

Joint Research Centre

Institute for Environment and Sustainability, *Sustainability Assessment Unit*

Critical Raw Materials: *Policy intervention strategies based on life cycle approach*



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Protecting Endangered Elements
Brussels, 22nd Sept 2015

Serving society
Stimulating innovation
Supporting legislation

Outline

- The JRC at European Commission; Support to the Raw Materials Knowledge Base
- Criticality assessment – EU Policy Support
- Criticality and Life Cycle Thinking – new approach towards a Circular Economy
- Zoom on two mitigation strategies:
 - Substitution
 - Recyclability
- Summary

The JRC inside the European Commission

*The **Joint Research Centre (JRC)** is the European Commission's in-house science service. It provides the science evidence for policy decisions, with a view to ensuring that the EU achieves its goals for a productive and competitive economy as well as a fair, secure and sustainable future for its citizen.*



Focus? Energy and raw materials

- Essential inputs to the production processes, together with human resources (including our innovative mind) and natural resources
- They account for 21-22% of world's trade (3,300 bn Euro)
- It's not their scarcity the priority problem, but their sustainability and renewability; however, scarcity remains an issue for some of them

Energy:

larger share (80%), fewer categories, impact at all levels

Who's next? Perhaps critical raw materials...
Are they endangered?

Endangered or critical?

Endangered:

- scarcity
- demand
- dangerous way of use/consumption

Critical:

- scarcity
- demand
- accessibility (supply risk may have other cause)
- strategic, geo-political behaviour

Myth or reality? The voracious Europe



The dilemma in Europe:

Consumption-oriented society
and economy

vs

Responsible producer and
consumer focused on
sustainability and fairness

The response:

EU policies and impact
assessment criteria oriented
towards the sustainable thinking

JRC Support to *EU Raw Materials Knowledge Base*

Knowledge Management

- JRC Raw Materials Information System → EU RMKB (Raw Materials Knowledge Base)

Development of Methods and Tools

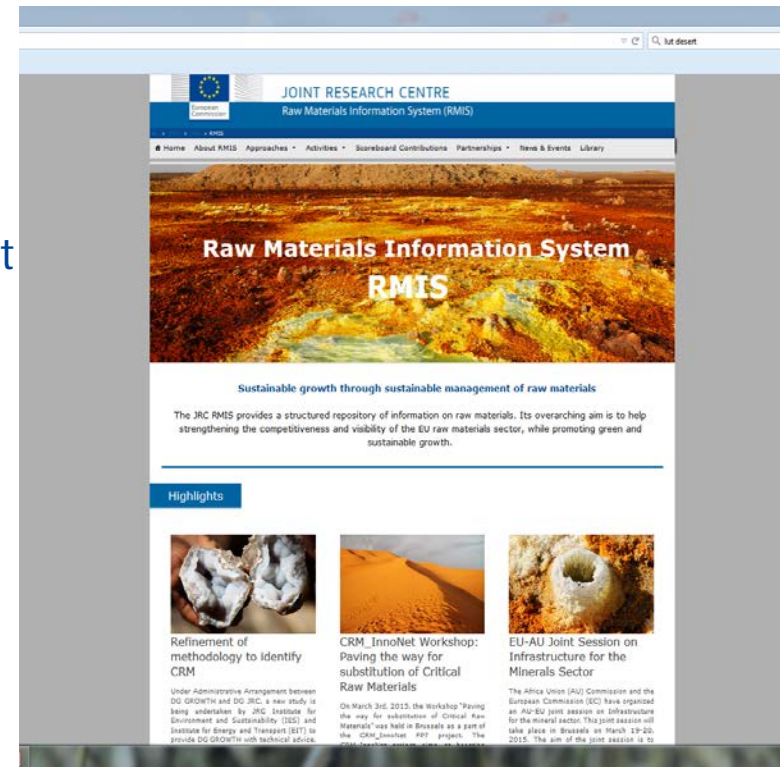
- Developing the Raw Materials Scoreboard, as part of EIP RM action plan
- LC Indicators on Waste Management

Analyses and Impact Assessments

- Assessment of Critical Raw Materials (CRMs)

Partnerships and International Dialogue

- Sustainability Support and Information Centre, partnership with EIT Raw Materials
- Support to Trilateral EU-US-Japan on Raw Materials



Support to EU Policy on Raw Materials: Criticality Assessment

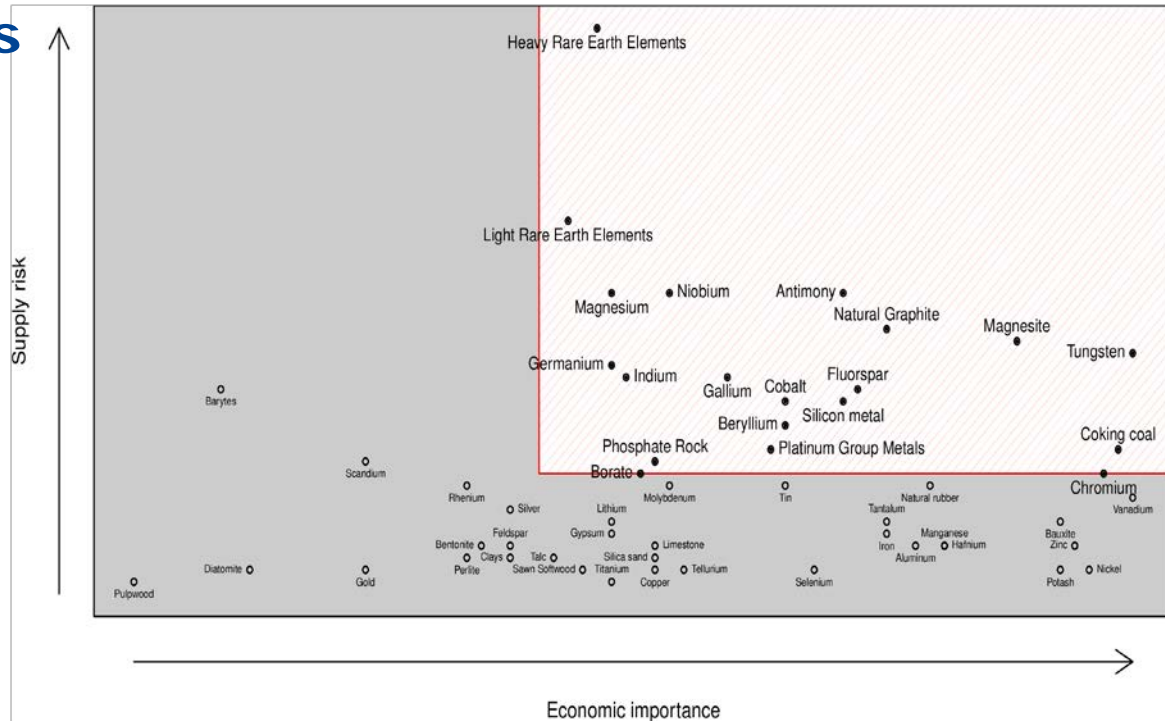
Critical Raw Materials for the EU (2014 list)

Economic importance

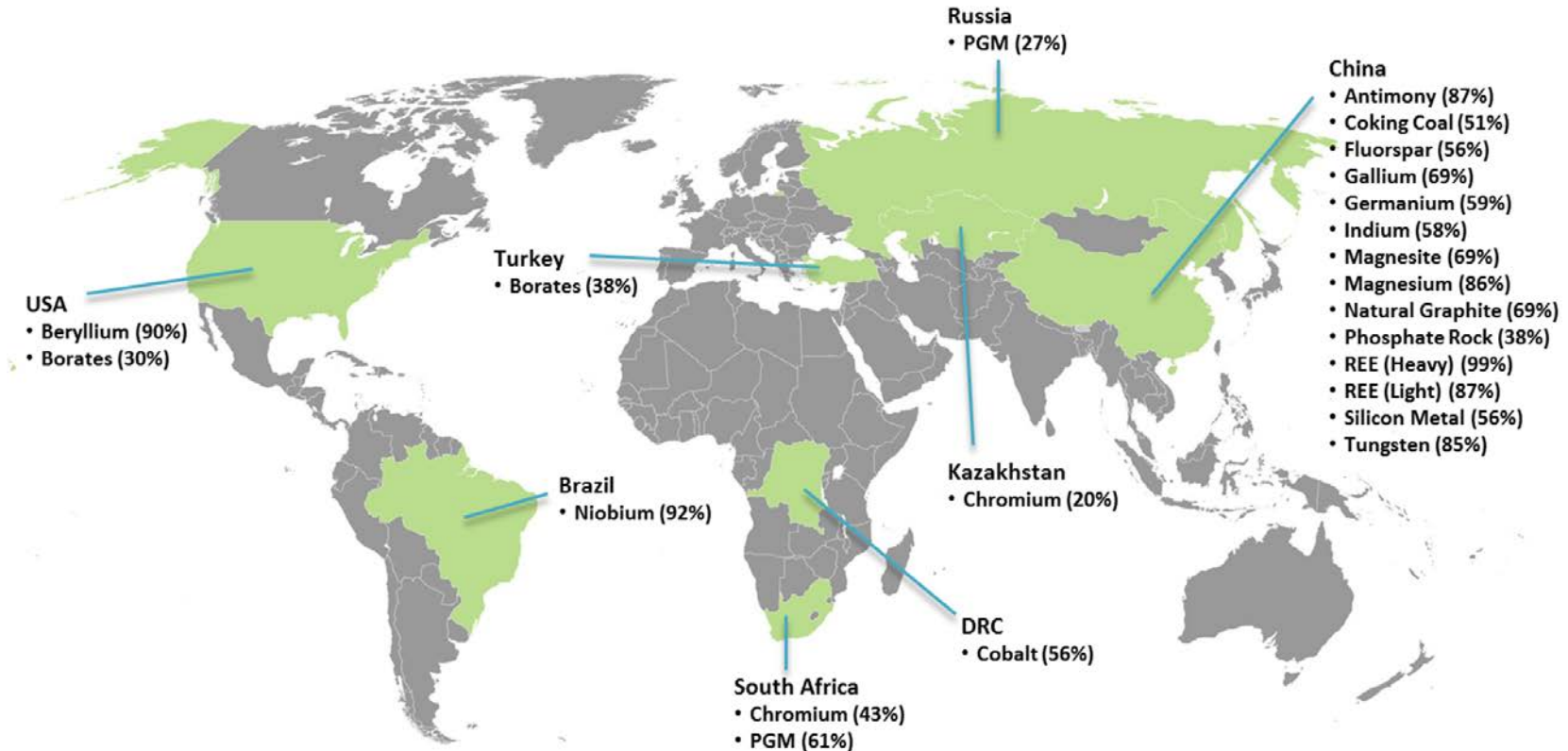
- Importance of a raw material per economic sector & importance of the sector in the EU economy

Supply risk

- Political and economic stability
- Level of production concentration
- Potential for substitution
- Recycling rate



- Critical Raw Materials (**CRMs**) combine a **high economic importance** to the EU with a **high supply risk**
- To address current and future challenges, the EC has created in **2010** a list of **14 CRMs**
- The list was updated in **2014** to **20 CRMs**



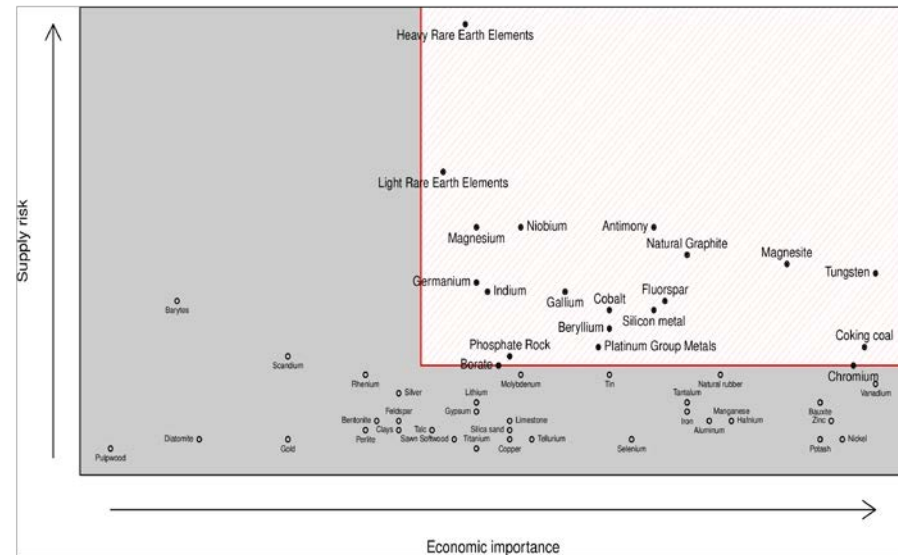
Examples of CRMs include **rare earth elements**, **cobalt**, **indium** and **platinum group metals**...

Critical raw materials list as a policy tool

- Contribute to the implementation of the EU industrial policy
- Incentivise the European production of critical raw materials and facilitate the launching of new mining activities
- Monitor issues of critical raw materials to identify priority actions (trade, legislation, research)
- Policy actions not limited to critical raw materials exclusively
- Contribute to a more circular EU Economy (more recycling)

Reviewed methodology
available early 2016

DG GROW → DG JRC

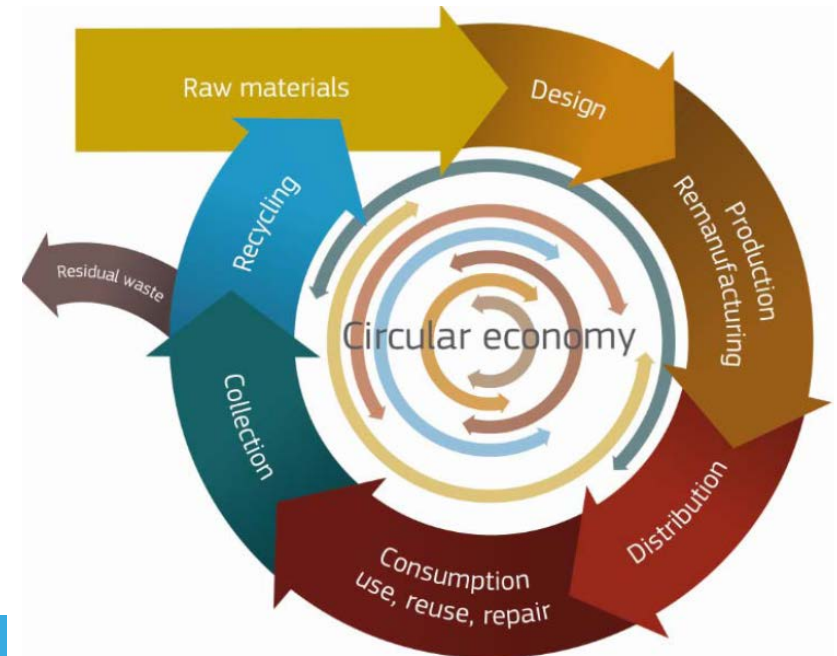


→ Revision of the methodology (2015)

→ Updated list of CRMs (early 2017)

Looking at Critical Raw Materials using a Life Cycle Thinking:

The entry point for the Circular economy



Role in Criticality management

- **LCA** contributes to the creation of the **knowledge-base** necessary for the **strategic management** of resources,
- identifies where raw materials are used in supply chains and how they are managed at end-of-life
- Help identify improvement options that reduce reliance on critical raw materials (CRMs):
 - **Substitution**
 - **Recyclability through ecodesign**
 - **Recycling technologies**
 -

Avoids shifting of burdens between different geographic areas and life cycle stages



*Hotspots identification
Identification of improvement options*

Life Cycle Data Network:

an organised repository to host quality-assured life cycle data on raw materials and critical raw materials

- COM(2014) 297 on the "Review of the list of critical raw materials" and annexed SWD(2014) 171



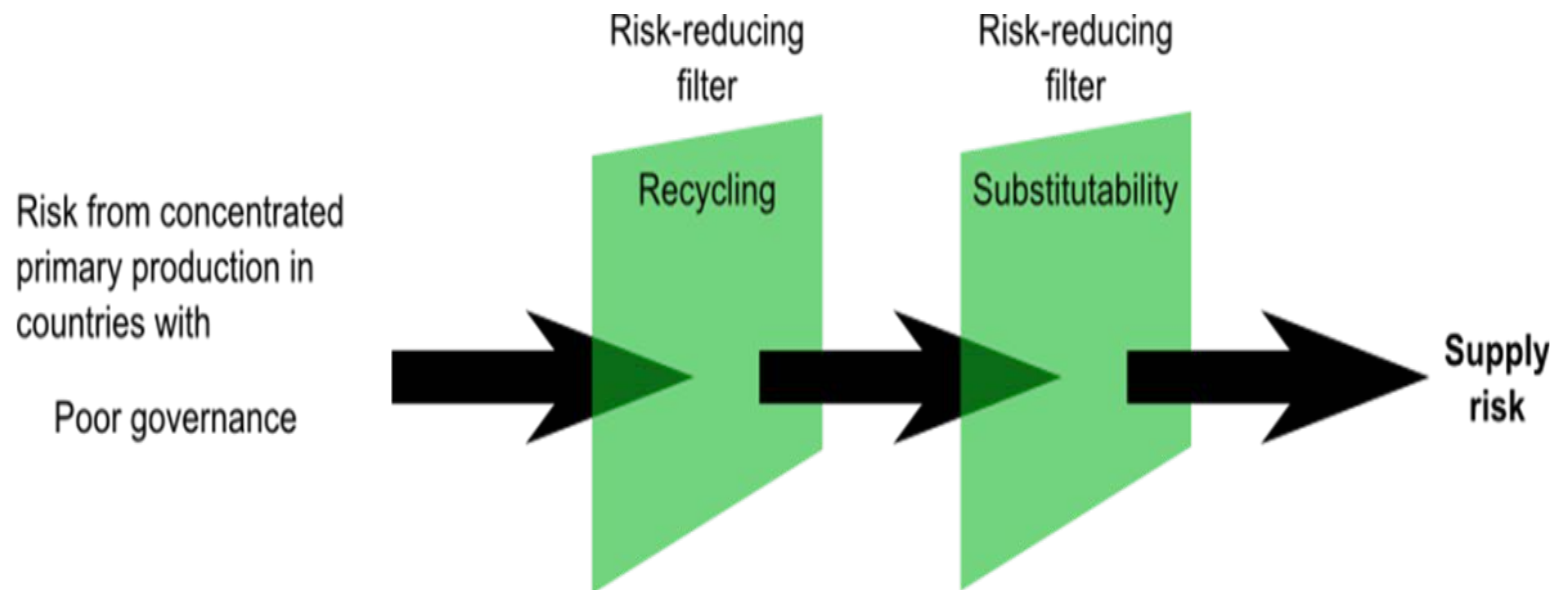
3.2.3. Lifecycle data network on raw materials and critical raw materials

The Commission continued to **develop lifecycle data**, methods and studies in order to improve the knowledge base **on (critical) raw materials**. Life cycle data outline the resources consumed, emissions, and social pressures associated with the supply chains of raw materials. They equally identify where raw materials are used in supply chains and how they are managed at the end-of-their life for products and services. The **Life Cycle Data Network**, officially launched in February 2014, is expected to host quality-assured life cycle data **from European and non-European public and private organisations**.

Two mitigation strategies:

- Substitution
- Recyclability

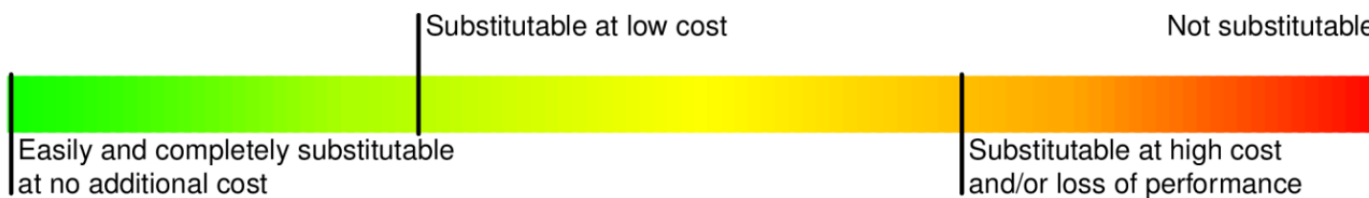
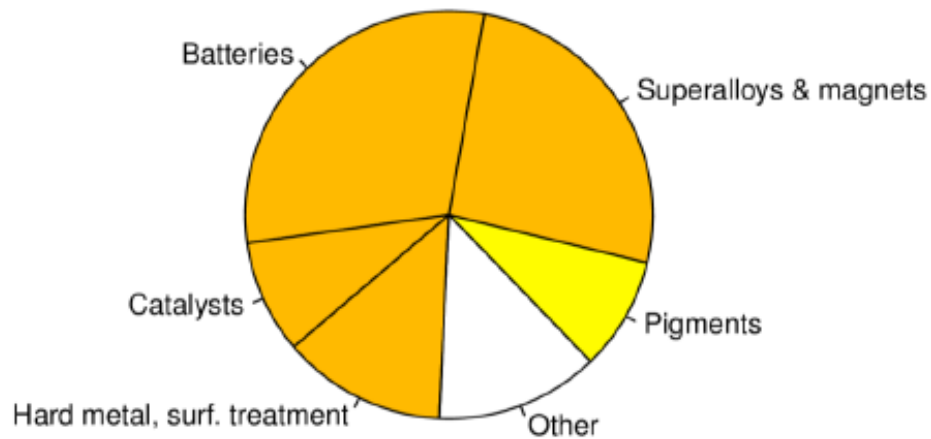
Recycling and Substitution: Reduction of the Supply risk



Source: Fraunhofer ISI.

$$\text{Supply risk} = \text{HHI} \times \text{WGI} \times (1-R) \times S$$

Substitution in Criticality assessment:



Recycling and recyclability in Criticality assessment:

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	*	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	**	Rf	Db	Sg	Sg	Hs	Mt	Ds	Rg	Uub	Uut	Uug	Uup	Uuh	Uus	Uuo

* Lanthanides

La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
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** Actinides

Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
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<1%



1-10%



10-20%



20-40%

Periodic table of global average end-of-life (post-consumer) recycling input rates (EOL-RIR)

Unfilled boxes indicate that no data or estimates are available, or that the element was not addressed by the EU study on CRMs (2013).

Higher recyclability -> lower criticality

- Through product policy intervention (e.g. Ecodesign Directive), higher recyclability of products can be enhanced:
 - To have useful information on CRMs in products:
 - > Example: *proposal* of declaration of content of Indium in displays put on the market (draft Ecodesign Regulation)
Recyclers know if/when it is worth investing in recycling technologies
 - To facilitate extraction of key components that contain CRMs:
 - > example: *proposal* of mandatory dismantlability requirements for some components (e.g. printed circuit boards that contain platinum group elements) in electronic displays (draft Ecodesign Regulation)



Summary

- **List of Critical Raw Materials (CRMs)** is key for various EU policies (including Industrial policy and Circular Economy)
- Criticality assessment and mitigation strategies should be addressed with **a life cycle approach**
- **Specific policy interventions** (e.g. through Ecodesign) are already possible
- Major need for **policy innovations and governance re-design to address CRM in a coherent manner** (raw material strategy; waste policies; product policies)

JOINT RESEARCH CENTRE

Sustainability Assessment

European Commission - JRC - IES - SA

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ABOUT US

Welcome to the S.A., Sustainability Assessment Unit Website

The Sustainability Assessment Unit fosters sustainability principles in EU policies by developing an integrated assessment framework towards environmental quality and socio-economic viability in the decision making process. The Unit is committed to applying new approaches and methods to perform integrated sustainability assessment and impact analyses across EU policies, particularly supporting improved resource efficiency in Europe and the strengthening of a green and circular economy. The focus is on the provision of knowledge, modelling tools, reference data, scenarios and examples of best practices, which all serve as a research base for policy recommendations, often following a life-cycle thinking approach.

Two existing integrative platforms are at the core of the development:

- The Land Use Modelling Integrated Sustainability Assessment Platform (LUMP/LUISA), for the evaluation of management options in response to policy and socio-economic scenarios, based on land use modelling methods, and
- The European Platform on Life Cycle Assessment (EPLCA), for the provision of life cycle related information, data coherence and quality assurance across EU institutions and European consumers and business, based on the development of methods, guidelines and tools specific to sustainability life cycle assessments of industrial processes, products and organizations.

Both platforms will further integrate and interact with sectoral and thematic modelling facilities within and outside the JRC.

Events

January 2014						
M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		
« Dec			Feb »			

News

SA_H08-Unit website

The new Sustainability Assessment_H08-Unit website is online

Thank you for your attention!

Further links and contact:

Joint Research Centre (JRC):
<https://ec.europa.eu/jrc>

Raw Materials Information System
<http://rmis.jrc.ec.europa.eu>

Sustainability Unit (H08):
<http://sa.jrc.ec.europa.eu/>

European Platform for Life Cycle Assessments
<http://eplca.jrc.ec.europa.eu>