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Sustainability and Life Cycle Assessment in the wire production

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Aurubis Metals for Progress

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Agenda

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- Where we are
- Life Cycle Assessment approach and Environmental Footprint
- How to perform a LCA
- CO_2 Footprint
- Use of the Environmental Footprint
- Summary

„Where we are“

Sustainability - Definition

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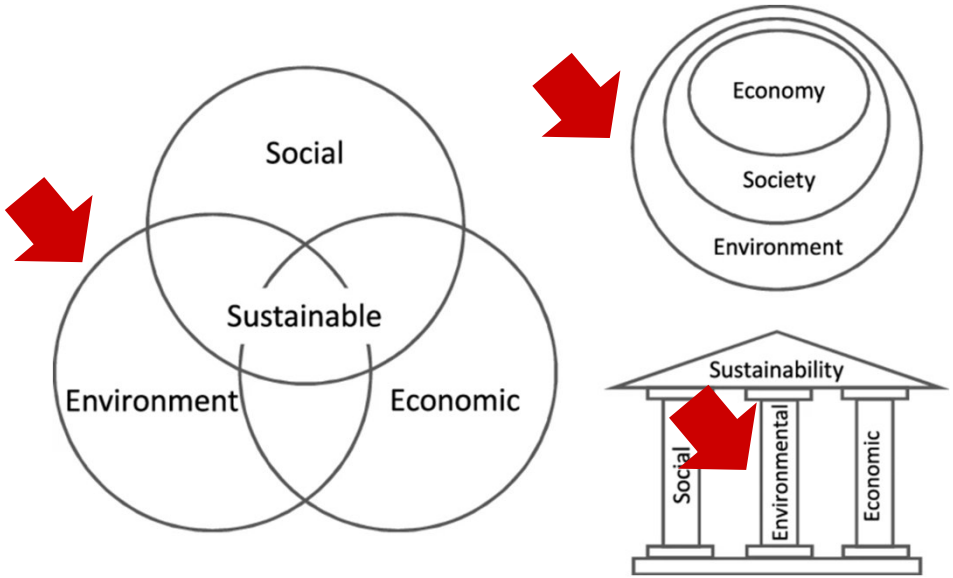
sustainable development (or susatainability) is defined as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs." (Source: Brundtland Report)

It encompasses three pillars:



Sustainability in concrete actions e.g. in EU!

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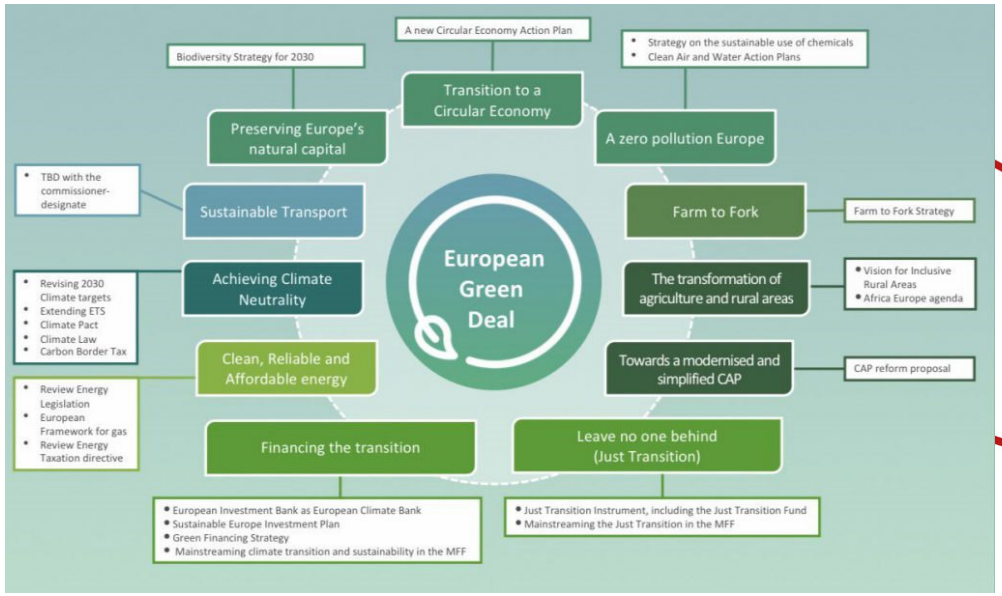
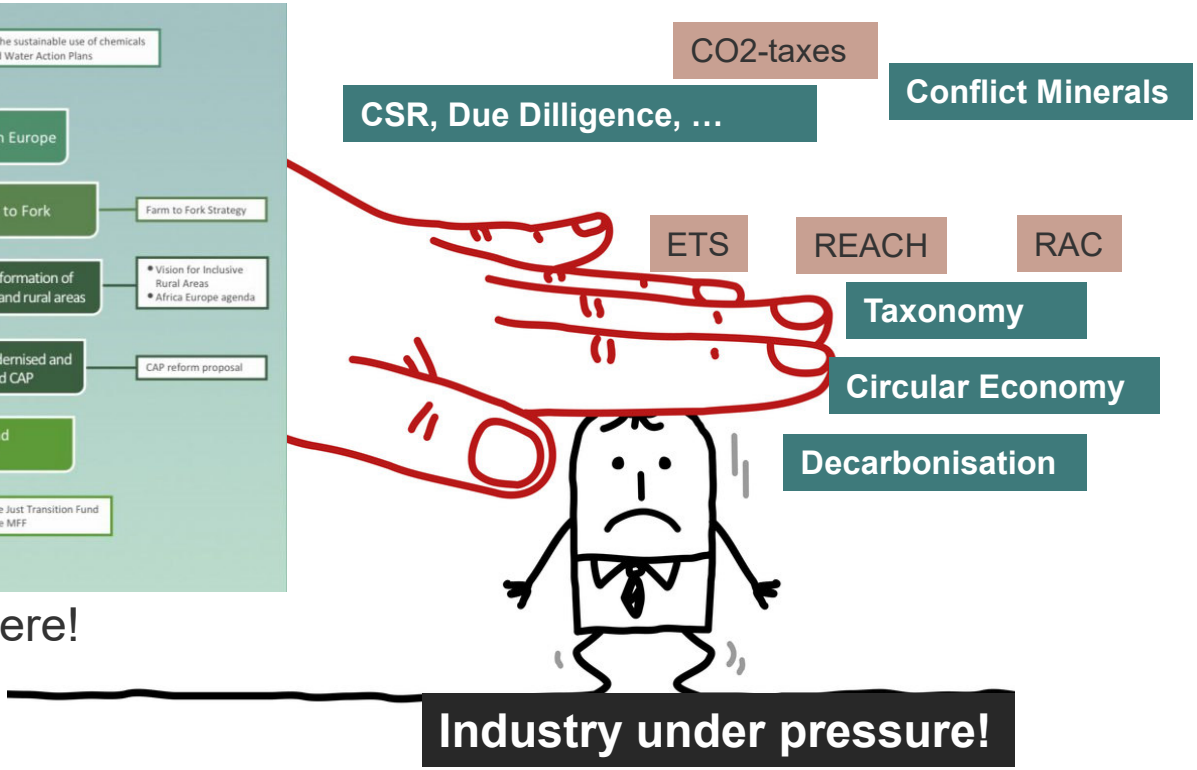


Same happens elsewhere!



Quantifying the Environmental Footprint

Environmental Footprint - Definition

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Life Cycle Assessment Approach is used to calculate the environmental Footprint.
The Life Cycle Approach guarantee that no shift of burden can occur, meaning responsability on the whole value chain is ensured.
The footprint is the measurement unit to capture the influence of activities on the environment along the full life cycle!
It is expressed e.g. in:

- CO_2eq-Emission (Global Warming Potential - GWP)
- H+ (or SO_2eq)-Emission (Acidity or Acidification Potential “AP”)
- Water (use, consumption)
- Land use
- …

Environmental Footprint – Impact Categories

Impact category	Unit
Climate change	kg CO_2 eq.
Ozone Depletion	kg CFC-11 eq.
Human Toxicity cancer	CTUh
Human Toxicity non-cancer	CTUh
Particulate matter	disease incidence
Ionising Radiation	kBq U_{235} eq
Photochemical ozone formation	kg NMVOC eq
Acidification	mol H+ eq
Eutrophication terrestrial	mol N eq
Eutrophication freshwater	kg P eq
Eutrophication marine	kg N eq
Ecotoxicity freshwater	CTUe
Land Use	Pt
Water use	m3 world eq
Resource minerals and metals	kg Sb eq
Resource use fossil	MJ

EF-Method

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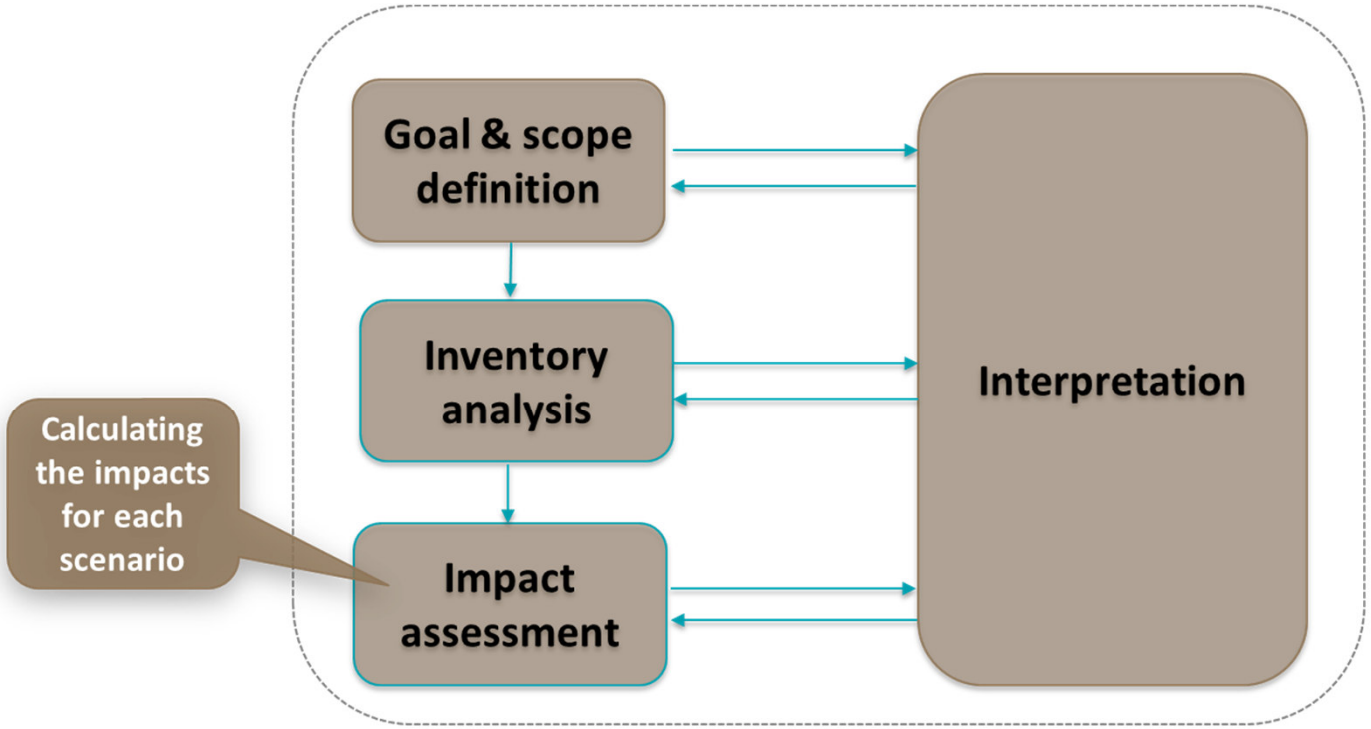
Framework / Standards

LCA framework, as described by ISO 14040: 2006



ISO 14040. 2006. Environmental management – life cycle assessment – principles and framework. International Standard Organization, Geneva, Switzerland.

Inventory: Data collection (Input und Output of the System

Interpretation: External as well as internal (e.g. Improvement using Hotspot-Analysis)

Framework / Standards

ISO Normen: Reihe 14040 ff

- ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework;
- ISO 14044:2006 Environmental management — Life cycle assessment — Requirements and guidelines;
- ISO 14067:2018 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification;
- ISO 14046:2014 Environmental management — Water footprint — Principles, requirements and guidelines;
- ISO 14020:2000 Environmental labels and declarations — General principles;
- ISO 14021:2016 Environmental labels and declarations — Self-declared environmental claims (Type II environmental labelling)
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures;
- ISO 14050:2009 Environmental management — vocabulary
- ISO/TS 14071:2014 Environmental management — Life cycle assessment — Critical review processes and reviewer competencies: Additional requirements and guidelines to ISO 14044:2006
- ISO 17024:2012 Conformity assessment - General requirements for bodies operating certification of persons.
- PEF Guide, Annex to Commission Recommendation 2013/179/EU on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations (April 2013);
- ILCD (International Reference Life Cycle Data System) Handbook[13];
- Ecological Footprint Standards[14];
- Greenhouse Gas Protocol - Product Life Cycle Accounting and Reporting Standard [15] (WRI/ WBCSD);

- BP X30-323-0:2015 General principles for an environmental communication on mass market products (ADEME)[16];
- PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services (BSI)[17];
- ENVIFOOD Protocol[18].
- FAO:2016. Environmental performance of animal feeds supply chains: Guidelines for assessment. LEAP Partnership.

From Inventory to Impact Category

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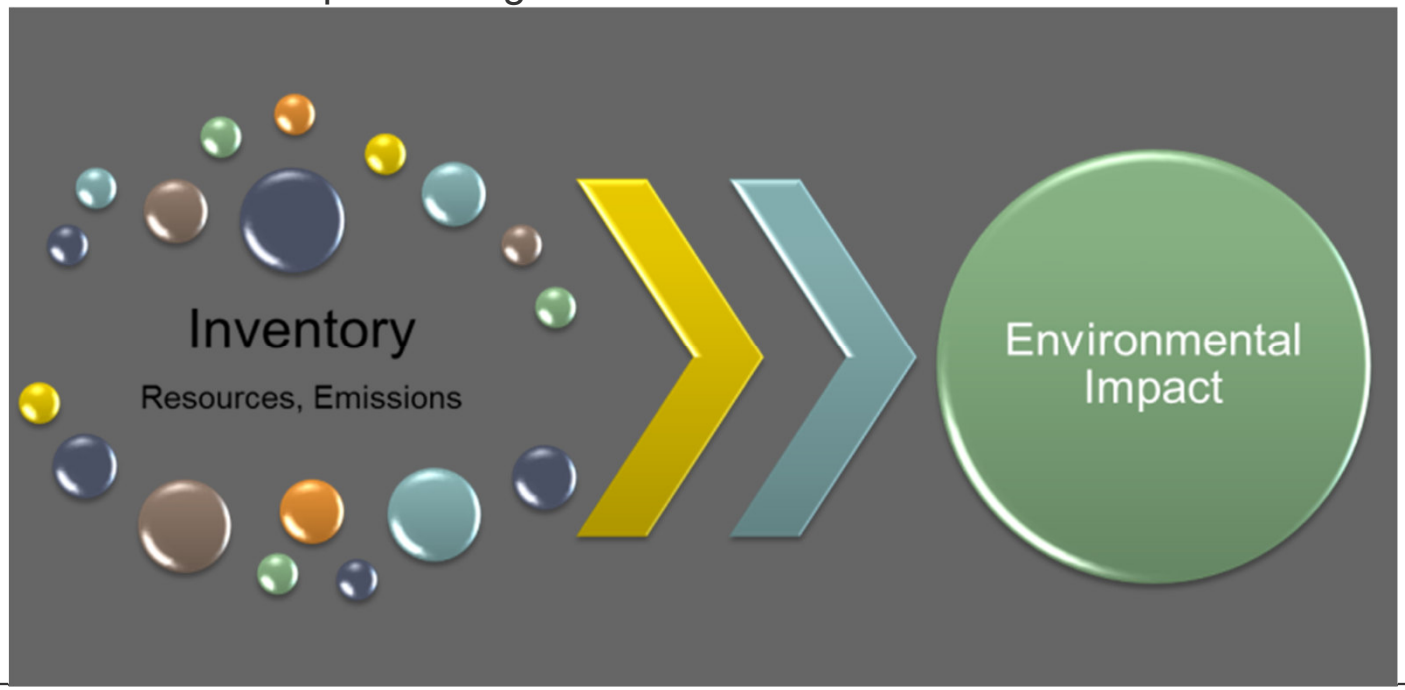
Calculation of Impact Categories



Inventory (Data Collection)

Resources → Emissionen

Impacts Categories

Grouping using equivalence – e.g. CO_2eq

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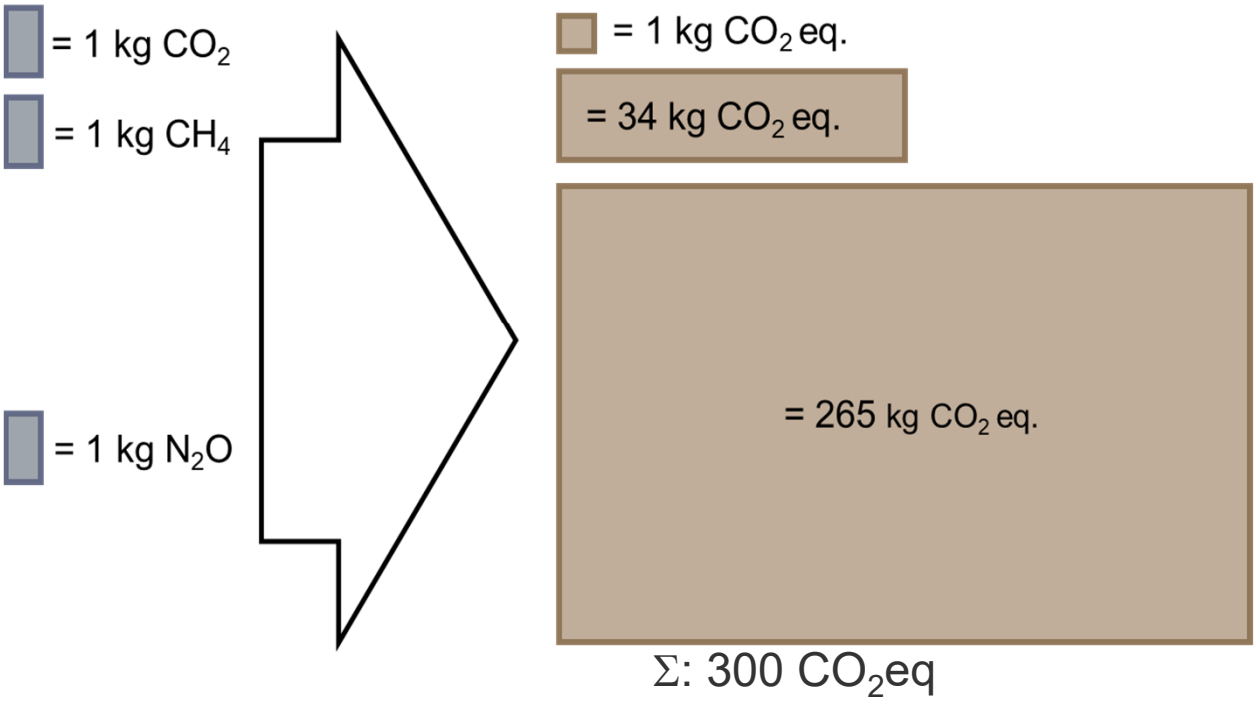

Designation	Formula	GWP for 100 years
Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265
CFC-12	CCl_2F_2	10 200
HCFC-22	$CHClF_2$	1 760
Tetrafluoromethane	CF_4	6 630
Hexafluoroethane	C_2F_6	11 100
Sulfur hexafluoride	SF_6	23 500
Nitrogen trifluoride	NF_3	16 100

© IPCC Microsoft Word - 2.2_Non-CO2_Stationary_Combustion_20030113.doc (iges.or.jp)

System boundary (Scopes) 1, 2 and 3

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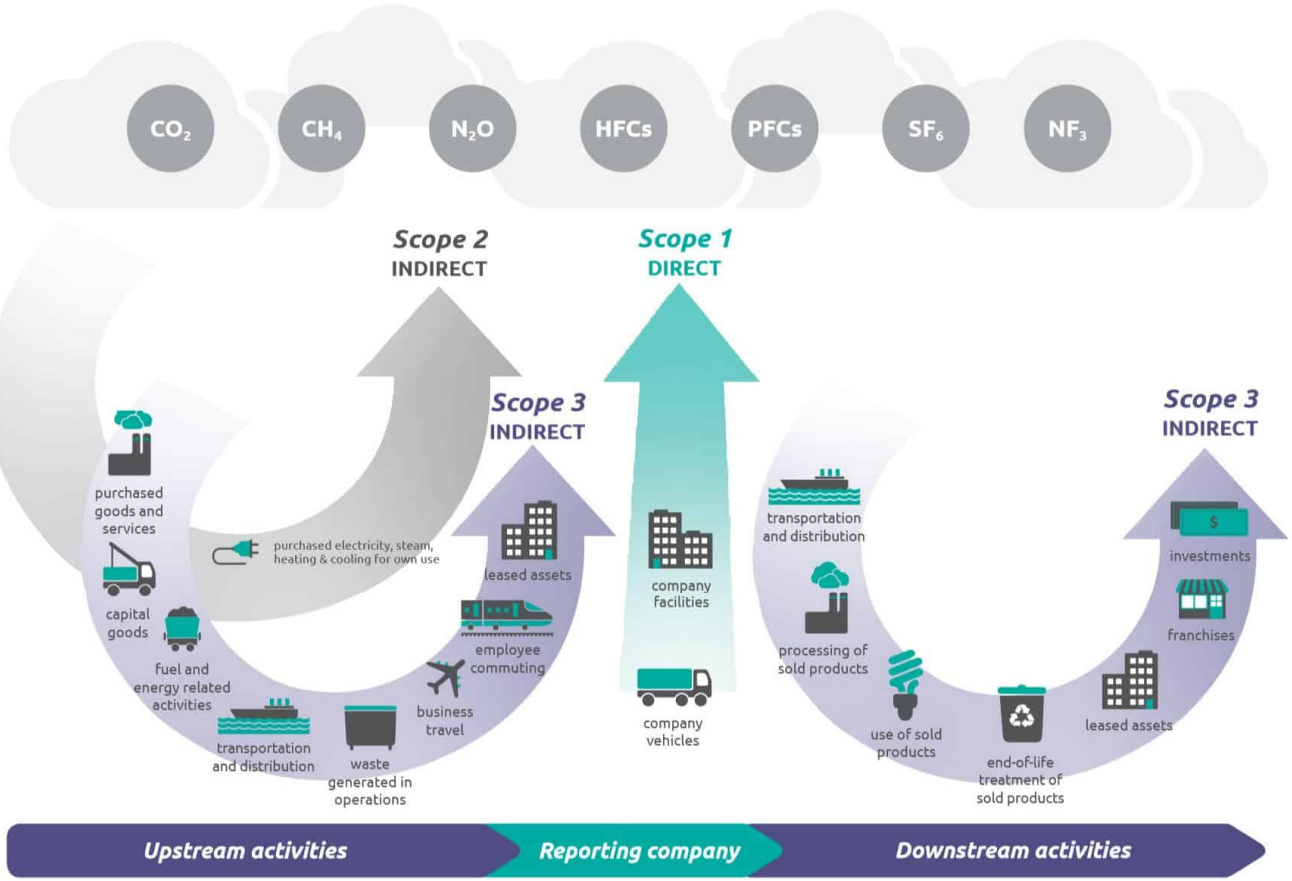

Scope 1: direct emissions under your responsability.

Scope 2: Emission from purchased electricy, steam, etc.

Scope 3: Emission from other purchased goods needed for the production

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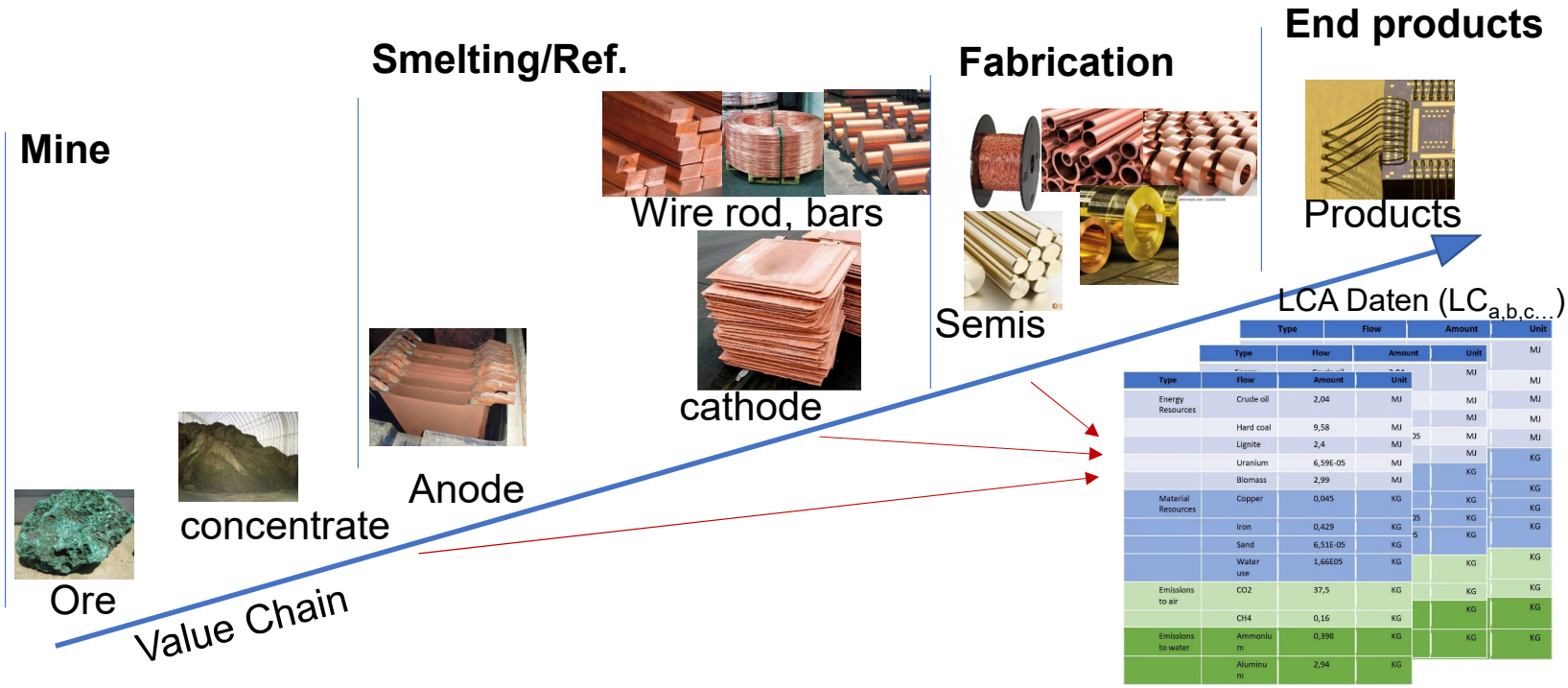
LCA approach

Value chain to be considered!



LCA approach

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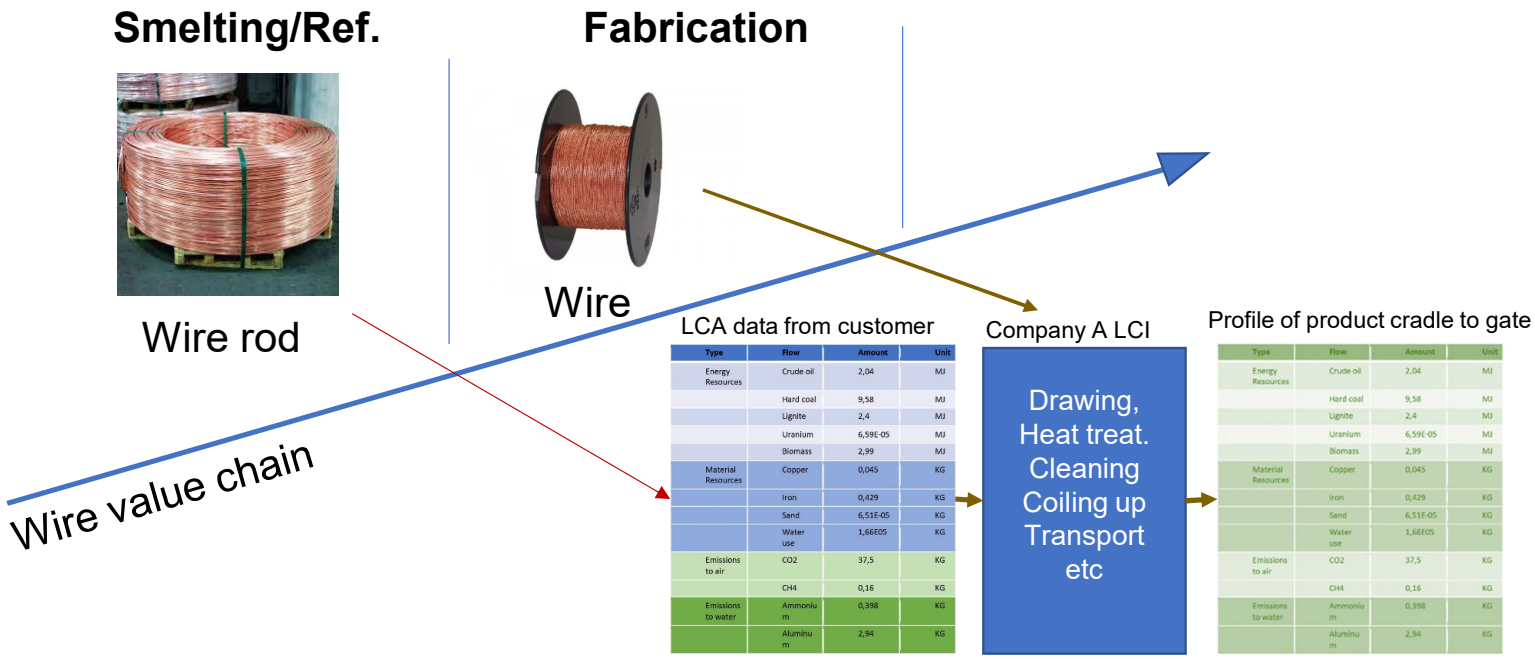
From cradle (mine) to gate (wire, cable)!



LCA Approach

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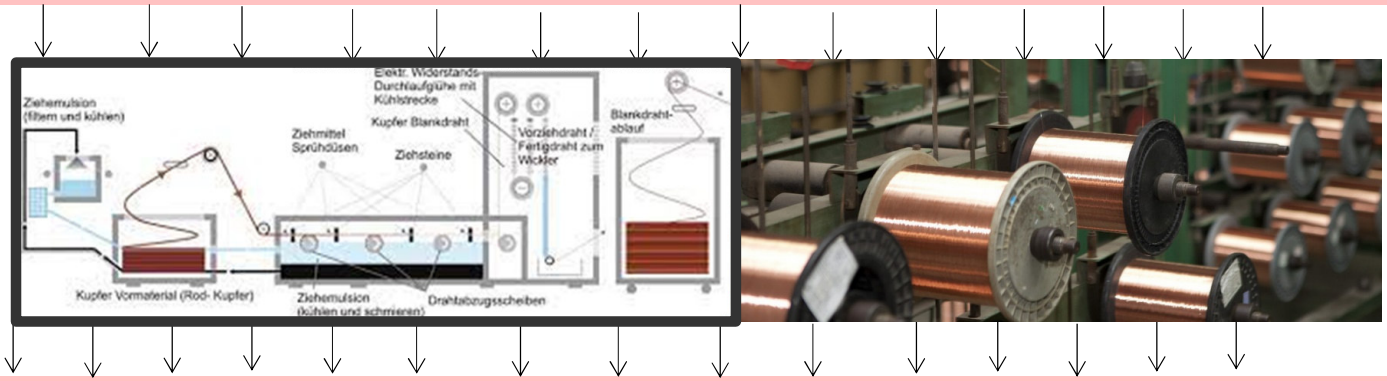
Use of the right system boundary and data collection of each process step!

Input: power, Water, gas, Lubricant, Chemical substances, wire rod, etc.



Output: Wire, Emissions (CO_2, Methane, Sulphur compounds, dust, Water, Wast, etc.)

Calculation of Environmental Footprint

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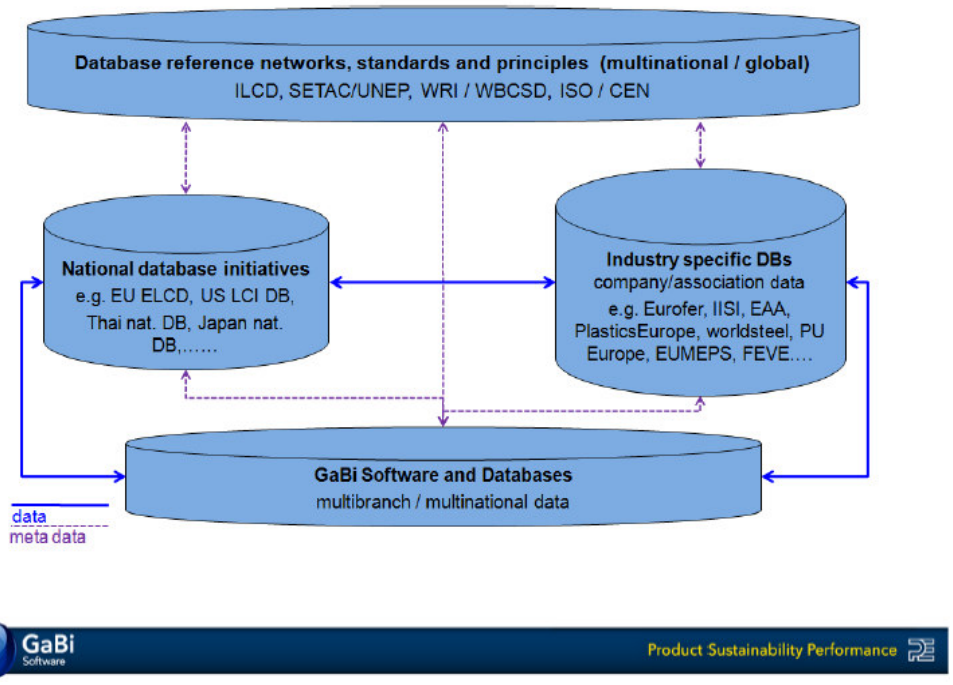
Data Bases help for background data:

- Energy (power grid, Diesel, etc.)
- Gases (hydrogen, oxygen, nitrogen, …)
- Transport (ship, lorry, etc.)
- Othe materials (Al, Fe, ceramic, etc.))
- Packaging (foils, wood, paper, etc.)
- Wast management (landfill, recovery, etc.)
- …

Calculation-Tools und Data Bases



Calculation of Environmental Footprint

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Results, Impact categories

Impact Categories	Total
Acidification Potential (AP) [kg SO2-Equiv.]	3,6
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	0,3
Global Warming Potential (GWP 100 years) [kg CO2-Equiv.]	1199,7
Photochem. Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	0,3
Primary energy demand from ren. and non ren. resources (net cal. value) [MJ]	23268,2

Start for many purposes:
- Improvement
- Sustainable communication
- Decarbonisation
- - etc.

Environmental Footpring – Copper Cathode

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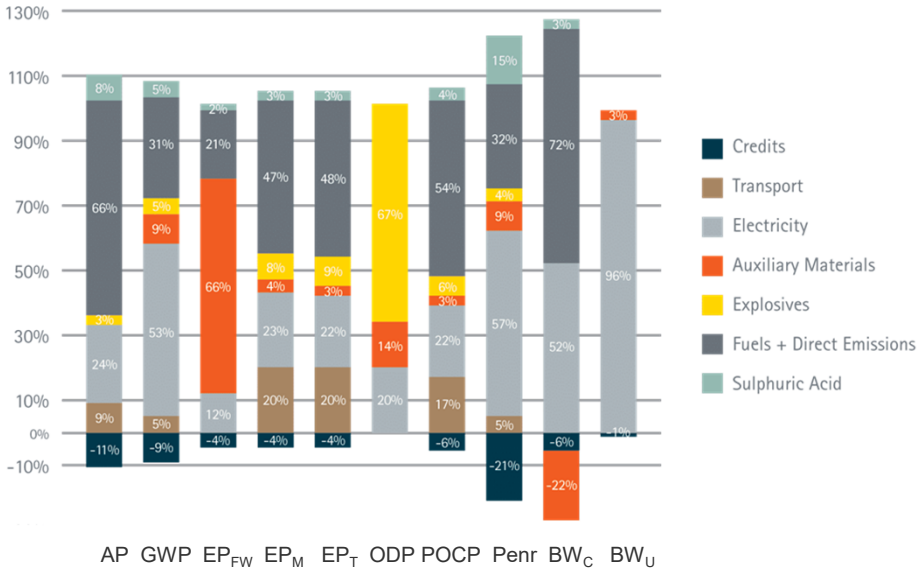
Profile of 1 ton global* copper cathode (EF3 method)

Impact Category (Wirkungskategorien)	Resultat	Einheit
Acidification	53.8	Mole of H+ eq.
Climate Change	3,9	to CO_2 eq.
Eutrophication, freshwater	0.03	kg P eq.
Eutrophication, marine	6.8	kg N eq.
Eutrophication, terrestrial	73.4	Mole of N eq.
Ozone depletion	6.5E-09	kg CFC-11 eq.
Photochemical ozone formation, human health	20.7	kg NMVOC eq.
Resource use, fossils (Energy)	46,7	GJ
Water use	2,308	m³ world equiv.

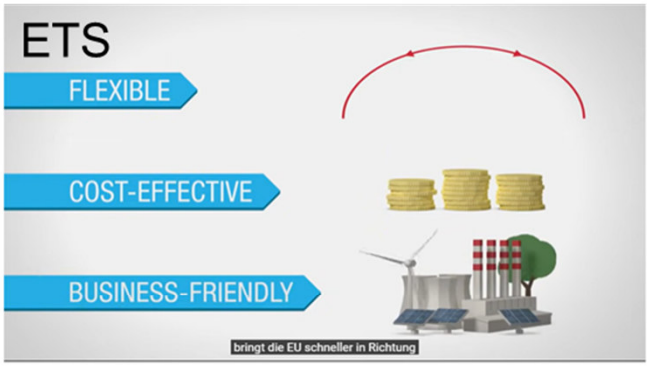
*China excluded

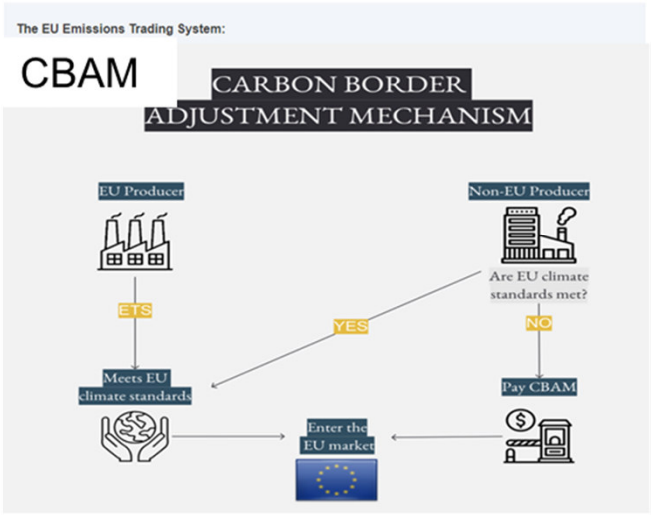
Hotspot-Analysis!



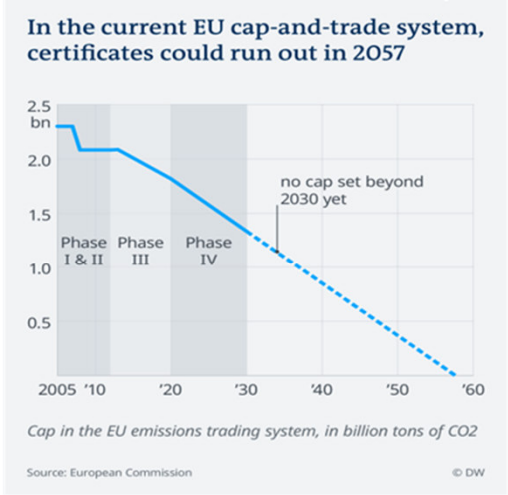
Use of the Environmental Footprint

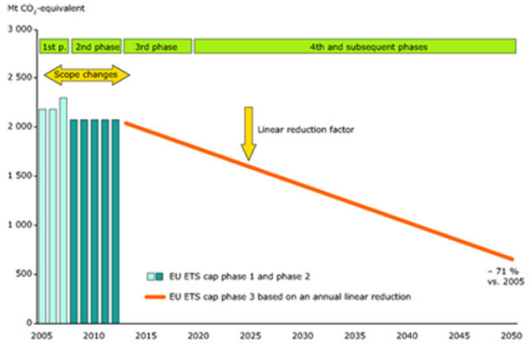
Legislative Tools to cut CO_2

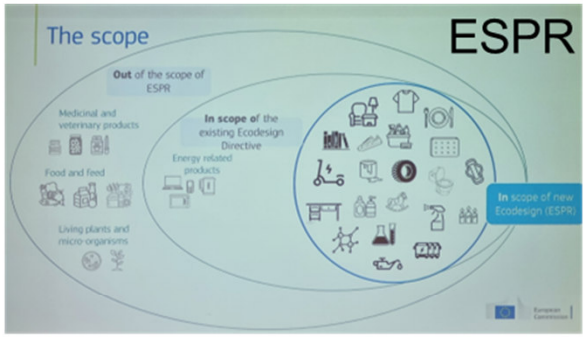


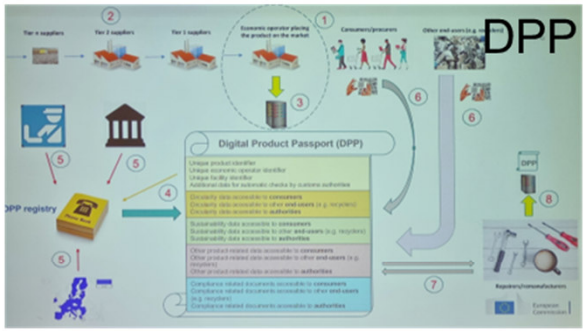


Goal: reduction of CO2-emission to zero by 20250









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Decarbonisation of Copper is on its Way

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Copper—The Pathway to Net Zero - Copper Alliance

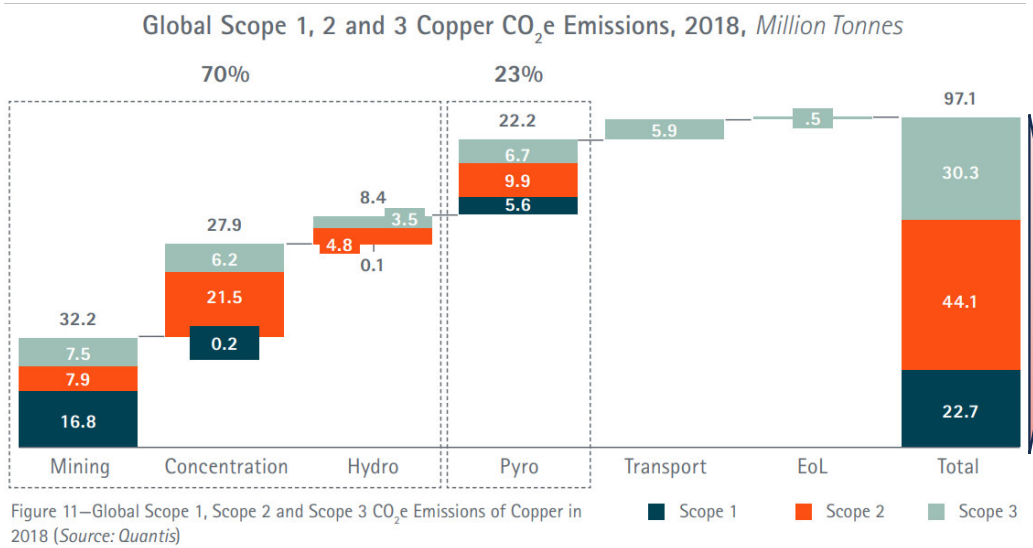
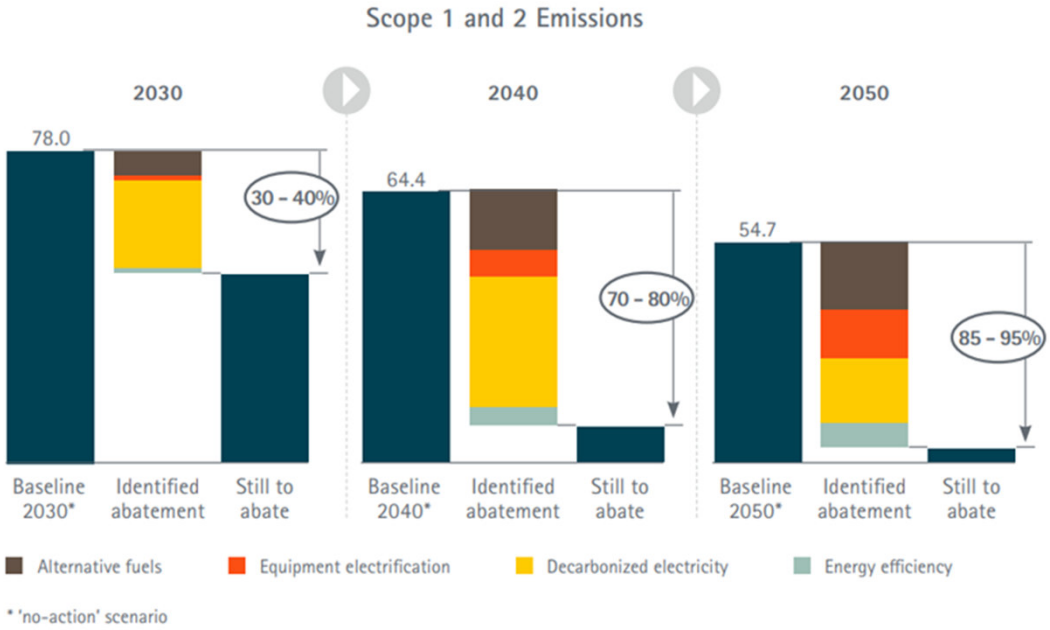


Figure 11—Global Scope 1, Scope 2 and Scope 3 CO_2e Emissions of Copper in 2018 (*Source: Quantis*)



Deep dive analysis with the help of the LCA of copper

Decarbonisation Roadmap

Environmental Footprint
-Key to the market?-

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Harmonizing environmental systems!

All products to be addressed!

Summary

Environmental Footprint - Summary

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- ✓Sustainability is key for business and living conditions
- ✓LCA approach is used to measure sustainability in calculating footprints (what you cannot measure you cannot manage!)
- ✓Environmental Footprint is the basis for sustainable management
- ✓It helps to improve production system and adapt consumption, etc. (using hotspot analysis)
- ✓It help to set up the communication of sustainability „B2B“ und „B2C“.
- ✓Many aspects of EU green deal (taxonomy, decarbonisation, etc.) use it to measure and manage.
- ✓In a near future a harmonized label (e.g. PEF) could be require for the EU market

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Thank you!