Allocation in ISO, GHG Protocol, and Environmental Footprints

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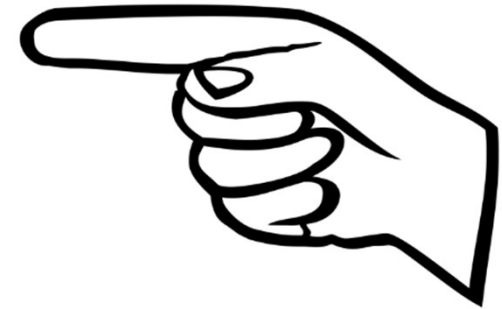SETAC-Europe Annual Meeting
Vienna, May 14th 2025

Key messages

Standards diverge in the interpretation of:

- **system expansion**

- **underlying physical relationships**

What we want:

- **clearer terminology**

- **separate allocation rules for different applications**

Organically growing multitude of ISO documents

ISO 13391-1	Carbon footprint of wood-based products
ISO 1402x	Environmental communication on products (incl. EPD)
ISO 1404x & 1407x	Life cycle assessment
ISO 1406x	Greenhouse gases (incl. carbon footprint)
ISO 16759	Carbon footprint of print media products
ISO/TS 19870	Carbon footprint of hydrogen technologies
ISO 20294	Carbon footprint of e-media
ISO/FDIS 20423	Carbon footprint product category rules for macroalgae
ISO 20915	LCI of steel products
ISO 21930	EPD of construction products and services
ISO 22526	LCA & Carbon footprints of biobased plastics
ISO 22948	Carbon footprint product category rules for finfish
ISO/AWI 25027	Carbon footprint of the use of lithium-ion batteries for vehicles
ISO/AWI 25191	Carbon footprint of Rare Earth
ISO 6338	Carbon footprint of liquefied natural gas

Allocation procedure (ISO 14044)

a) **Step 1:** Wherever possible, allocation should be avoided by

   1) dividing the unit process to be allocated into two or more sub-processes and collecting the input and output data related to these sub-processes, or

   2) expanding the product system to include the additional functions related to the co-products

b) **Step 2:** Where allocation cannot be avoided, the inputs and outputs should be partitioned between its different products or functions in a way that reflects the underlying physical relationships between them; i.e., they should reflect the way in which the inputs and outputs are changed by quantitative changes in the products or functions delivered by the system.

c) **Step 3:** Where physical relationship alone cannot be established or used as the basis for allocation, the inputs should be allocated between the products and functions in a way that reflects other relationships between them. For example, input and output data might be allocated between co-products in proportion to the economic value of the products.
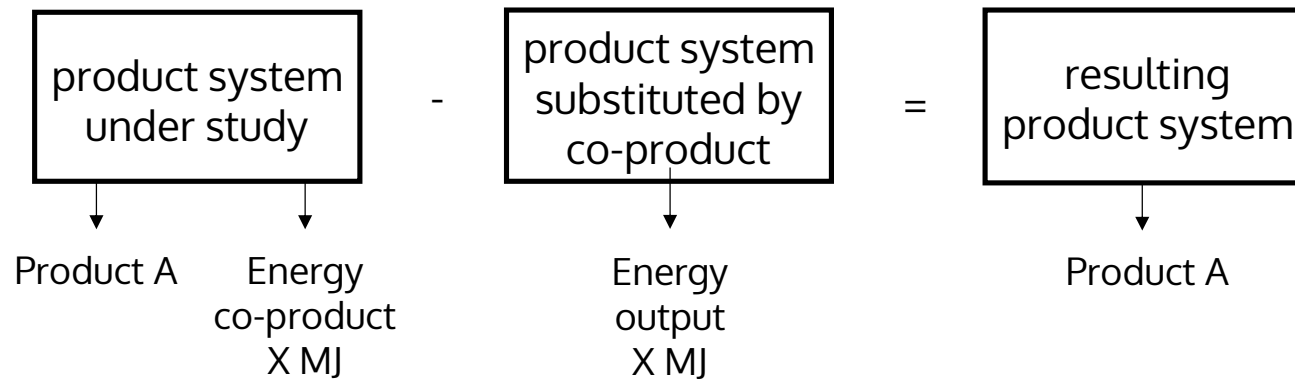
Allocation hierarchy (ISO 14044)

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Expanding the product system to include the additional functions
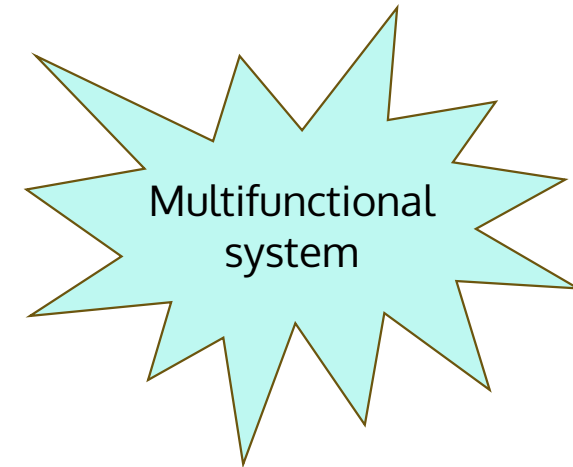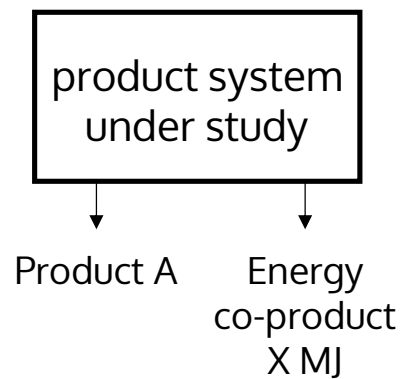
ISO 14044/Amd 2:2020, Annex D

System expansion with substitution

Substitution

product system under study		product system substituted by co-product		resulting product system
	−		=	

Product A · Energy co-product X MJ − Energy output X MJ = Product A

Expanding the product system to include the additional functions

ISO/TR 14049:2012 Examples on how to apply ISO 14044

Expansion to multifunctional system

```
┌─────────────────────┐
│  product system     │
│  under study        │
└─────────────────────┘
     │            │
     ▼            ▼
 Product A     Energy
              co-product
                X MJ
```
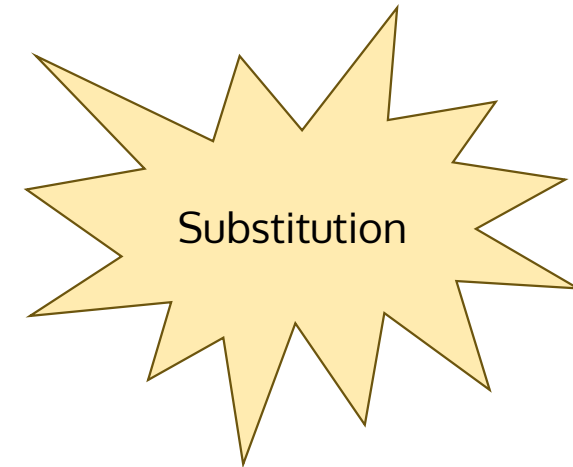
Multifunctional system

Expanding the product system to include the additional functions

ISO 20915:2018 LCI of steel products

"When choosing the alternative system for system expansion, it shall be chosen regarding the regional situation. The choice of system should be the most likely production method that would be offset."
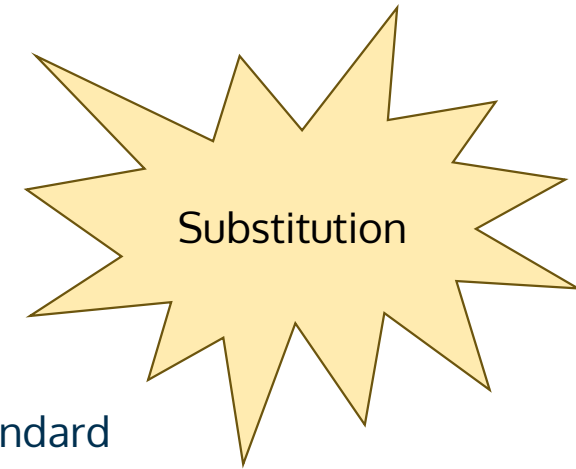
Substitution

Expanding the product system to include the additional functions

ISO 22526-4:2023 LCA of biobased plastics

"System expansion means 'expanding the product system to include additional functions', so all additional functions are modelled and calculated and there are multiple benefits; nothing is subtracted."
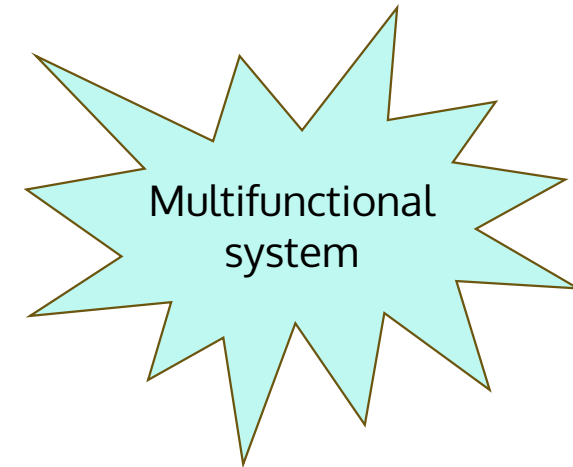
Multifunctional system

Expanding the product system to include the additional functions

Substitution

Greenhouse Gas Protocol: Product Life Cycle Accounting and Reporting Standard

"Companies shall avoid allocation wherever possible by using process subdivision, redefining the functional unit, or using system expansion."

Expanding the product system to include the additional functions

Multifunctional system
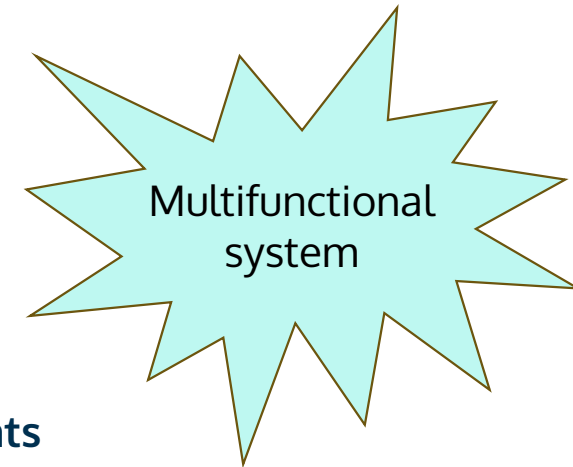
EU COMMISSION RECOMMENDATION 2021/2279 Environmental Footprints

- Direct substitution is a form of allocation based on a relevant underlying physical relationship

- Indirect substitution is a form of allocation based on some other relationship

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Underlying physical relationships (Step 2)

ISO 14044/Amd 2:2020, Annex D

"Such a relationship exists when the amounts of the co-products can be independently varied."

Process	Step 2
Joint Production	-
Combined Production	X

Underlying physical relationships (Step 2)
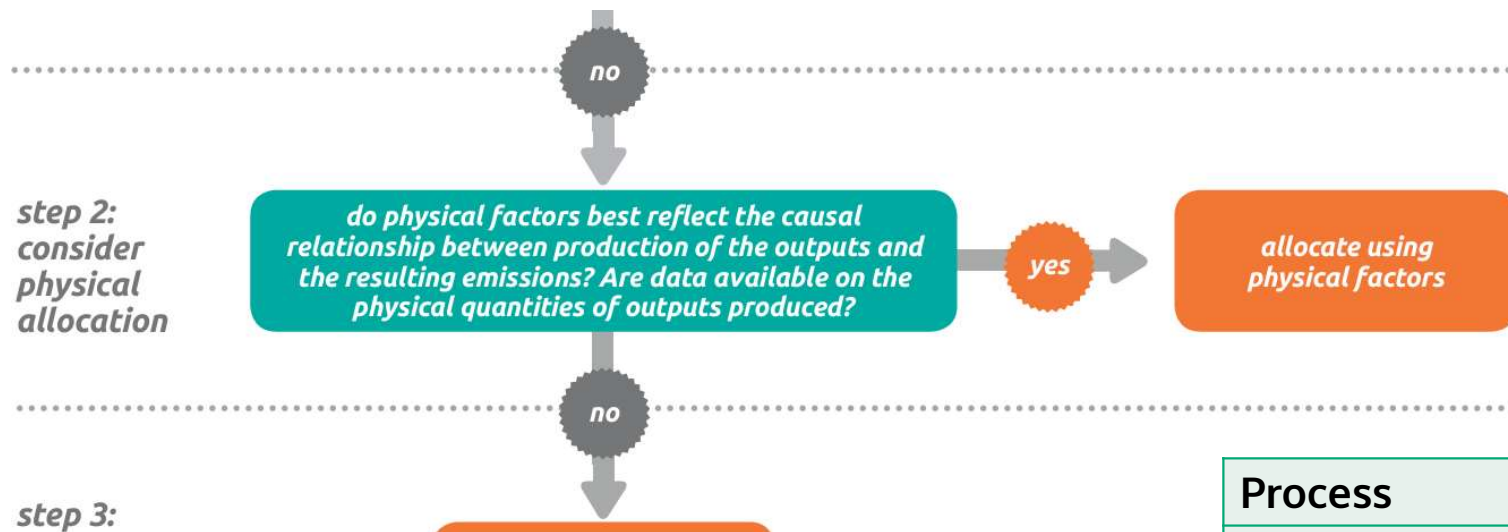
ISO 21930:2017 EPD in the construction sector

Step 2: preferred option for joint production

Step 3: just economic allocation

Process	Step 2
Joint Production	X
Combined Production	X

Underlying physical relationships (Step 2)

Greenhouse Gas Protocol: Corporate Value Chain (Scope 3) Accounting and Reporting Standard

step 2: consider physical allocation

no

do physical factors best reflect the causal relationship between production of the outputs and the resulting emissions? Are data available on the physical quantities of outputs produced?

yes → allocate using physical factors

no

step 3:

Process	Step 2
Joint Production	X(?)
Combined Production	X

Underlying physical relationships (Step 2)

EU COMMISSION RECOMMENDATION 2021/2279 Environmental Footprints

"...a relevant, quantifiable physical relationship between the process inputs and co-product outputs (for example, a physical property of the inputs and outputs that is relevant to the function provided by the co-product of interest). "

Process	Step 2
Joint Production	X(?)
Combined Production	X

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Allocation in attributional and consequential LCA (tentative)

- Expansion to multifunctional system => Functional unit

- Attributional LCA:
    1. Subdivision
    2. (Substitution)
    3. Allocation

- Consequential LCA:
    1. Subdivision
    2a. Joint production: Substitution
    2b. Combined production: Allocation reflecting underlying physical relationships

Thank you for your time and attention!

Consistent LCA standards

A Swedish Life Cycle Center project

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