Grundstoffe auf der Suche nach Nachhaltigkeit/ Raw Materials in Search of Sustainability

Dr. Ing. Martin Tauber

President CRM Alliance

Chairman European Committee IMA

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CRM Alliance
Critical Raw Materials

International Magnesium Association

Bausteine/Base layers

http://ec.europa.eu/environment/circular-economy/index_en.htm
http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm
https://ec.europa.eu/epsc/sites/epsc/files/strategic_note_issue_18.pdf

Sustainable Finance

Sustainable finance includes a strong green finance component that aims to support economic growth while

- reducing pressures on the environment
- addressing green-house gas emissions and tackling pollution
- minimising waste and improving efficiency in the use of natural resources

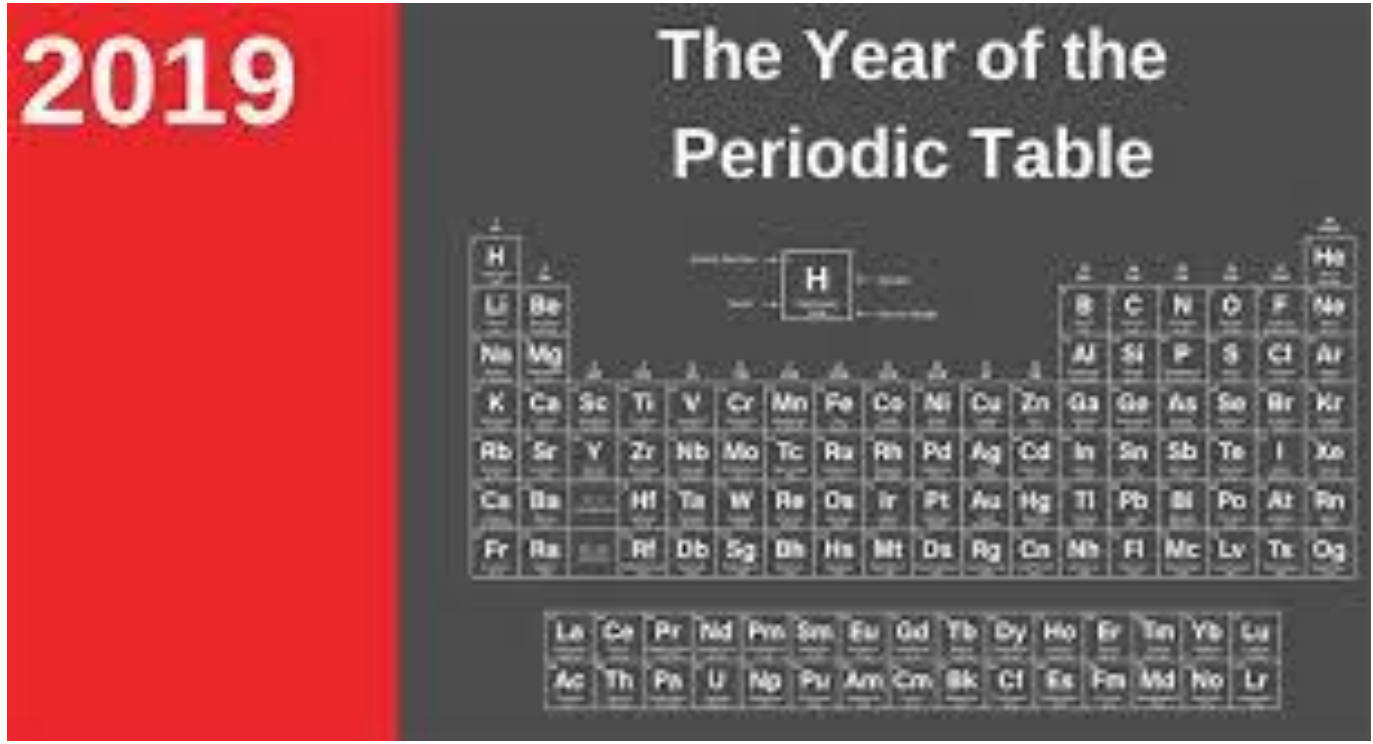
It also encompasses increasing awareness of and transparency on

- the risks which may have an impact on the sustainability of the financial system
- the need for financial and corporate actors to mitigate those risks through appropriate governance

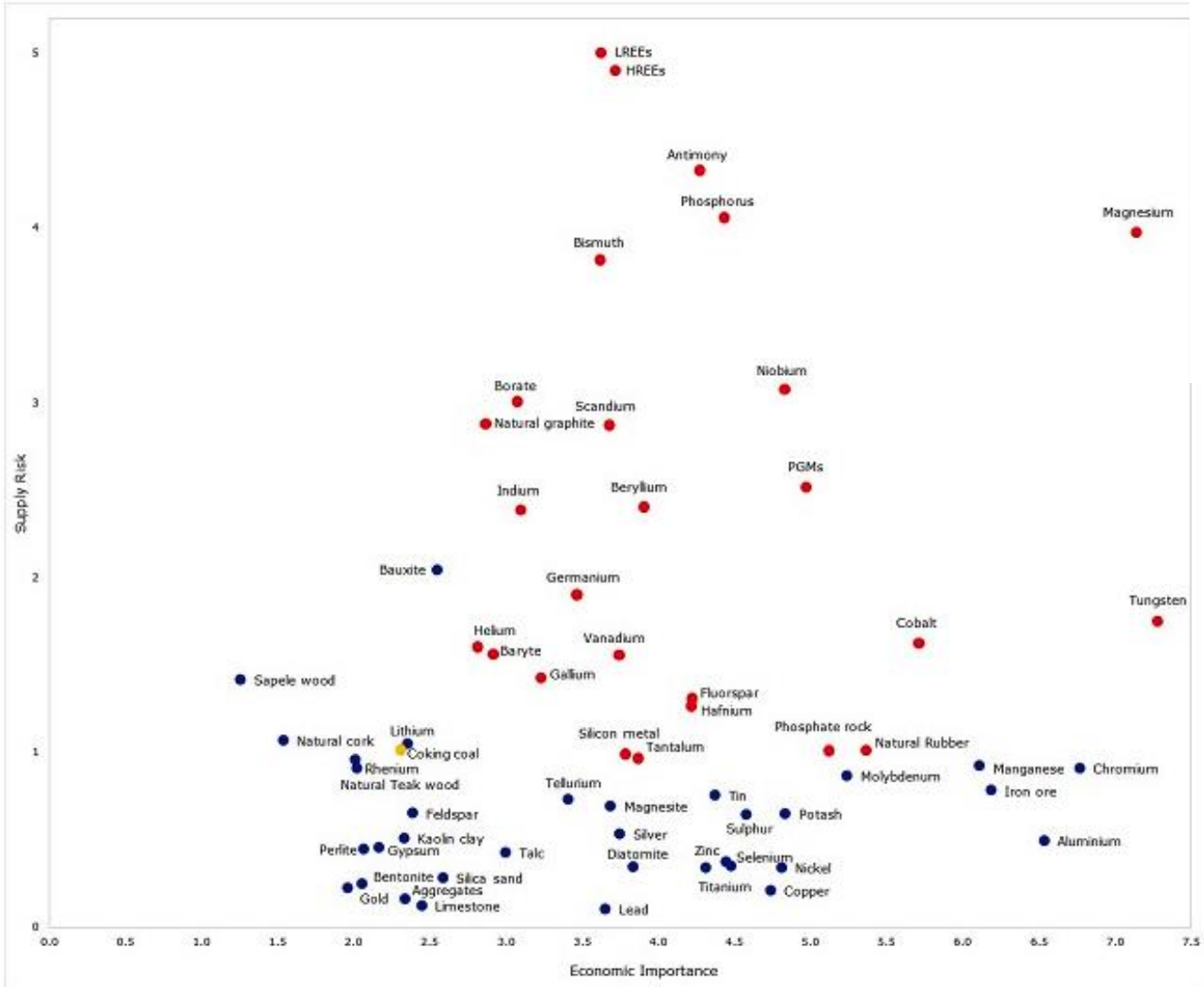
https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance_de

Significance of classifying raw materials

- EU Critical Raw Material List
- Conflict Minerals
- CRMs for defense sector
- DERA Raw Material Information
- US List of critical materials
- Raw materials of strategic economic importance for high-tech made in Germany
- EU Battery Alliance list
- Supper Alloys
- …

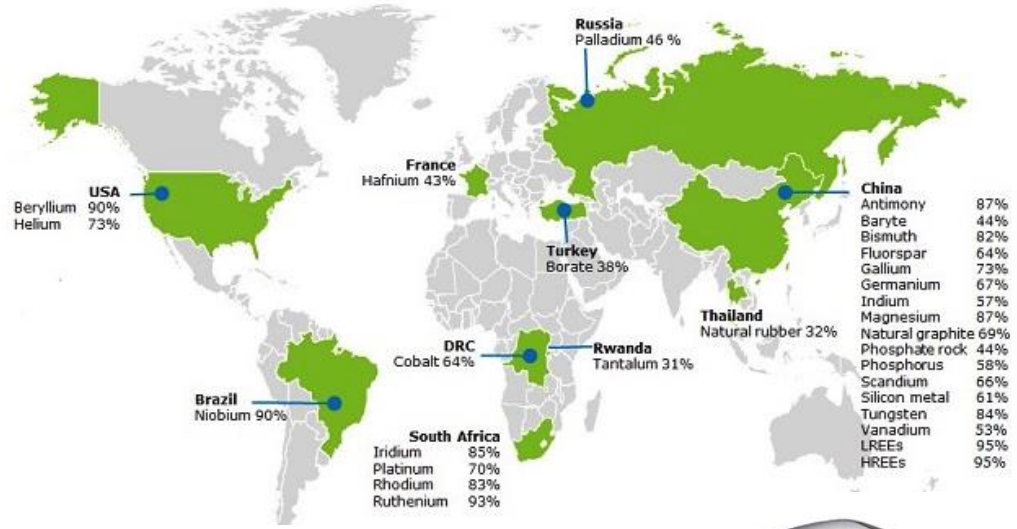


EU list of Critical Raw Materials (CRMs)



2017 CRMs (27)			
Antimony	Fluorspar	LREEs	Phosphorus
Baryte	Gallium	Magnesium	Scandium
Beryllium	Germanium	Natural graphite	Silicon metal
Bismuth	Hafnium	Natural rubber	Tantalum
Borate	Helium	Niobium	Tungsten
Cobalt	HREEs	PGMs	Vanadium
Coking coal	Indium	Phosphate rock	

Countries accounting for largest share of global supply of CRMs



http://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en

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Conflict Minerals

http://ec.europa.eu/trade/policy/in-focus/conflict-minerals-regulation/
http://www.usconverters.com/index.php?main_page=page&id=82&chapter=0
http://scnavigator.avnet.com/article/january-2015/the-making-of-a-conflict-free-supply-chain/

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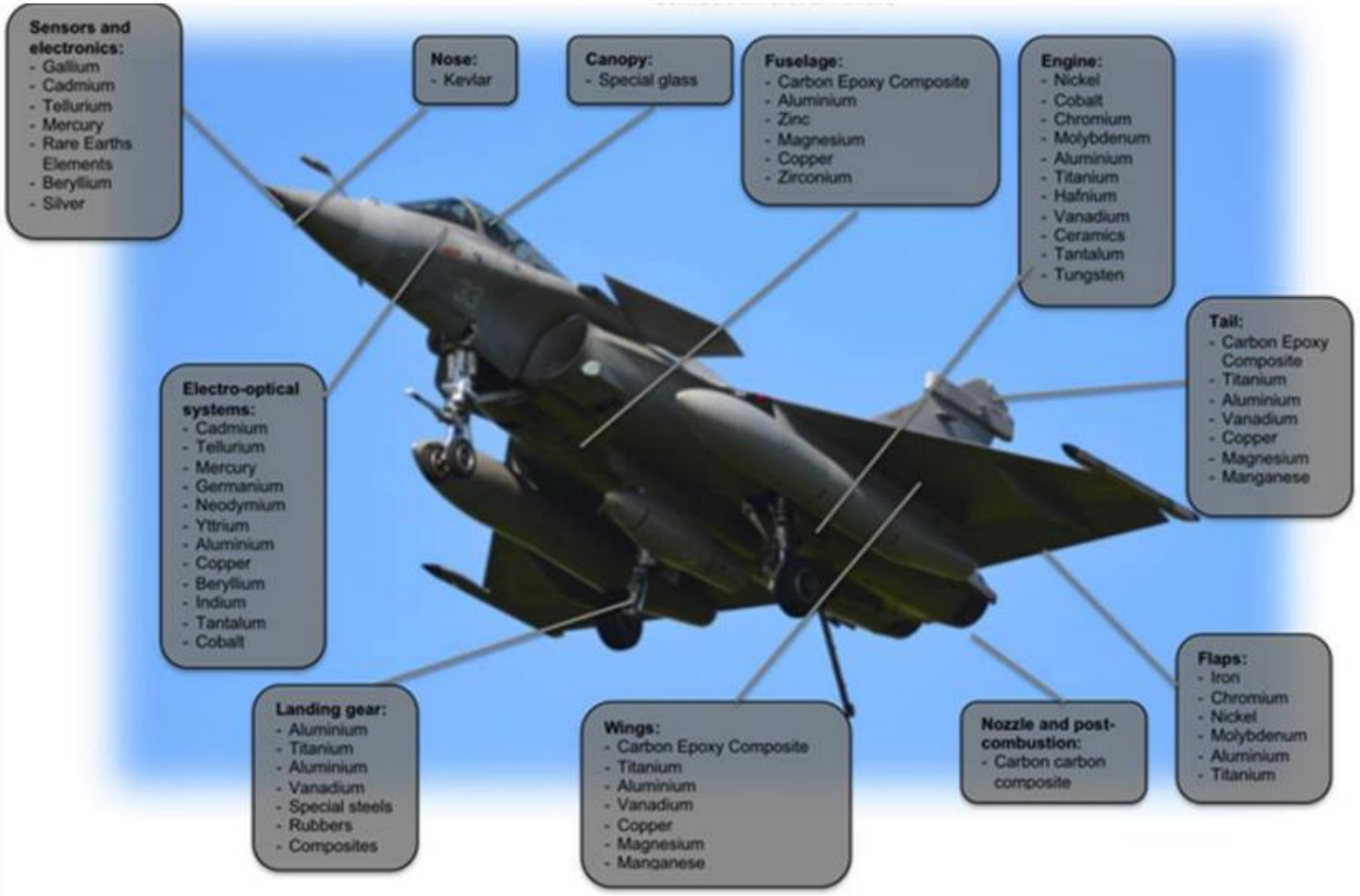
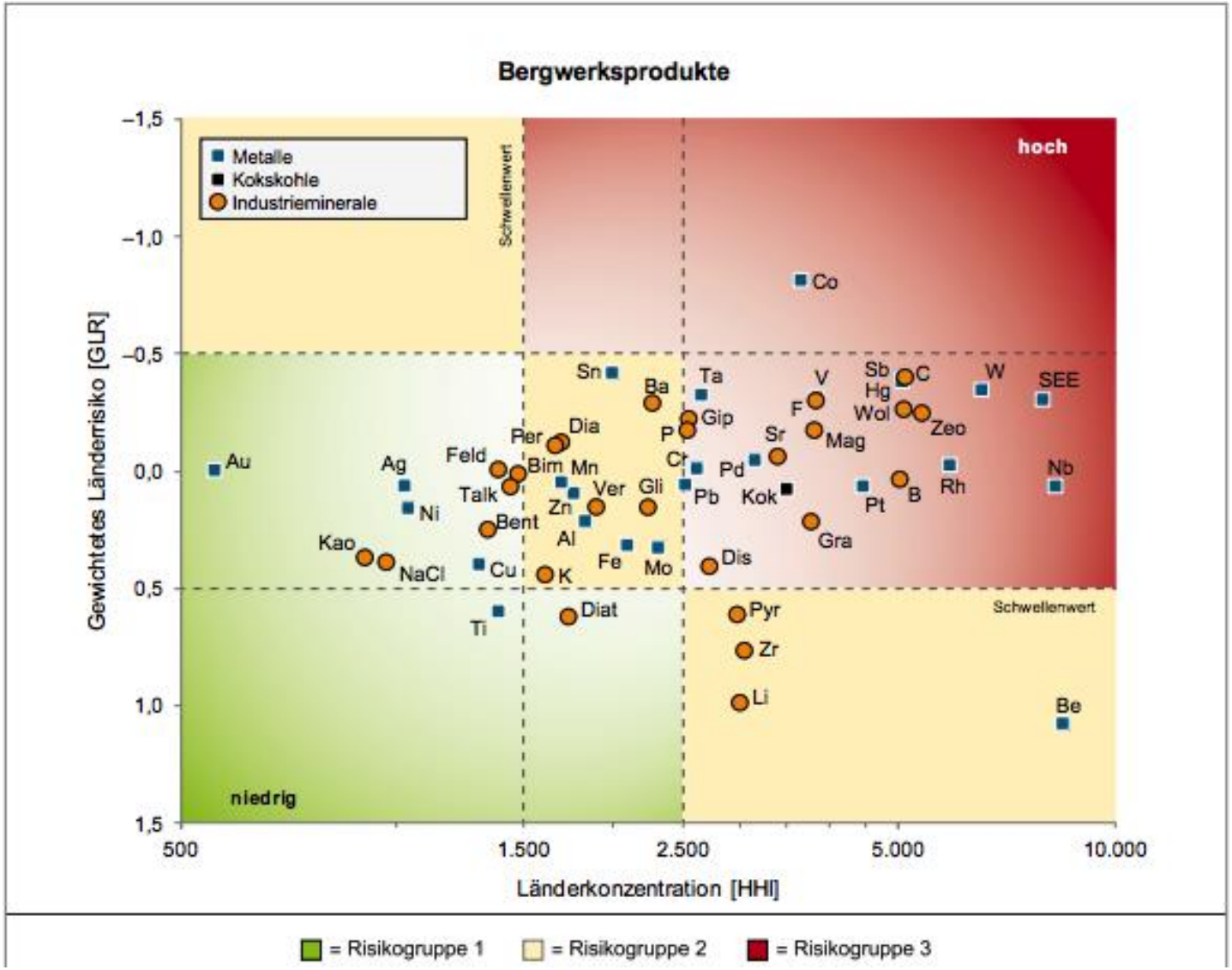
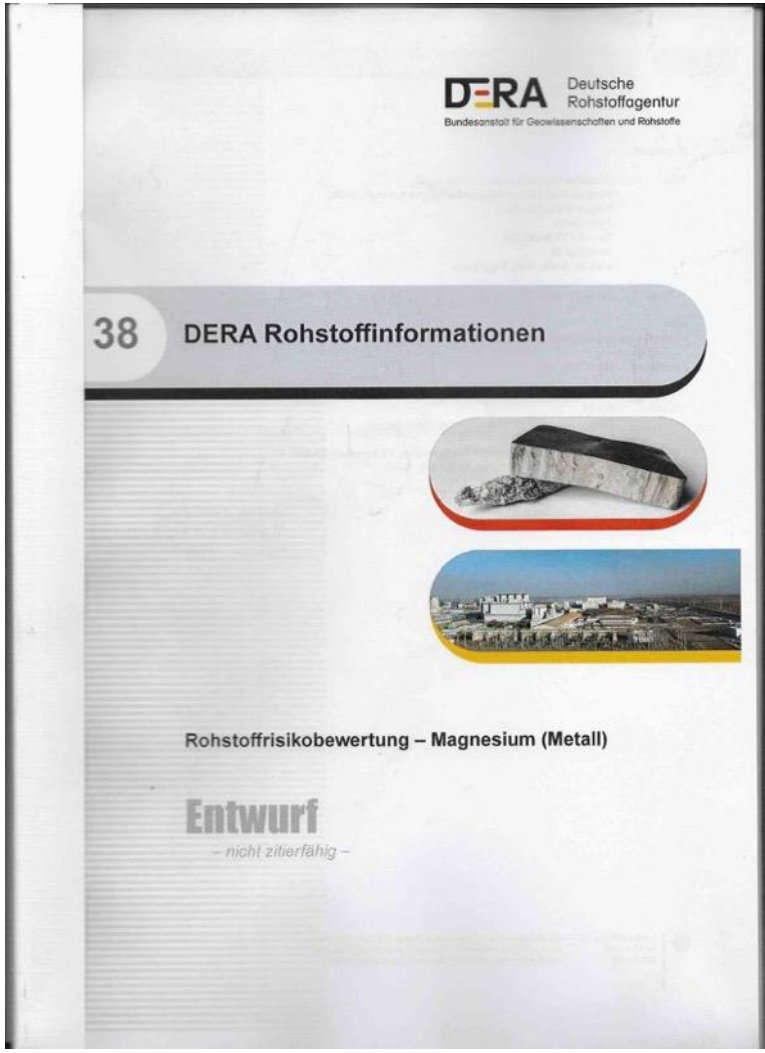
Raw materials in the European defence industry



https://setis.ec.europa.eu/sites/default/files/reports/raw_materials_in_the_european_defence_industry.pdf

DERA – Raw Material Information





https://www.deutsche-rohstoffagentur.de/DERA/DE/Downloads/rohstoffliste-2016.pdf?__blob=publicationFile

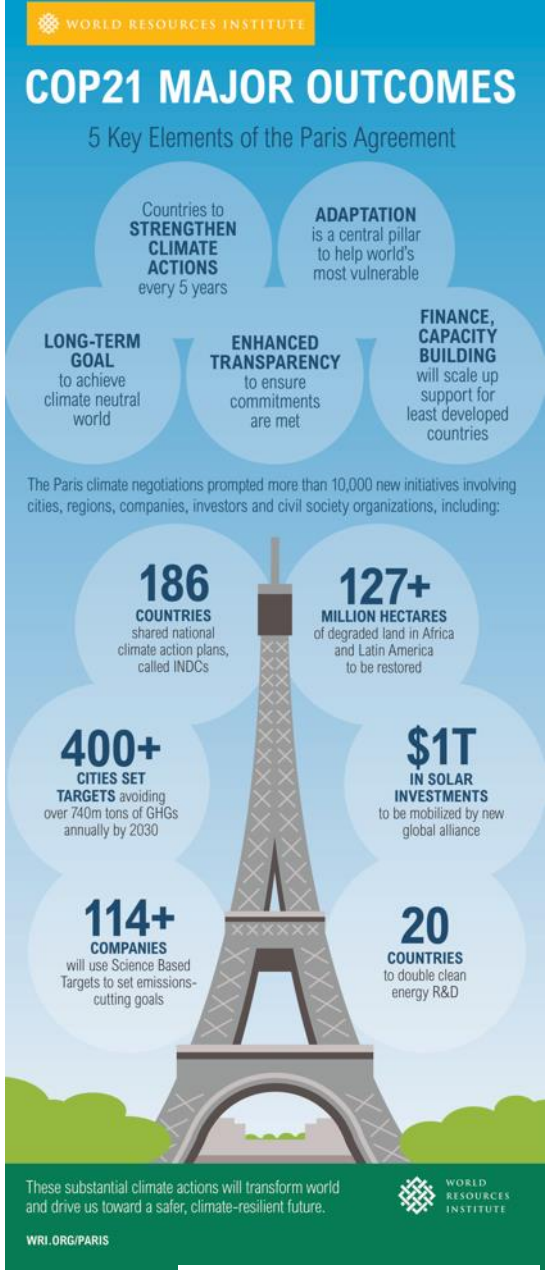
Overall targets & framework

SUSTAINABLE DEVELOPMENT GOALS

GLOBAL FORUM ON RESPONSIBLE BUSINESS CONDUCT

UN GLOBAL COMPACT United Nations Global Compact

ISO 26000 - Social responsibility



https://www.wri.org/blog/2015/12/paris-agreement-turning-point-climate-solution
https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

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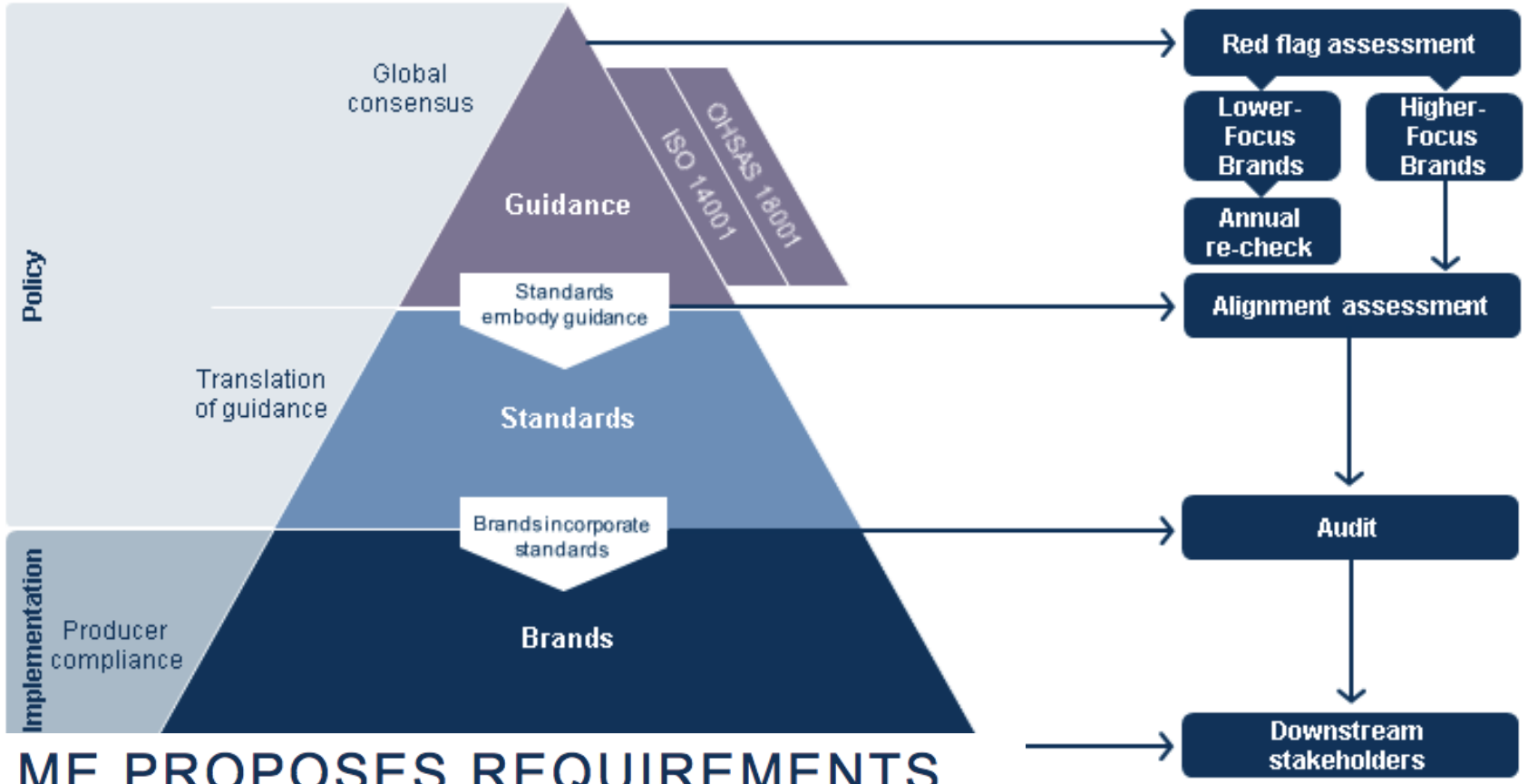
LME proposes guidelines for responsible sourcing



Sustainable Stock Exchanges Initiative

LME PROPOSES REQUIREMENTS FOR THE RESPONSIBLE SOURCING OF METAL IN LISTED BRANDS

https://www.lme.com/en-GB/Trading
http://market.sa.com/tradeiq/Singapore+Stock+Exchange+Sustainability-5197.html

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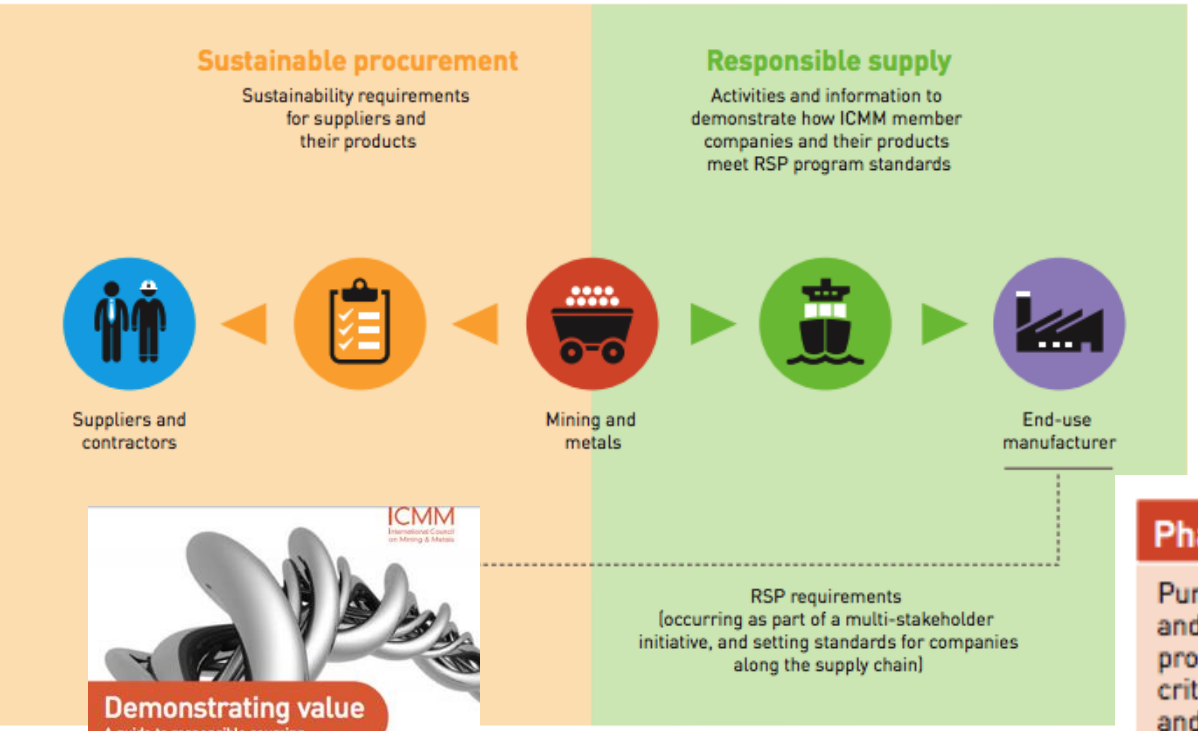
Independent guidelines for sustainable sourcing

- ICMM: Sustainable development principles; Mining with principles
- CSR Europe; The European Business Network for Corporate Social Responsibility
- CSR – RUG: The CSR reporting obligation
- DRIVE Sustainability: A STUDY OF RISKS AND OPPORTUNITIES FOR COLLECTIVE ACTION IN THE MATERIALS SUPPLY CHAINS OF THE AUTOMOTIVE AND ELECTRONICS INDUSTRIES
- UMICOR: Sustainable procurement framework on Cobalt

ICMM – 10 Sustainable development principles



ICMM
International Council on Mining & Metals

MINING WITH PRINCIPLES

Phase 1 – Easy wins

Purchase of environmentally and socially respon sible products based on clear criteria or credible labels and certifications

Phase 2 – Integration

Systematic analysis of spending to identify opportunites

Development of social, environmental and life cycle cost consideration/criteria for priority products and services

Development of tools and data to support procurement staff and specification writers

Phase 3 – Innovation

Collaboration with suppliers and other stakeholders to improve sustainability of products and services

Innovative contract models that drive improvement

Value chain analysis of suppliers and products

https://www.icmm.com/en-gb/environment/managing-metals-sustainably/responsible-sourcing
http://miningwithprinciples.com/

CSR Europe – European & national guidelines

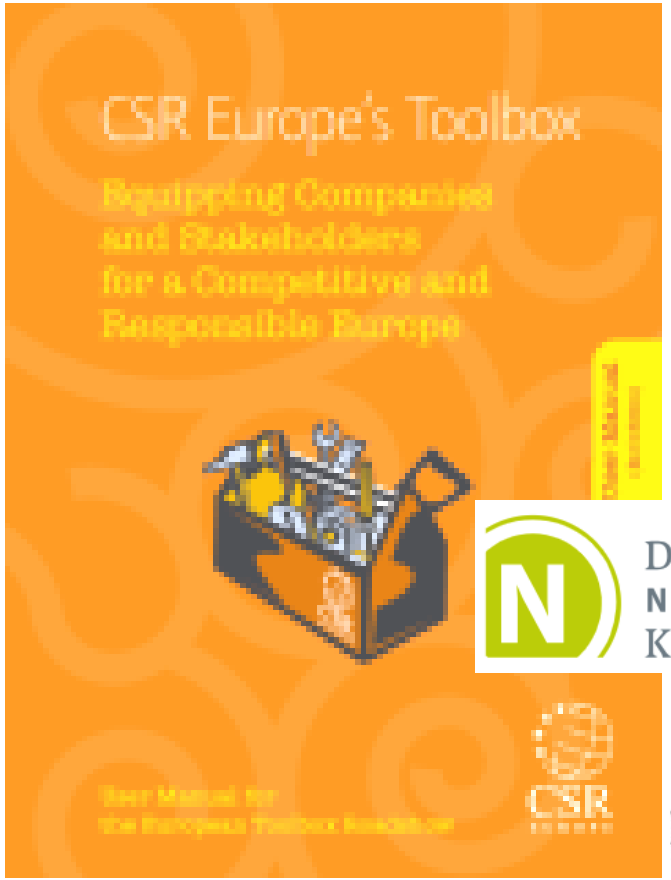
The requirements of the German CSR Directive Implementation Act (CSR RUG) obligate Bayerische Motoren Werke Aktiengesellschaft (BMW AG) to publish a non-financial report at company and Group level for financial year 2017 for the first time. This will be published jointly

SDG 12 – Responsible Consumption and Production

By significantly reducing and reinforcing the material cycles of primary raw materials that are needed for our e-drive system, we are setting the course for sustainable production models in line with this SDG.

ourselves. The → **BMW Group Supplier Sustainability Standards** stipulate compliance with internationally recognised human rights as well as binding environmental, labour and social standards for all suppliers of the BMW Group.

In 2017, as a member of the DRIVE Sustainability Working Group (www.drivesustainability.org), we partnered with other automotive manufacturers to launch an initiative on raw materials sourcing. This involves systematically identifying sustainability risks in the extraction of raw materials and devising measures to reduce these risks.



Deutscher NACHHALTIGKEITS Kodex

https://www.deutscher-nachhaltigkeitskodex.de/de-DE/Home/DNK/CSR-RUG
https://www.volkswagenag.com/en/sustainability/reporting.html
https://www.bmwgroup.com/en/download-centre.html

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Drive Sustainability – Collective action

Selected materials and applications

1 **Engine**
Aluminium
Nickel *(turbocharger)*
Tungsten *(crankshaft)*

2 **Microphone / Speaker**
Rare earth elements
Nickel
Iron
Cobalt

3 **LED Display**
Rare earth elements

4 **Windscreen / Windows**
Glass

5 **Interiors**
Leather
Plastics

6 **Catalytic converter**
Palladium
Plastics
Rare earth elements

7 **Paint / Pearlescent finish**
Mica
Cobalt

8 **Tyres**
Rubber
Cobalt

9 **Wheels**
Graphite *(bearings)*
Steel / Iron
Tungsten *(bearings, ball joints)*

10 **Suspension**
Steel / Iron

11 **Chassis**
Aluminium
Steel / Iron
Tungsten

12 **Body panels**
Steel / Iron

13 **Brakes**
Graphite
Steel / Iron
Tungsten

14 **Transmission**
Nickel
Steel / Iron

15 **Clutch**
Graphite

16 **Radiator**
Copper

Applications found in electric/hybrid cars

Lithium-ion battery
Cobalt
Graphite
Lithium
Nickel
Rare earth elements
Zinc*
(Tin**)

Materials in applications found throughout a passenger vehicle

Capacitors
Found in systems for brakes, power steering, transmission, electric motors etc.
Mica
Palladium
Tantalum

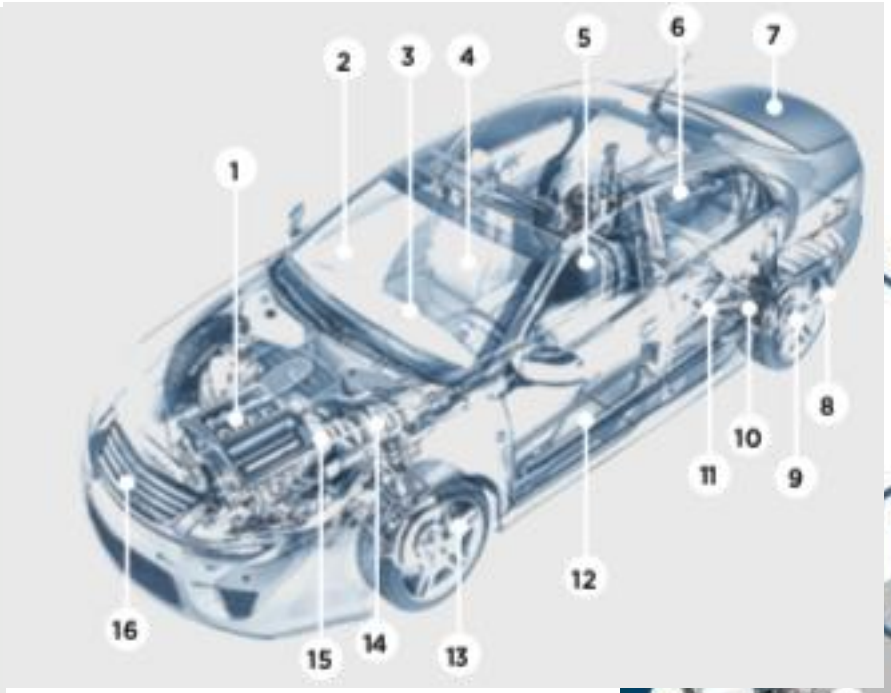
Electric motors
Found in starter motor, alternator, windscreen wipers, air conditioning etc.
Graphite
Rare earth elements

Plating
Found on engine parts, brake parts, chassis, trims, air conditioning etc.
Nickel
Zinc

Printed circuit boards
Found in systems for braking, engine control systems, safety and security systems, GPS navigation and entertainment etc.
Aluminium
Copper
Gold
Nickel

Solder
Tin

Circuitry
Copper
Gold
Palladium



drive sustainability

https://drivesustainability.org/

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Drive Sustainability – Collective action

Association with Artisanal and Small-Scale Mining (ASM)

Figures 9 and 10 compare the two industries' consumption and association of the 37 materials with artisanal and small-scale mining (ASM). Although much has been achieved in recent years in improving the capacity and management practices at ASM operations, ASM is often strongly associated with serious environmental and human rights impacts.

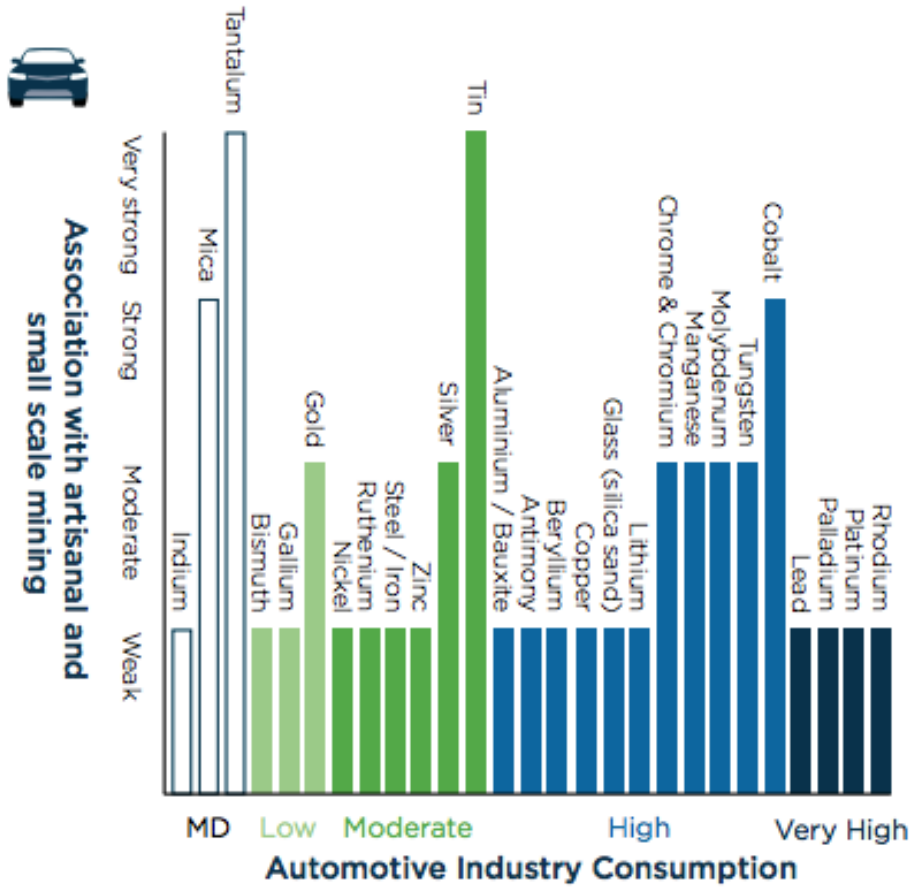
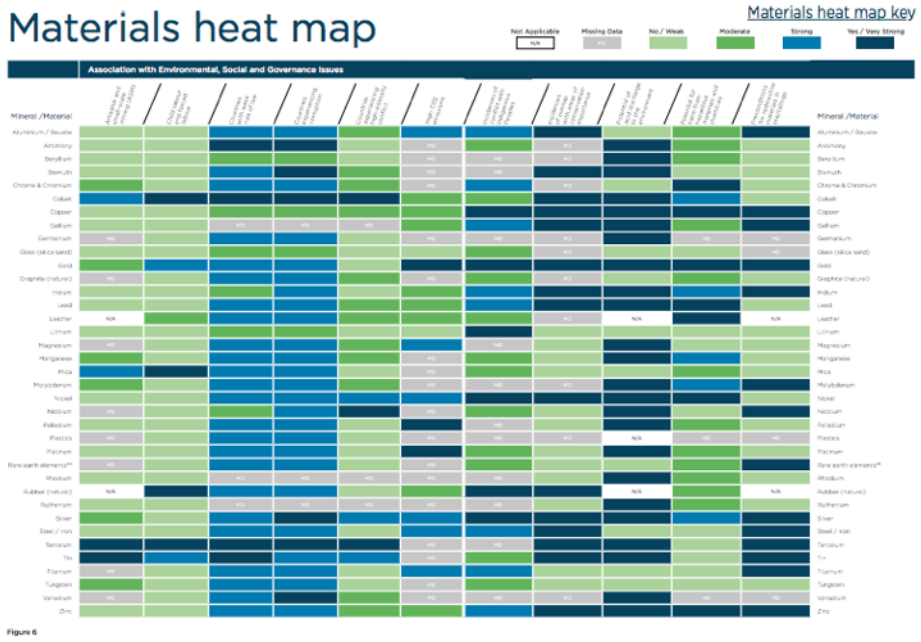


Figure 9: Ratings of materials' association with ASM and by automotive industry % of total global consumption



Rating	Colour
Very High / Very Strong	
High / Strong	
Moderate	
Low / Weak	
Missing Data	MD
Non Applicable	N/A

https://drivesustainability.org/

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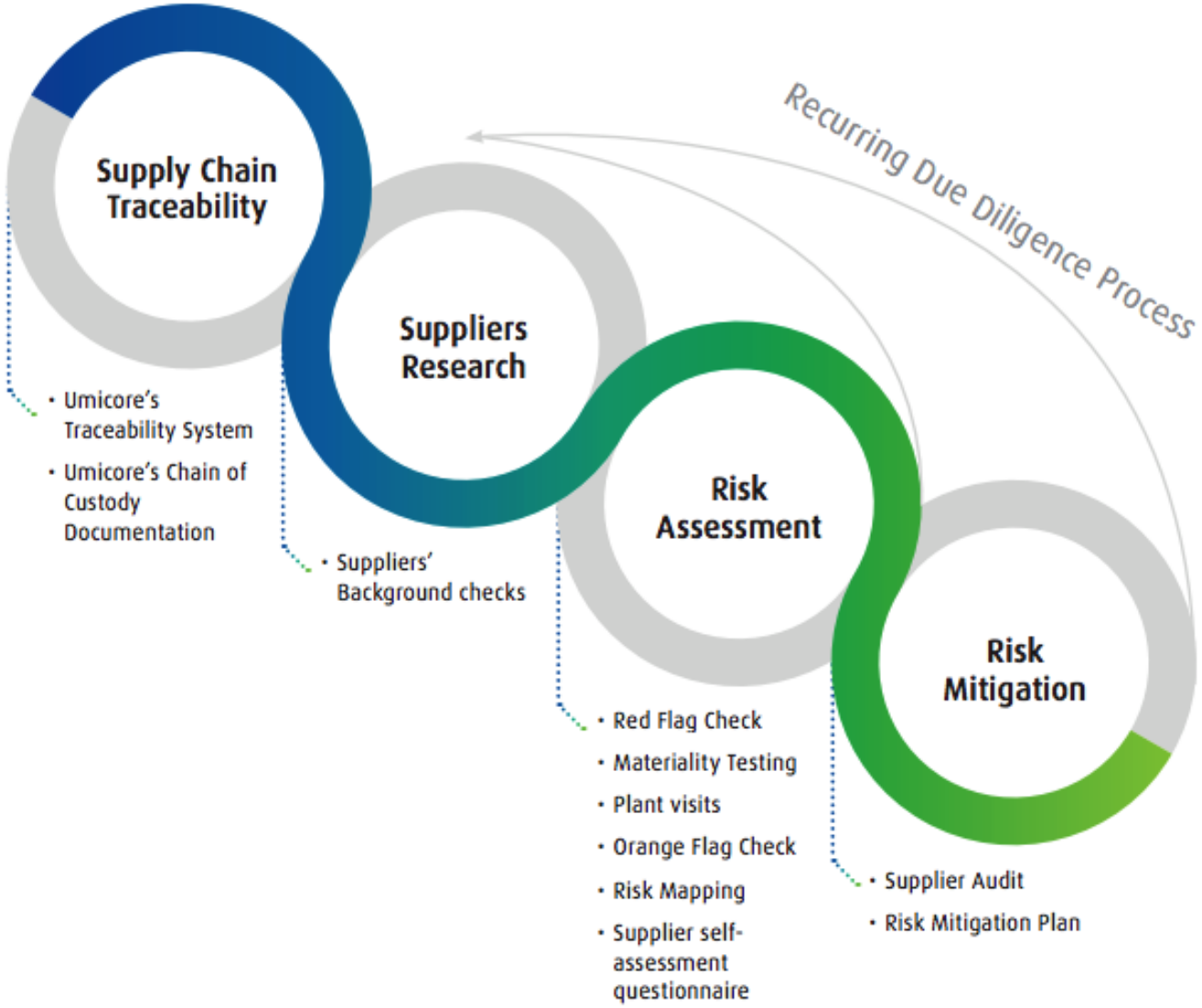
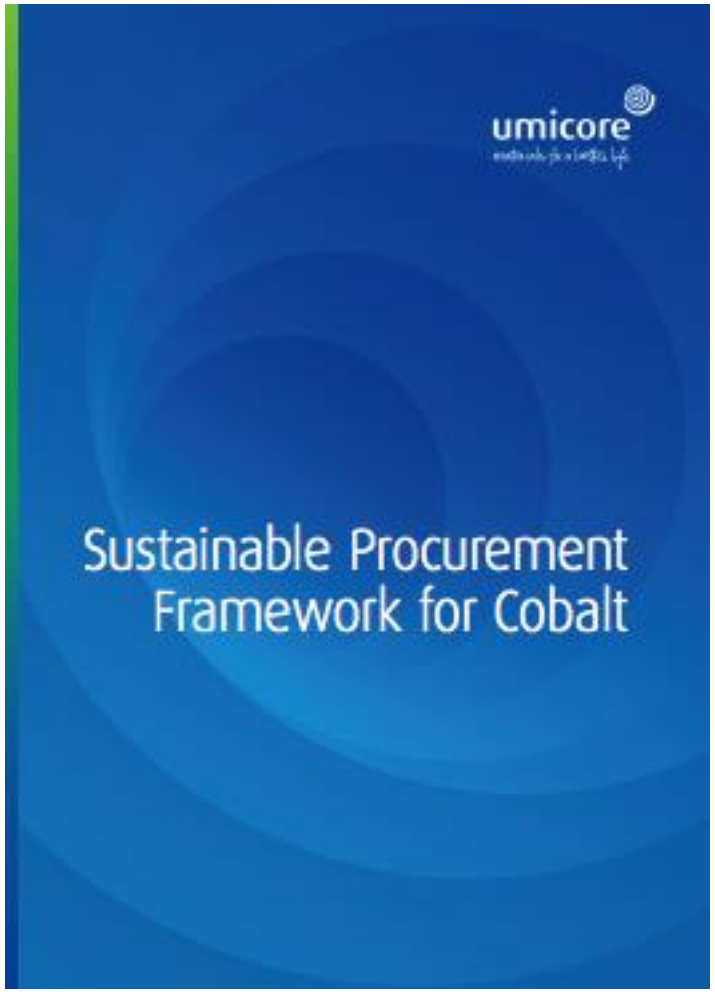
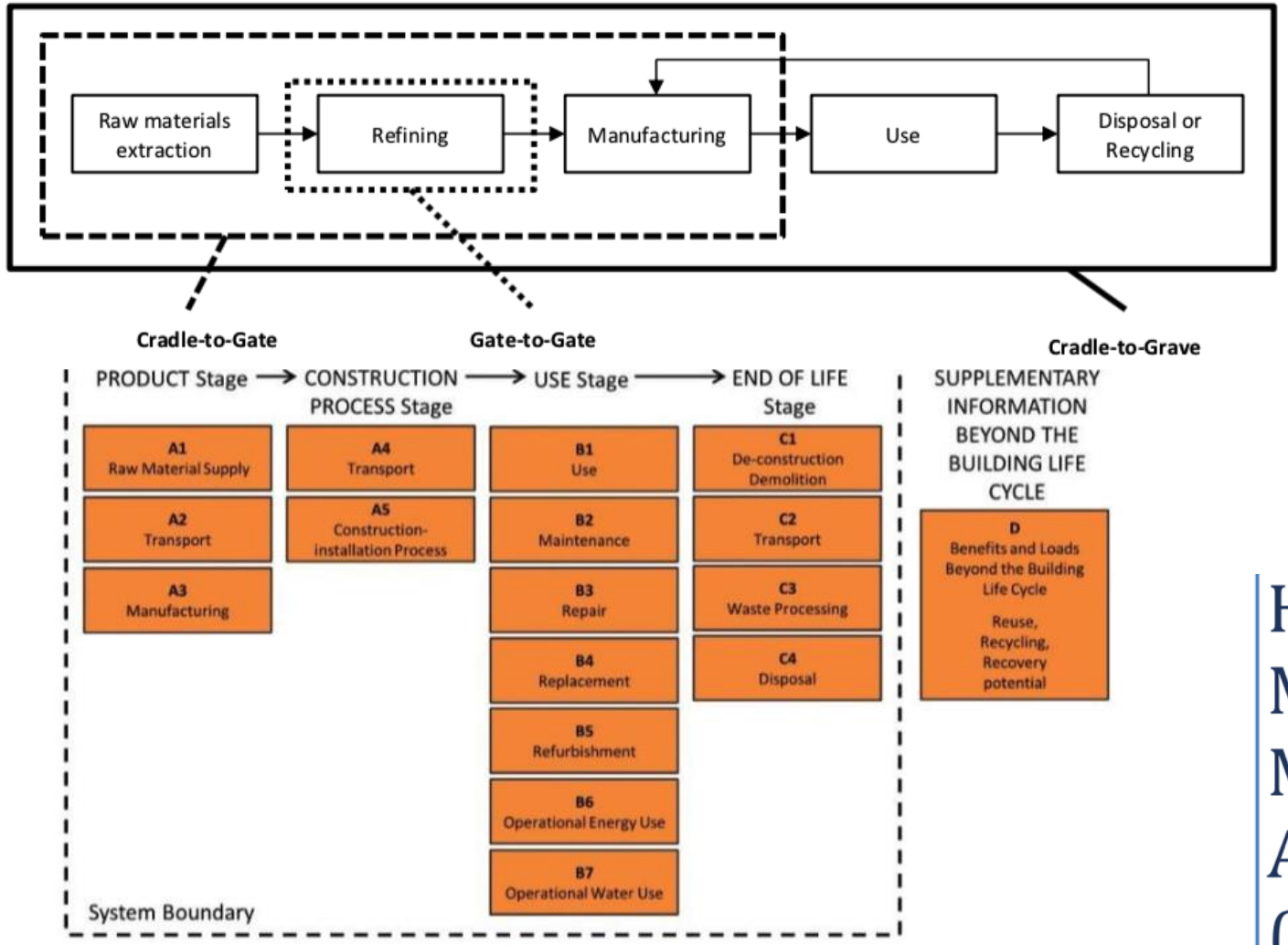
Sustainable procurement framework on Cobalt





https://www.umicore.com/storage/main/sustainablecobaltsupplybrochurefinal.pdf

Life Cycle Analysis



- Aluminium Association
- Cobalt Development Institute (CDI)
- Eurometaux
- Euromines
- International Aluminium Association (IAI)
- International Copper Association (ICA)
- International Council on Mining and Metals (ICMM)
- International Lead Association (ILA)
- International Lead Management Center Site
- International Lead Zinc Research Organization (ILZRO)
- International Manganese Institute (IMnI)
- International Molybdenum Association (IMoA)
- International Stainless Steel Forum (ISSF)
- International Zinc Association
- Nickel Institute (NI)
- World Steel

Harmonization of LCA Methodologies for Metals – Frequently Asked Questions (FAQs)

ISO

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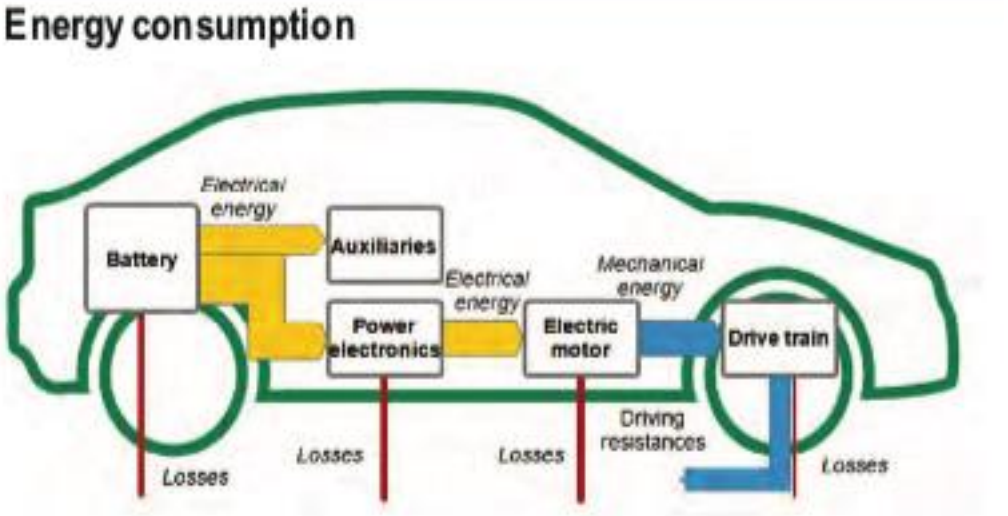
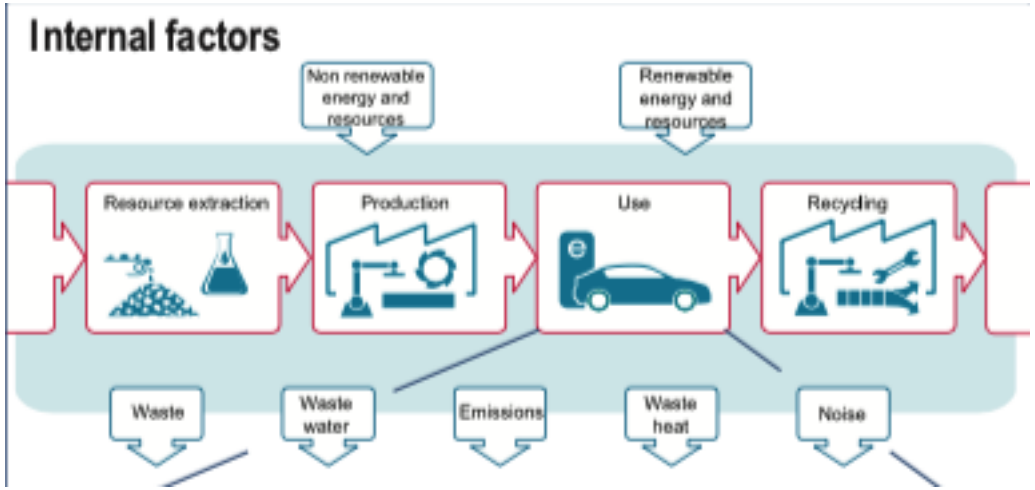
Material/Application/Vehicle LCAs

Automotive Steel

LIFE CYCLE ASSESSMENT – AN SUV CASE STUDY

		Baseline		AHSS-intensive		Al- intensive	
		Expected	Actual	Expected	Actual	Expected	Actual
Production	Minimum		13,743		12,968		22,852
	Maximum		13,865		13,089		22,973
Use	Minimum	36,891	36,891	33,752	33,752	32,842	32,842
	Maximum	61,486	61,486	58,613	58,613	57,779	57,779
End of Life	Minimum		(4,111)		(3,793)		(9,794)
	Maximum		(4,111)		(3,793)		(9,794)
Total	Minimum	36,891	**46,524**	33,752	**42,927**	32,842	**45,899**
	Maximum	61,486	**71,239**	58,613	**67,909**	57,779	**70,958**
Savings Over Baseline	Minimum	--	--	3,139	3,596	4,050	624
	Maximum	--	--	2,873	3,330	3,707	281





https://www.industr.com/en/life-cycle-assessment-an-suv-case-study-2323272
https://www.sciencedirect.com/science/article/pii/S2212827115005004

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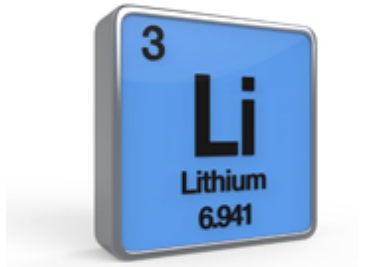
The issue with supply chains

	Raw and processed materials	Cell component manufacturing	Cell manufacturing	Battery pack manufacturing	Electric vehicle manufacturing	Recycling
Most Relevant Statistics	51 %	43 %	88 %	40 %	31 %	50 %
	Democratic Republic of Congo's share of global cobalt production [4] - a critical material for Li-ion technology	Cathode revenue as share of cell components market [5]	Asian share of Li-ion cell manufacturing market [6]	Share of pack assembly cost over the total battery pack cost [7]	Automotive share of Li-ion cell market in volume (MWh) [8]	Recycling efficiency for Li-ion batteries set in the Battery Directive [9]
Revenues	EU Mining and quarrying industry revenues: B$ 19 [1] EU Chemical industry Revenues: B$ 28 [1]	Global Li-ion cell components Industry revenues: B$ 7 [5]	Global Li-ion cell manufacturing revenues: B$ 16.7 [5]	Global automotive battery pack manufacturing revenues: B$ 22 [5]	EU Automotive industry Revenues: B$ 900 [10]. 20% of worldwide [11]	EU Waste collection & Recycling Industry Revenues: B$ 150 [10]. 75% of worldwide [12]



https://www.ceps.eu/publications/prospects-end-life-electric-vehicle-batteries-circular-economy

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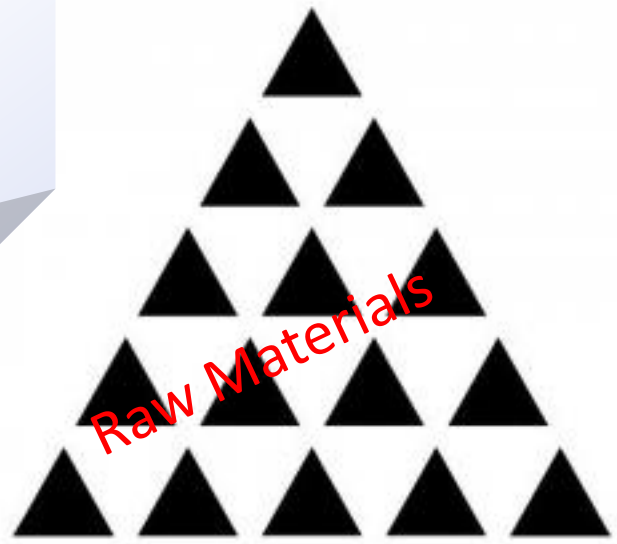
Search & drives for sustainability

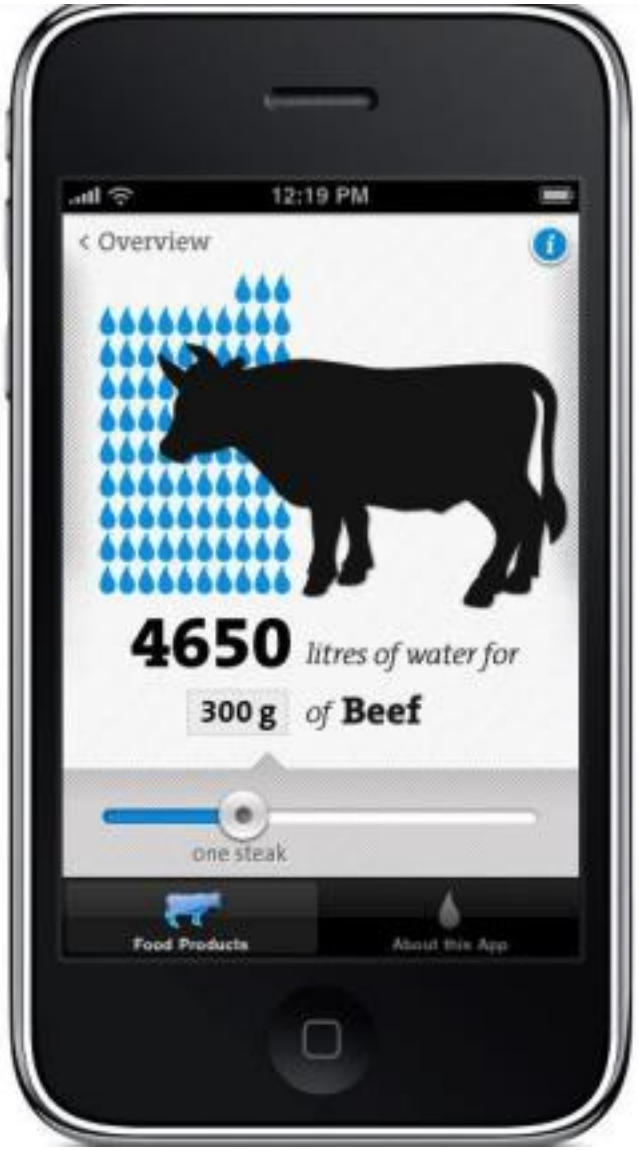
Legal §
- Stock listing
- Transparency
- CO2 targets
- Bans

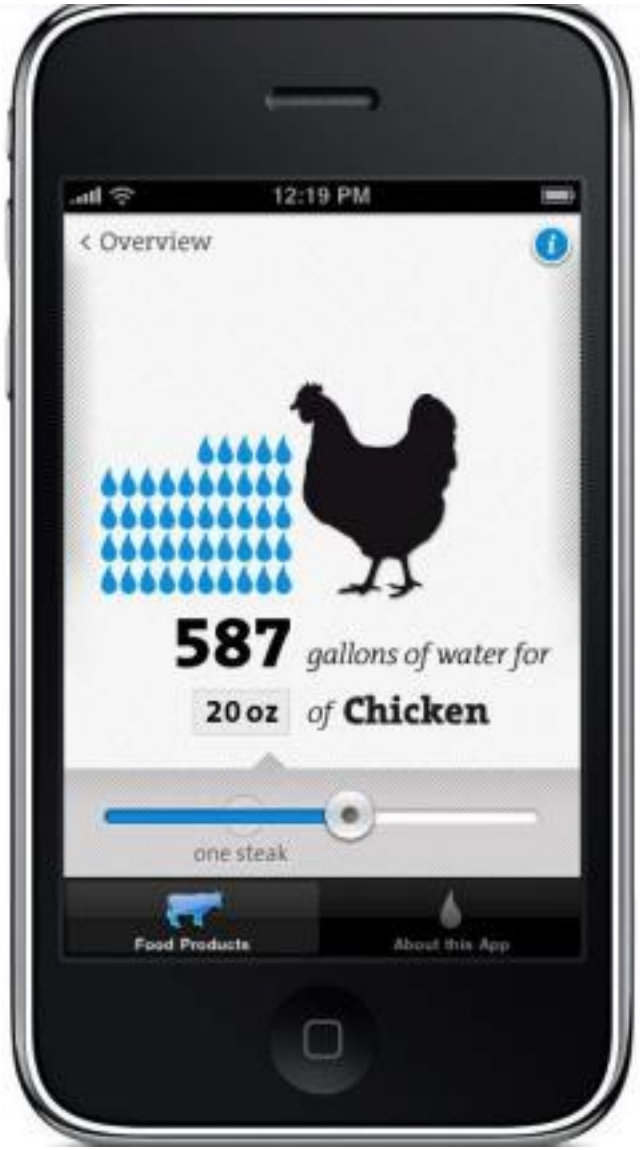
Insentives $
- CO2 credits
- Tax preference
- Funding

Instruments @
- LCA analysis
- Risk analysis
- Procurement
- Networks
- Supply chains

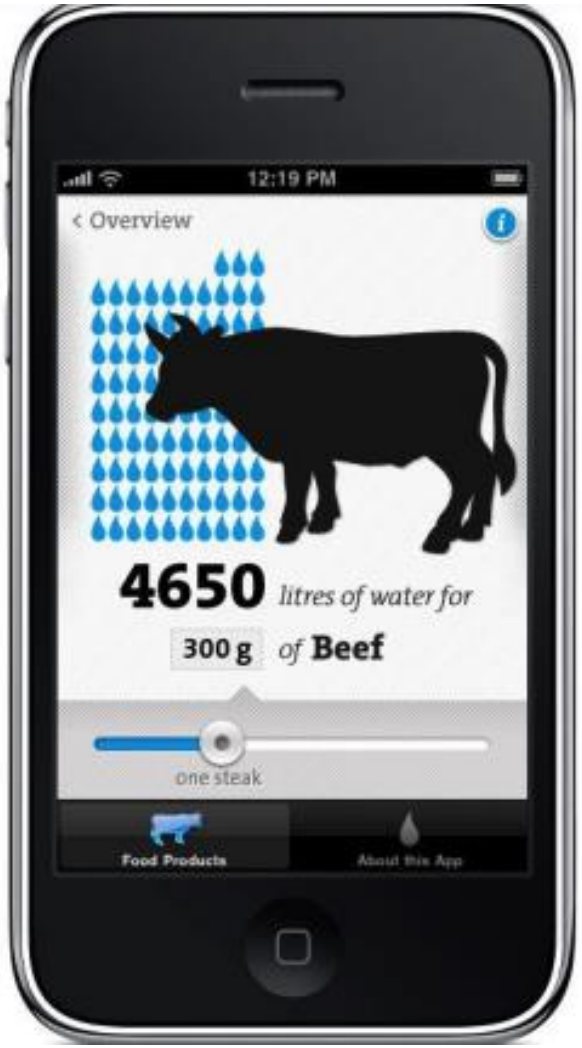


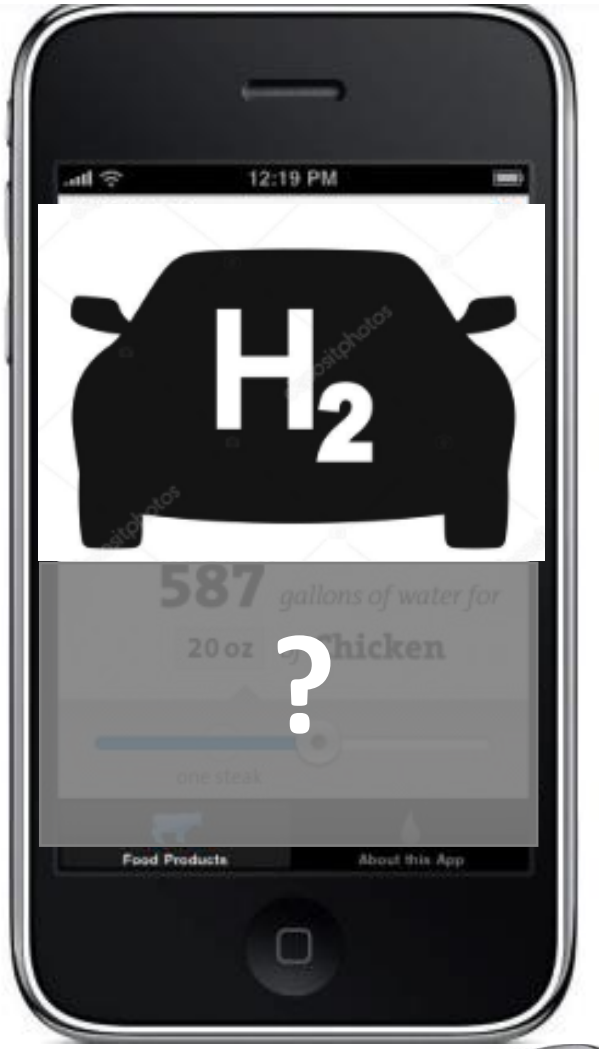
Alternative examples





Vehicle overall LCA footprint (e.g. cradle to gate)





Recycling deal?

„With the recycling deal, you sell back after 2 years your car to us“

...

Or decide if you want to take it over for x$

For Automotive that could mean:

- *With the reycling deal the consumer sells back the car after 5 years*
- *(or take it over for e.g. 20%-30% of the original price)*
- *Initial purchasing price could kept lower = reducing of buying hurdle!*
- *Industry does know what comes back and when*
- *Industry can sell new cars every cycle*
- *Industry covers their recycling obligations*

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