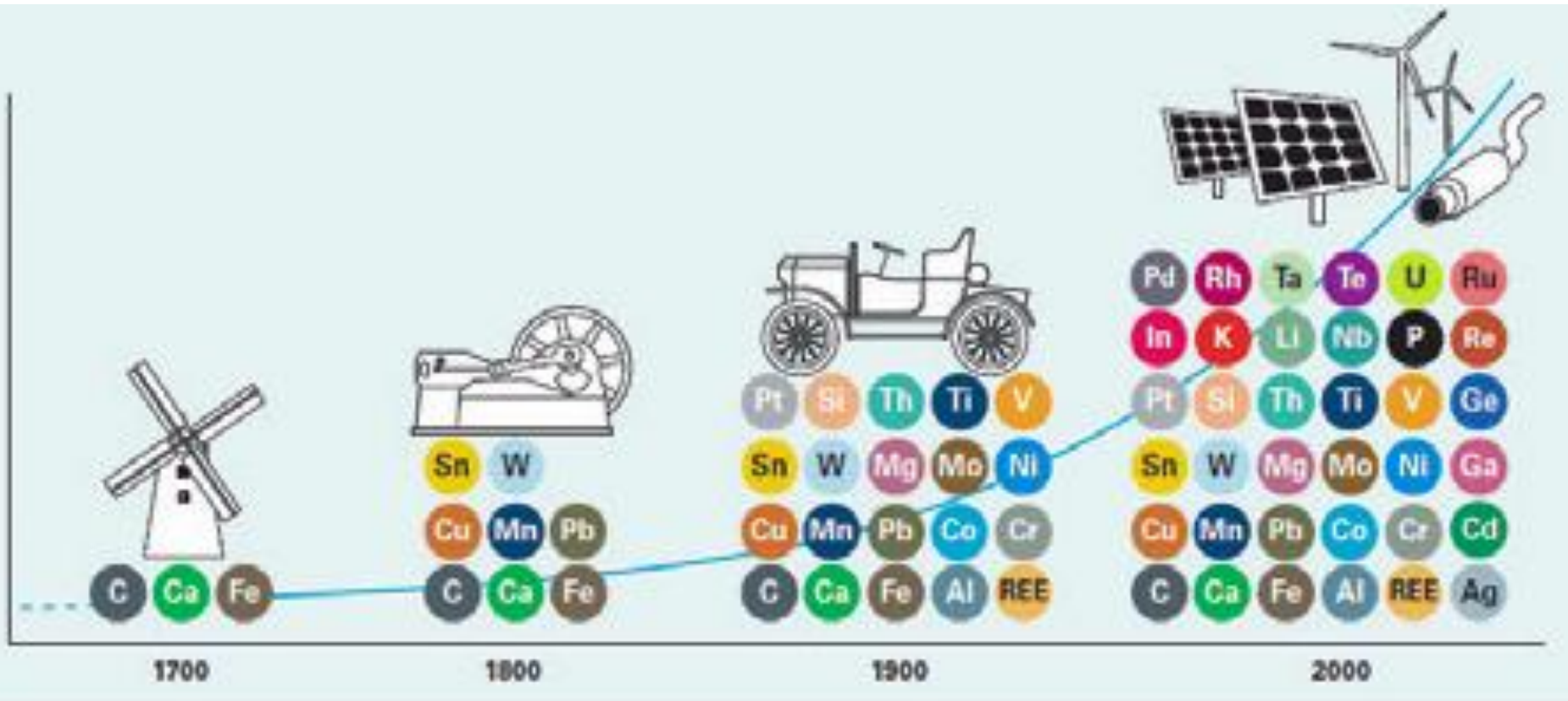




**WE LIVE
WITH
PRECIOUS MATERIALS**



Materials portfolio of some energy technology



Source: EIP Raw Materials – Raw Materials Scoreboard, from: Volker, Z., Simons, J., Reller, A., Ashfield, M., Rennie, C. (BP), 2014, 'Materials critical to the energy industry – An introduction'.

Did you know?

A newborn infant will need a lifetime supply of:

- **300 kg of lead**
- **280 kg of zinc**
- **560 kg of copper**
- **1.350 kg of aluminum**
- **12.200 kg of iron**
- **9.950 kg of clays**
- **1.500 kg of salt and**
- **448.000 kg of stone, sand, gravel and cement**



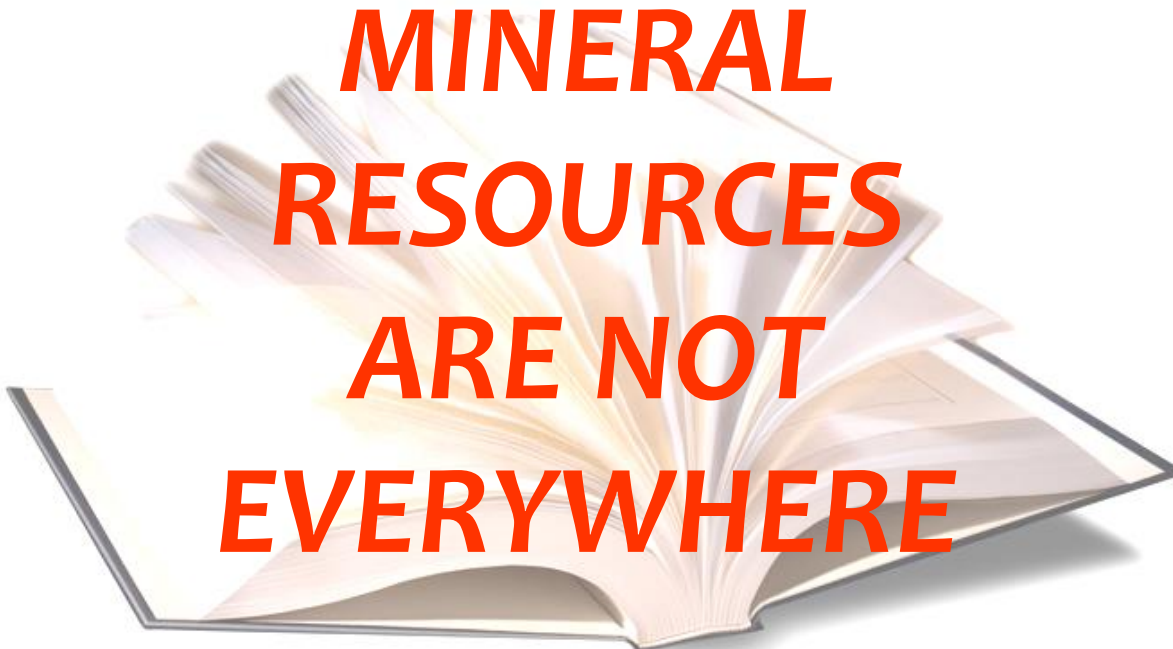
All that has to be mined!

Continued growth by **emerging countries** will keep pressure on demand for raw materials

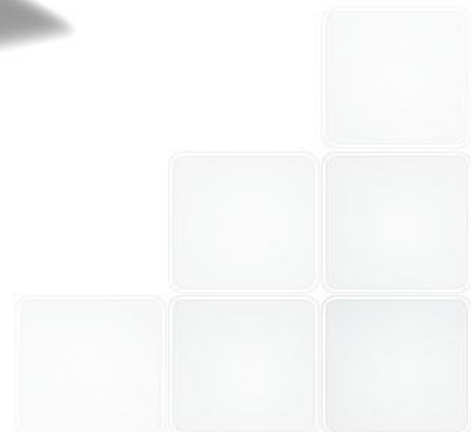
Demand also increasingly driven by demand for **new technologies**

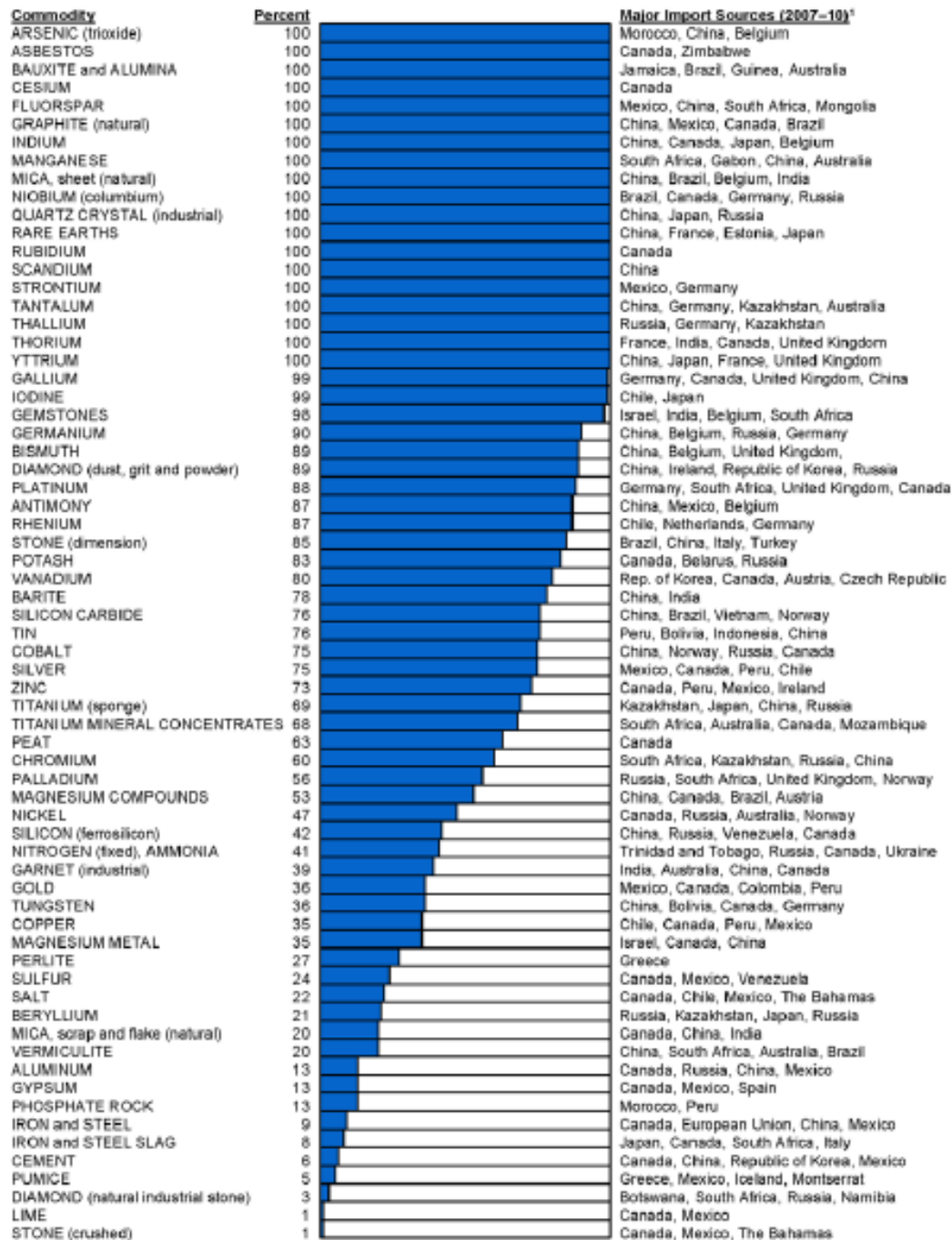
EU highly dependent on imports of important raw materials which are increasingly affected by **market distortions**

Potential in Europe, but increased **competition for different land uses** and a highly regulated environment



**MINERAL
RESOURCES
ARE NOT
EVERYWHERE**

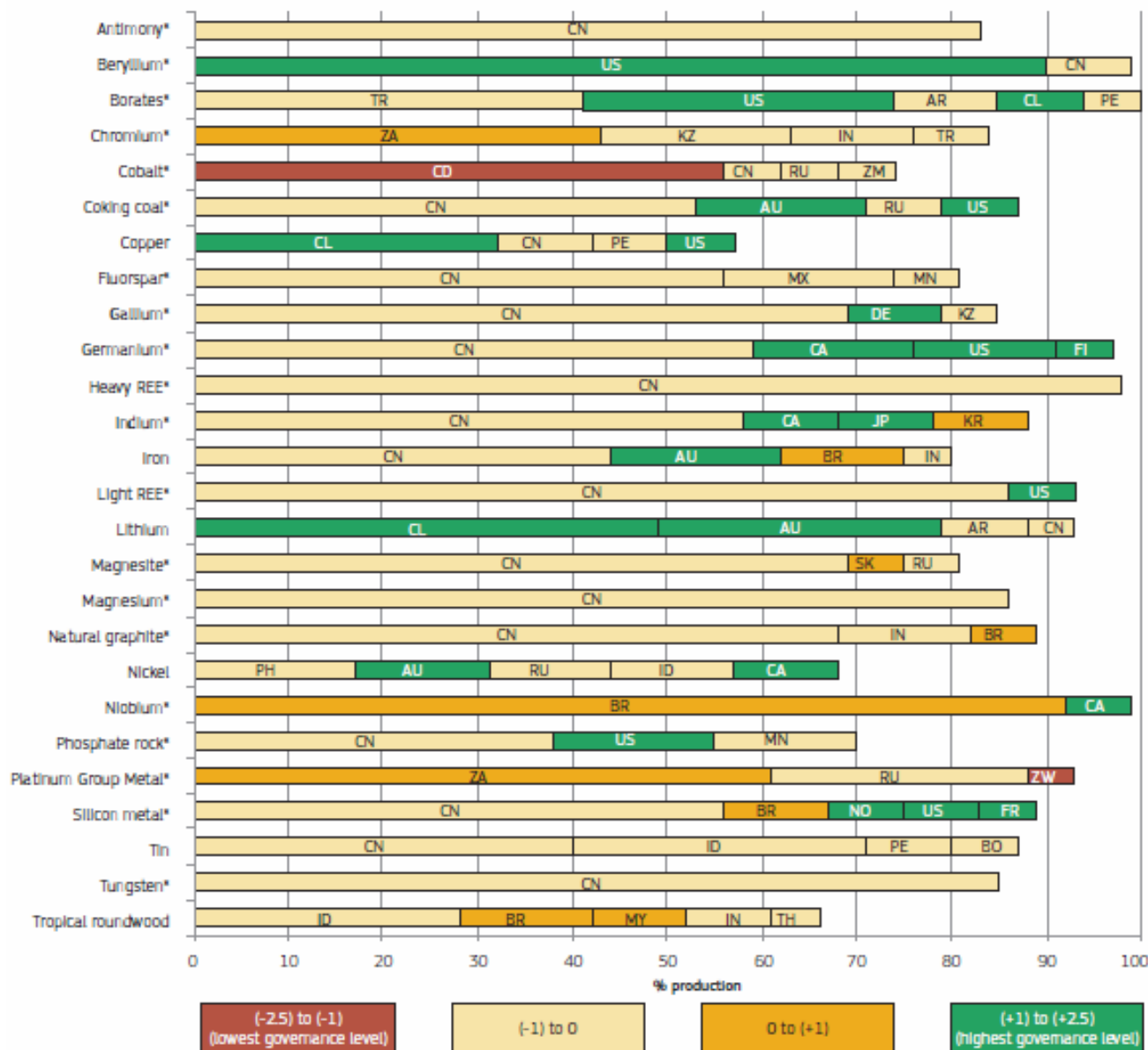




EU is largely dependent on imports of some non-energy, non-food raw materials

Source: L. Mancini - EU-US Expert Workshop on Mineral Raw Materials Flows & Data; Brussels 12-13 Sept. 2012 and USGS Mineral Commodity Summaries (2012)

Geographic concentration & governance quality



Source: EIP Raw Materials – Raw Materials Scoreboard

Two lists of CRM for EU are available



Critical raw materials for the EU

Report of the Ad-hoc Working Group on defining critical raw materials

The ad-hoc Working Group is a sub-group of the Raw Materials Supply Group and is chaired by the European Commission

JRC Scientific and Technical Reports

Critical Metals in Strategic Energy Technologies

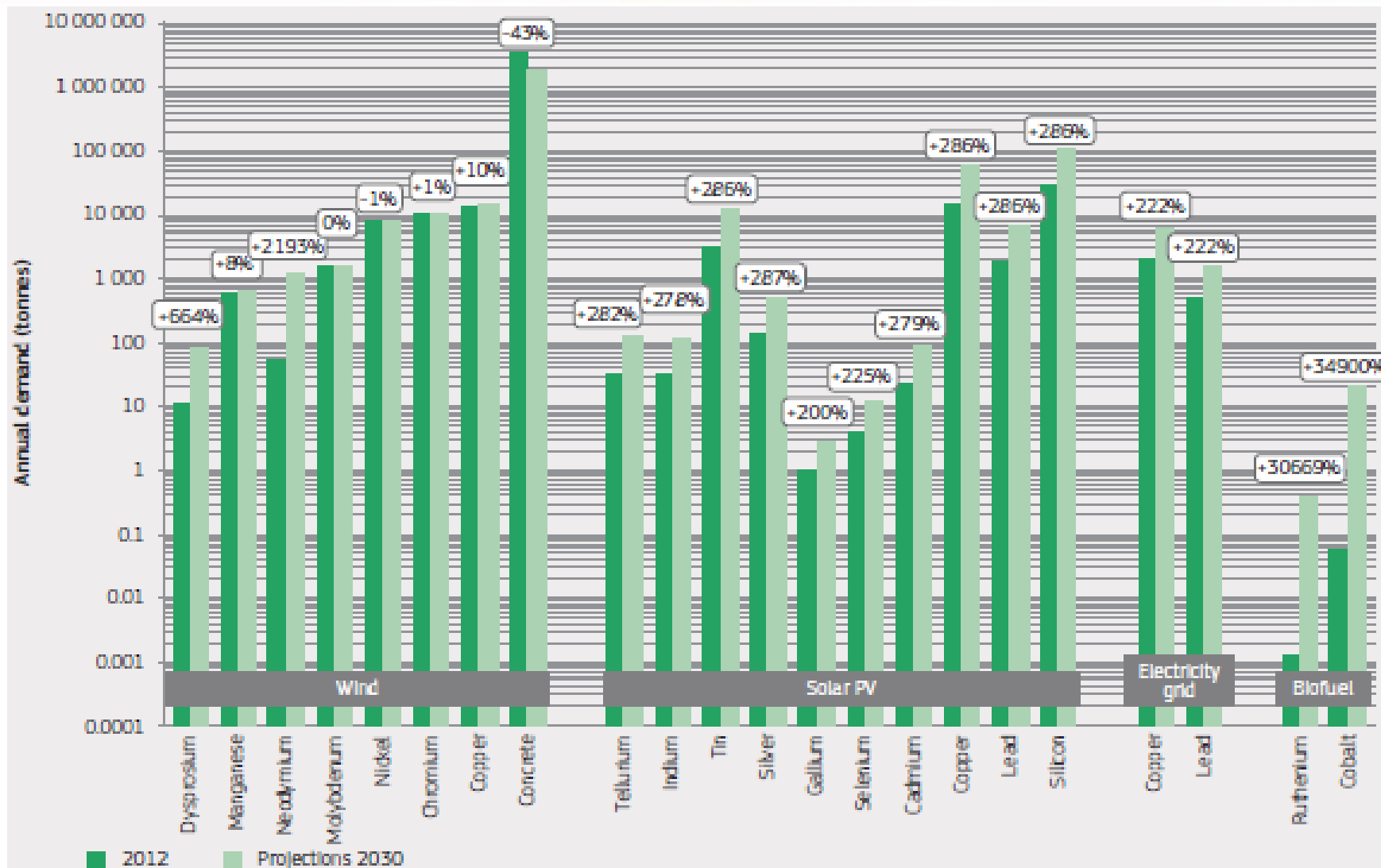
Assessing Rare Metals as Supply-Chain Bottlenecks in Low-Carbon Energy Technologies

R.L.Moss¹, E.Tzimas¹, H.Kara², P.Willis² and J.Kooroshy³

¹JRC – Institute for Energy and Transport
²Oakdene Hollins Ltd
³The Hague Centre for Strategic Studies

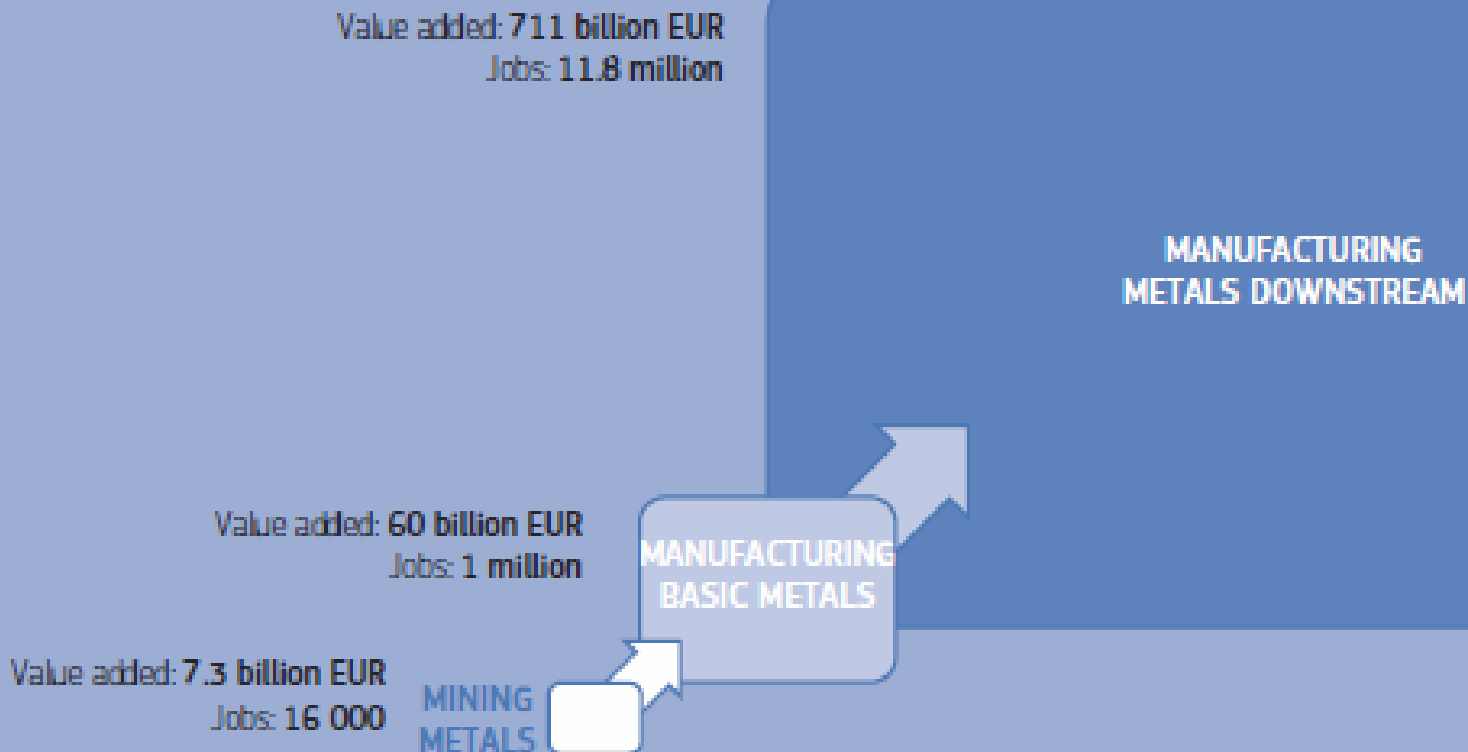
	<i>EU industries</i>	<i>EU energy industries</i>
<i>Antimony</i>	X	
<i>Beryllium</i>	X	
<i>Cadmium</i>		X
<i>Cobalt</i>	X	
<i>Dysprosium</i>		X
<i>Fluorspar</i>	X	
<i>Gallium</i>	X	X
<i>Germanium</i>	X	
<i>Graphite</i>	X	
<i>Hafnium</i>		X
<i>Indium</i>	X	X
<i>Magnesium</i>	X	
<i>Molybdenum</i>		X
<i>Neodymium</i>		X
<i>Nickel</i>		X
<i>Niobium</i>	X	X
<i>Pt Group Metals</i>	X	
<i>Rare earths</i>	X	
<i>Selenium</i>		X
<i>Silver</i>		X
<i>Tantalum</i>	X	
<i>Tellurium</i>		X
<i>Tin</i>		X
<i>Tungsten</i>	X	
<i>Vanadium</i>		X

Annual demand of RM for lowcarbon energy technology

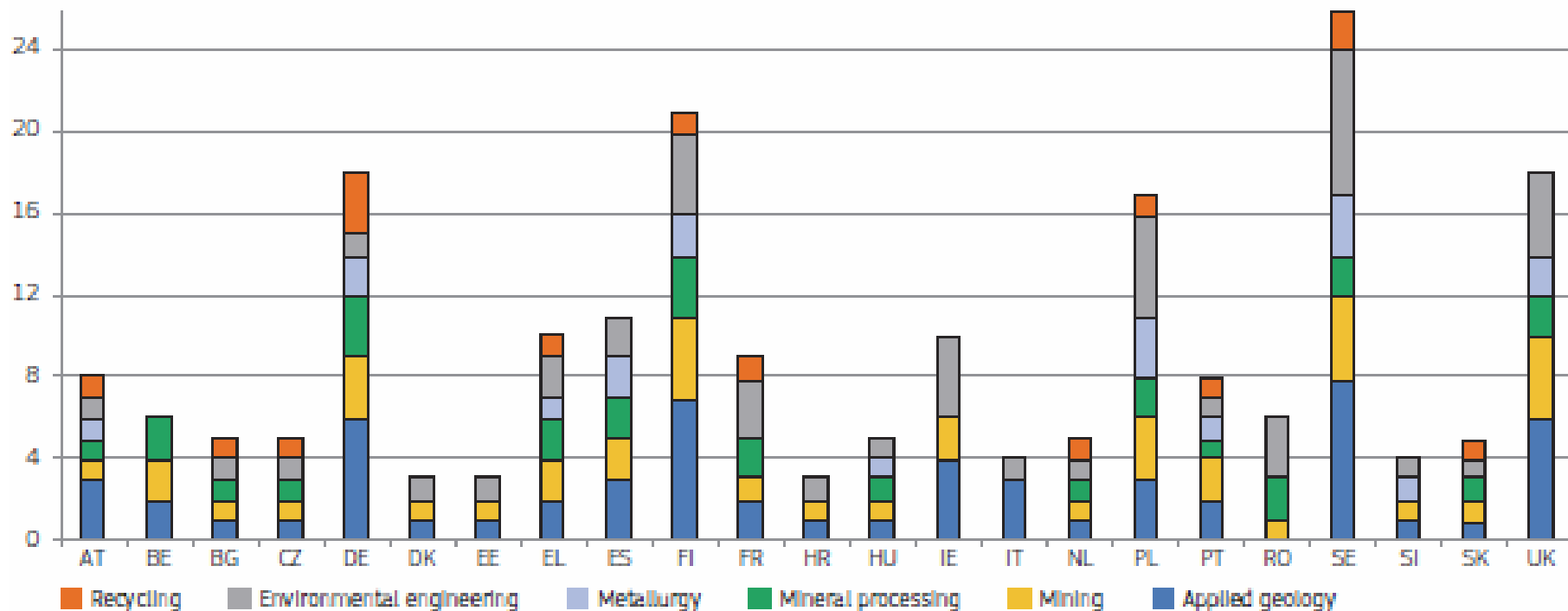


Source: JRC analysis based on European Commission, 2013, 'Critical Metals in the Path towards the Decarbonisation of the EU Energy Sector: Assessing Rare Metals as Supply-Chain Bottlenecks in Low-Carbon Energy Technologies', JRC Science and Policy Reports

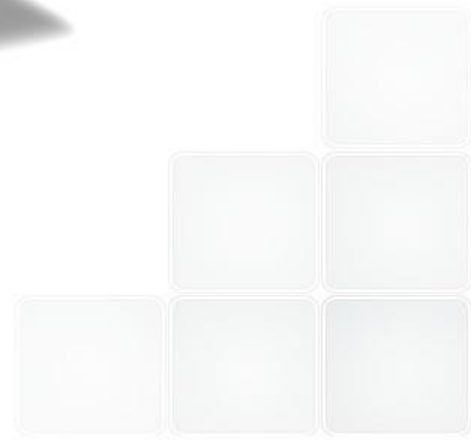
The impact on value and jobs



Education programmes in EU



Source: EIP Raw Materials – Raw Materials Scoreboard

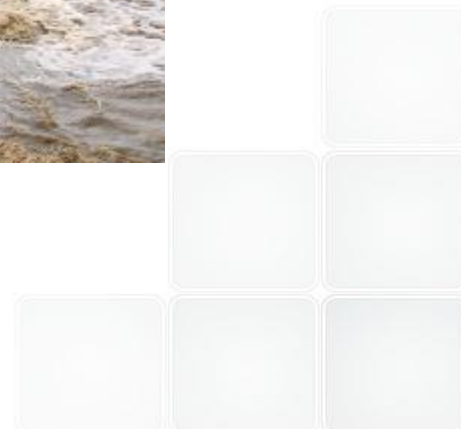


Sustainable and improved mining

e.g.: deep, automated, environmental friendly, in harsh environments, etc...



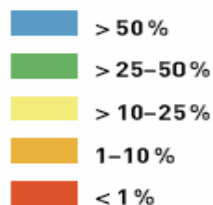
Source: www.cassandralegacy.com, www.edumine.com,



Efficient Recycling

END OF LIFE RECOVERY RATE

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Sg	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uug	115 Uup	116 Uuh	117 Uus	118 Uuo



* Lanthanides

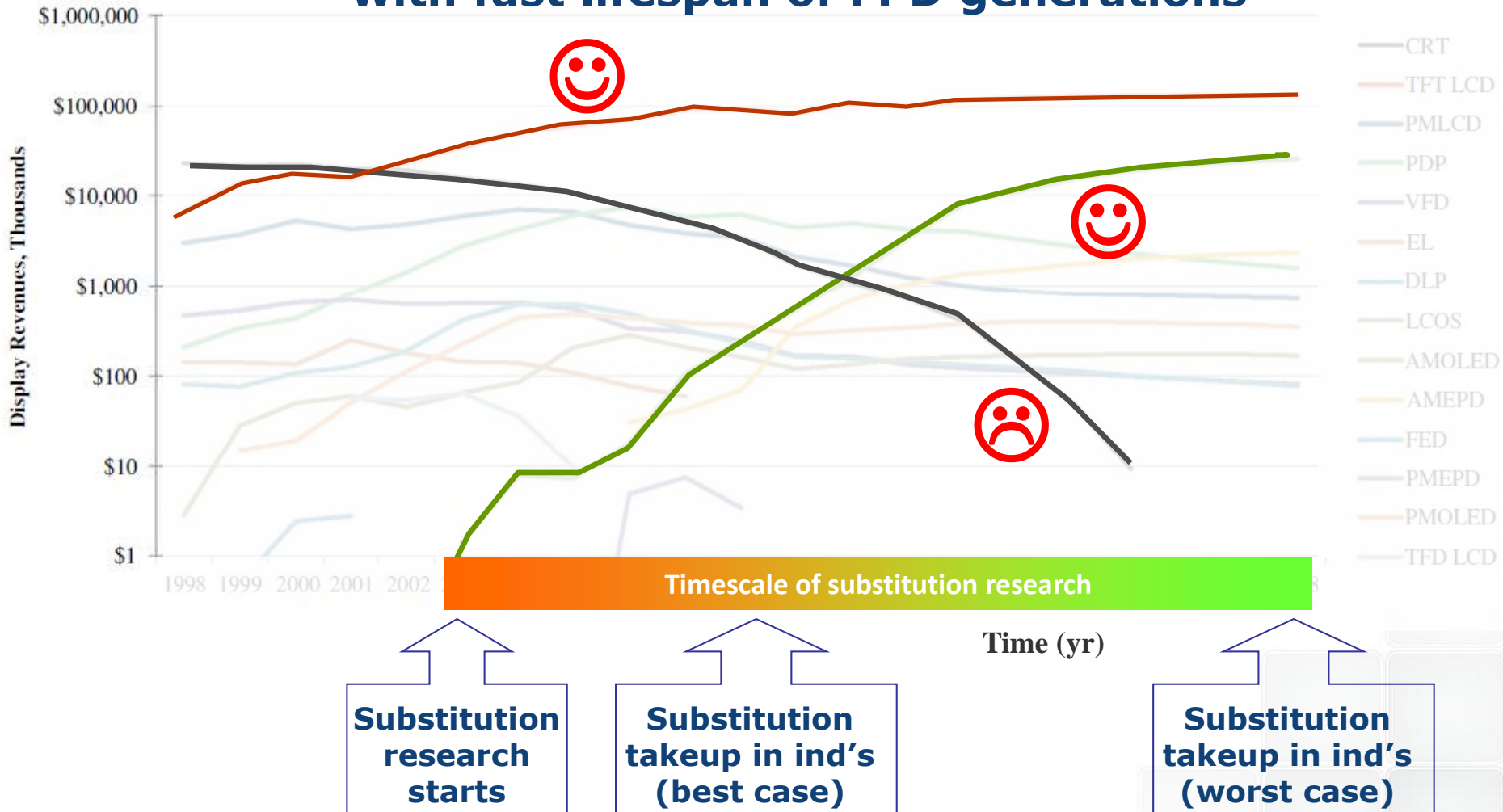
57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

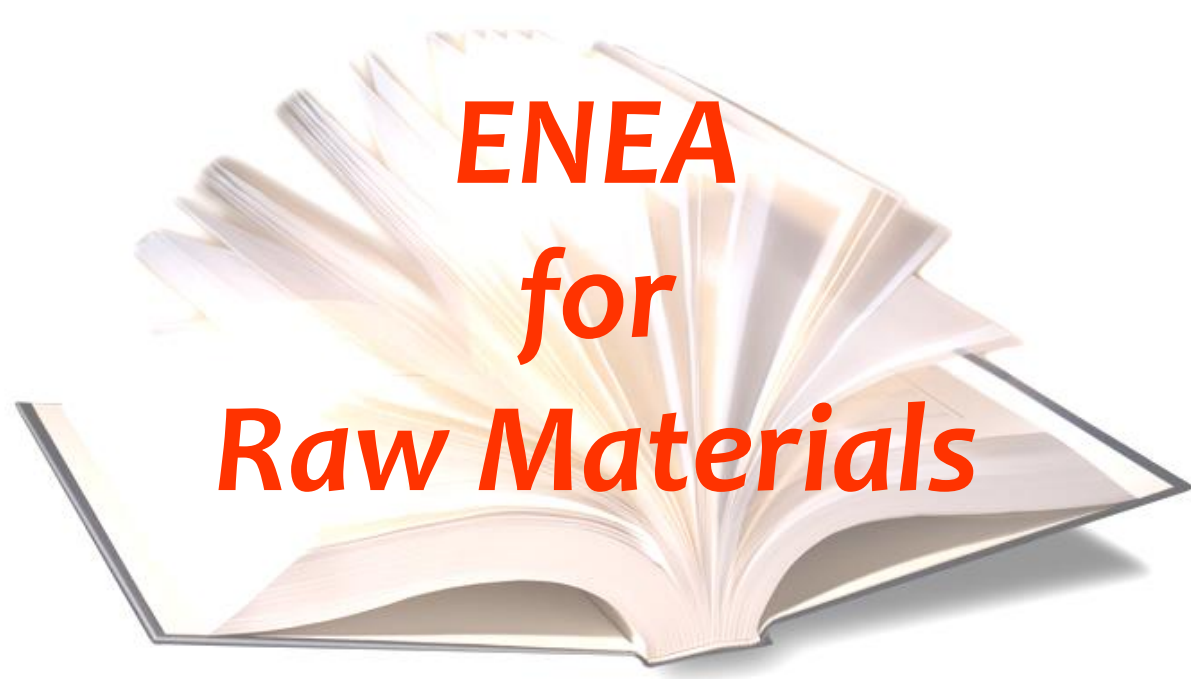
** Actinides

Source: *Recycling Rates of Metals: A Status Report*. Second report of the Global Metal Flows working group of the International Panel on Sustainable Resource Management of UNEP, May 2011. <http://www.unep.org>

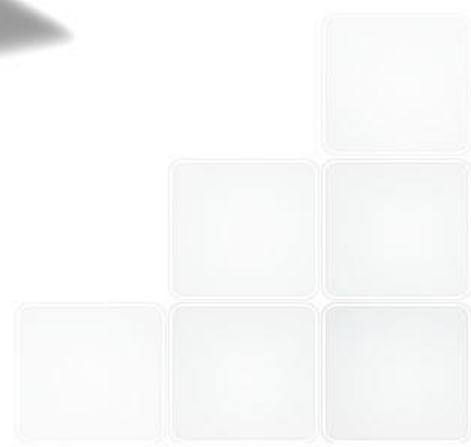
(Wise) substitution of CRM

Exercise: compare substitution timescale with fast lifespan of FPD generations





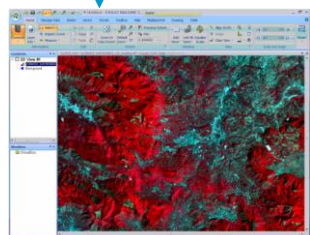
ENEA
for
Raw Materials



Main efforts of ENEA in RM issues

Mining

Modelling for energy and the environment (Rome)



Geomatics and space observation of earth

Substitution

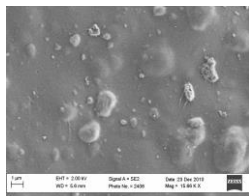
Materials science (Rome)

Materials science (Naples)

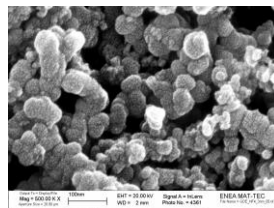
Materials science (Brindisi)



Micro-structure analysis



Indium-free SSL and solar cells



Reduce CRM in energy devices and catalysts

Recycling

Environmental technologies (Rome)



Co, Mn, Pt, rare earth recovery at the end of life of products



Industrial symbiosis, Life Cycle Assessment, GPP, Ecolabel, EPD, EMS

Details



exploration, accounting	extraction and processing	regulations and proactive actions	substitution, industrial use	recycling, reuse	ecodesign, ecolabels	international	
WP 1. Developing new innovative technologies and solutions for sustainable raw materials							
X							<ul style="list-style-type: none"> advanced exploration technologies
	X						<ul style="list-style-type: none"> innovative alternatives for extraction
	X						<ul style="list-style-type: none"> ...hazardous substances in mining processes...treatment from mining waste...
	X			X			<ul style="list-style-type: none"> advanced technologies ...for minerals and secondary raw materials...
				X			<ul style="list-style-type: none"> turning wastes into valuable secondary raw materials ...
		X					<ul style="list-style-type: none"> the development of standardisation roadmaps...
WP 2. Developing new innovative materials by design and solutions for the substitution of							
			X				<ul style="list-style-type: none"> ...the most economically vital and ecological sensitive applications where critical raw materials
			X				<ul style="list-style-type: none"> ...sustainable alternatives, for ...LEDs..., or electrical drives, catalysers, indium and gallium, TC
			X		X		<ul style="list-style-type: none"> ...resource efficient production....
			X				<ul style="list-style-type: none"> ...ETP ...new ideas for innovative materials and products....
WP 3. Improving Europe's raw materials regulatory framework, knowledge and							
X							<ul style="list-style-type: none"> ...exploration of primary and secondary raw materials...including urban mines...
X							<ul style="list-style-type: none"> make use of satellite based information systems such the Global Monitoring for Environment
	X	X					<ul style="list-style-type: none"> ...best practices in defining a minerals policy in the Member States.....
	X	X					<ul style="list-style-type: none"> ...best practices in terms of land-use planning for minerals in the Member States....
	X	X					<ul style="list-style-type: none"> ...facilitate the process for authorisation of minerals exploration and extraction....
X		X					<ul style="list-style-type: none"> standardisation of geological data.....
	X	X					<ul style="list-style-type: none"> ...high-tech mining industry....
WP 4. Improving the regulatory framework via promotion of excellence and promoting recycling through public procurement and private initiatives							
		X					<ul style="list-style-type: none"> ...taking advantage of the experience of the most advanced Member States
	X						<ul style="list-style-type: none"> ...application of the existing Best Available Technique...for the extractive industry...
		X		X			<ul style="list-style-type: none"> improve the profitability and reduce the cost of recycling....
		X		X			<ul style="list-style-type: none"> identifying ways of tracking major flows of waste inside and outside the EU....
			X		X		<ul style="list-style-type: none"> ...new product policies focused on material efficiency....
		X		X	X		<ul style="list-style-type: none"> ...standardisation and/or certification schemes ...for recycling facilities...
WP 5. International framework – horizontal approach							
X							<ul style="list-style-type: none"> geology and improving the geological knowledge base
X	X		X	X	X		<ul style="list-style-type: none"> research and innovation
						X	<ul style="list-style-type: none"> trade and investment conditions
						X	<ul style="list-style-type: none"> policy dialogue/co-operation with international organisations and fora....

Portfolio 2016: ENEA in EIT RawMaterials (Network of Infrastructures)



Acronym	Full title	Snapshot
EXTREME (ENEA coordinator)	Substitution of CRMs in components and coatings used under extreme conditions	Substitution of critical materials to be used in «extreme» conditions as temperature, wear, corrosion, etc. Main objectives: <ul style="list-style-type: none">- New actions to substitute the aforementioned materials;- Services (modelling, development of coatings and bulk materials, test, recovery, recycling, etc...) for companies and research organizations;- Support training and education
NANOGREAT (FBK coordinator)	Graphene NANOcomposites REActors at preindustrial Technology readiness	Upscaled production of graphene nano-composites. Graphene based materials and composites as substitution materials (“more than metal”) Collaboration with the FET FLAGSHIP GRAPHENE

Portfolio 2016: ENEA in EIT RawMaterials (Network of Infrastructures)



Acronym	Full title	Snapshot
OPTNEWOPT (ENEA coordinator)	Materials substitution in optoelectronic devices	Reduce or substitute the use of indium, gallium and germanium in opto-devices. (e.g. photovoltaic panels, LEDs, displays and photodetectors). Create an infrastructure to study and develop new materials and support European companies and new entrepreneurship
LIGHTWEIGHT MATERIALS (TU Freiberg coordinator)	Metal-based lightweight materials	Production, processing, application and recycling of lightweight metals. Pool existing research laboratories and infrastructures (about light-metals and metal-based hybrid materials) Provide access to the labs and offer extended research opportunities for researchers and industrial entities

Portfolio 2016: ENEA in EIT RawMaterials (Network of Infrastructures)

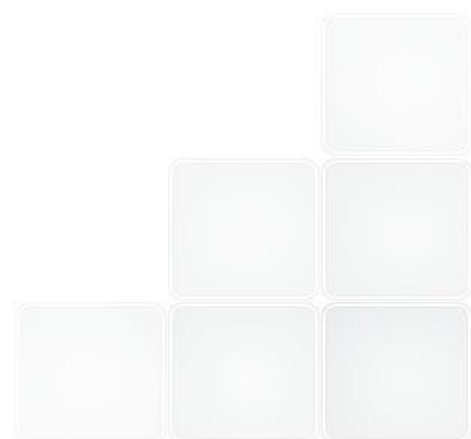


Acronym	Full title	Snapshot
PCRec (ENEA coord.)	Product Centric Recycling	<p>Product-centric recycling of Waste Electrical and Electronic Equipment (WEEE).</p> <p>Facilitate the access to infrastructures targeting printed circuit boards (PCBs), lighting devices, LCD, flat screens, permanent magnets.</p> <p>Avoid duplication of infrastructures and pilot plants, share complementary equipment</p>
SSIC (Ghent University coord.)	Sustainability Support and Information Centre	<p>Make use of a state-of-the-art sustainability assessment toolbox.</p> <p>Become the central contact point, from resource extraction to product design and recycling, about questions regarding input output analysis, life cycle assessment, life cycle sustainability assessment, socio-economic assessment, sustainability of material flows and stocks, cost benefit analysis, recyclability benefit calculations, criticality analysis, etc.</p>

Portfolio 2016: ENEA in EIT RawMaterials (Network of Infrastructures)



Acronym	Full title	Snapshot
ERMAT (Höganäs AB Coordinator)	Efficient use of Residual MATerials	Registry of by-product suppliers, needs and processing/transformation routes. The main goal is to increase the usage of residual material for new products and as complement to virgin raw material within Europe resulting in a higher utilization of as well as >9000 ktons less deposits



Portfolio 2016: ENEA in EIT RawMaterials (Upscaling of products, processes and services)



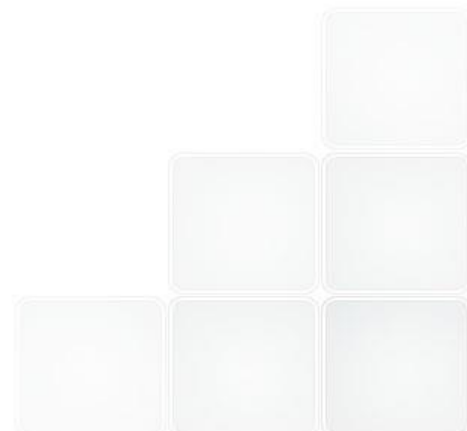
Acronym	Full title	Snapshot
ECOCOMBAT (Fraunhofer coord.)	ECOLOGICAL COMPOSITES FOR HIGH-EFFICIENT LI-ION BATTERIES	Produce new composites for the next generation of lithium-ion batteries, the high-voltage batteries. This up-scaling comprises an improved quantity, efficiency and sustainability of the production processes
AVAR (Rusal Coord.)	Added Value Alumina Refining	Produce a number of scarce raw material for the European economy from wastes from the alumina refining industry. Capture of high purity gallium and vanadium from upstream spent Bayer liquors whilst improving alumina yield within the Bayer process.



Portfolio 2016: ENEA in EIT RawMaterials (Upscaling of products, processes and services)



Acronimo	Progetto	Descrizione
STORM (ENEA Coord.)	Industrial Symbiosis for the Sustainable Management of Raw Materials	Provide services for the implementation of cooperation models of circular economy about raw materials from end of life complex products with more attention for secondary products. Facilitate the exploitation of European secondary resources



Portfolio 2016: ENEA in EIT RawMaterials (Learning & Education)



Acronimo	Progetto	Descrizione
RMProSchool (TU Freiberg coord.)	RMProSchool	Provide a course program, by hiring world leading specialists to teach their experience, knowledge and insights to the participants
RAMSES (Univ. MI- Bicocca coord.)	Advanced School on Critical Raw Materials Substitution for Energetics and Photonics	A short PhD class promoting novel material strategies for the substitution or reuse of critical materials in the fields of energy and photonics.
RefresCO (ENEA Coord.)	Professional Refresher Courses	Provide on-demand professional refreshment courses regarding recovery of materials from secondary resources and substitution of CRM and related fields such as environmental evaluation, business opportunities and supply chain management.



See you in SMETCH
EIT RawMaterials aims to foster an innovative and entrepreneurial approach to education **blending several disciplines**, to address the needs of development for youngs and professionals in the field of raw materials , to support the effective development of **ideas to business** and contribute to build up an **efficient, competitive and sustainable industry** , from an economical, environmental and social point of view.
(ENEA-Casaccia

SMETCH objectives

- ✓ Release info about EU initiatives about strategic raw materials
- ✓ Keep Italian SMEs to activities and funding of **EIT RawMaterials**

Oct. 4-5, 2016)

“SMETCH: SMEs match in Italy with EIT RawMaterials”

Prima giornata **4 ottobre 2016**

9,30 Registrazione

9,45 **Sessione Plenaria**

- Apertura dei lavori
- **Timo Hapaleehto**, Program Manager - *European Investment funds for Raw Materials sector – state of play*
- **Mattia Pellegrini**, CE DG GROW – *Finanziamenti europei per la ricerca delle PMI*
- *Attività ENEA nel settore Materie Prime*

11,15 *Coffee break*

- 11,30
- Union Camere (speaker tbd) - *Il supporto di Unioncamere a EIT Raw Materials*
 - **Enrico Veneri** – ZANARDI Fonderie S.p.A. - *Una testimonianza di partecipazione a EIT Raw Materials*
 - *Le PMI illustrano le proprie attività*
 - Dibattito

13,30 *Pranzo*

14,30 Incontri bilaterali tra PMI, Enti di ricerca, Consorzi, studenti

17,30 Conclusioni

19,30 *Cena sociale*

Seconda giornata **5 ottobre 2016**

9,30 Introduzione ai lavori della giornata

10,00 Tavola rotonda sulle principali aree di interesse

12,00 Valutazioni a caldo e conclusioni

**See you in SMETCH
(ENEA-Casaccia
Oct. 4-5, 2016)**

***Register to SMETCH
at:***

<https://www.b2match.eu/smetch2016>