ecoinvent user meeting, Luxembourg

Welcome to the ecoinvent user meeting!

An overview of ecoinvent v3

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What is ecoinvent?

- A **not-for-profit** association of several research organizations

- Publisher of the ecoinvent database – **Life Cycle Inventory** data on many thousands of products and services

- ecoinvent is not:

  - A business

  - A provider of LCA studies

What is ecoinvent?

- ecoinvent is a **data publisher**

  - Reviews, consistency checks, publishing services, e.g. support for users

  - Working with an established network of data providers, including governmental agencies from multiple countries, industry associations, private companies and researchers

- **Internal staff** as well as experts from **member organizations** provide the core expertise

- The **editorial board** provides additional competences on various sectors and topics

- **User** and **stakeholder** meetings, surveys and direct feedback also inform the development of the database
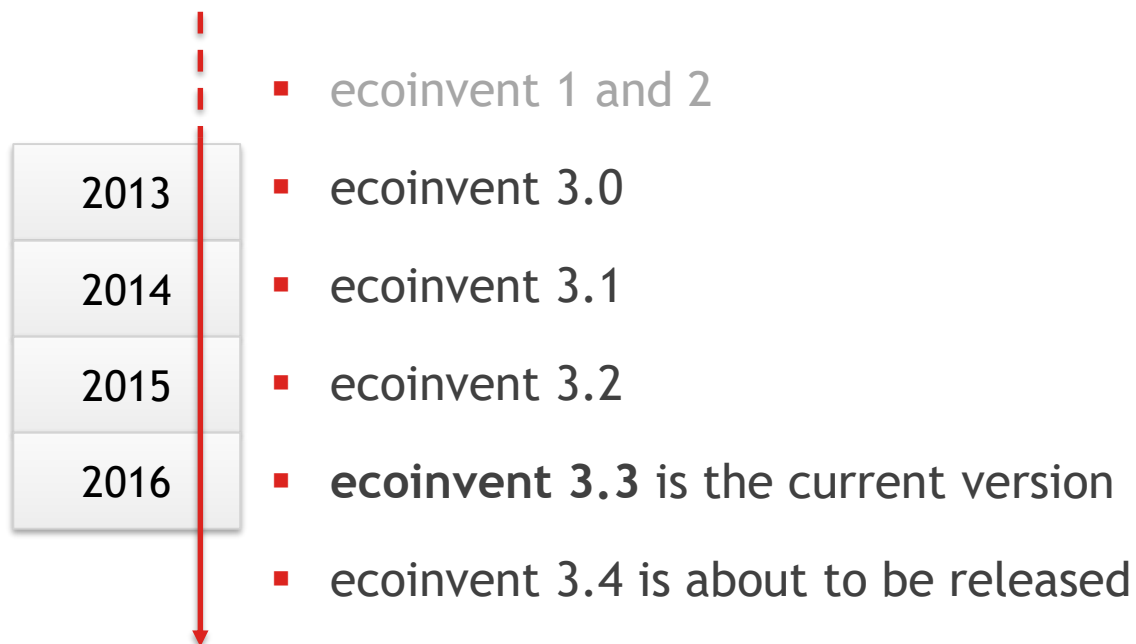
What is ecoinvent?

- ecoinvent is a **background database** which contains **generic data** on different materials and services

  - e.g. energy, basic materials, agriculture, transport, construction, and many more

- ecoinvent connects data providers and users

- The database provides data of a known quality

- More than **12'500** processes
- More than **2'700** products
- More than **3'300** distinct technologies
- Data from **80** countries and **157** geographies

ecoinvent – Quality Features

- **Consistent**
  - Submissions are reviewed against consistent quality guidelines
  - Inconsistencies are actively addressed and corrected

- **Reliable**
  - Independent expert review for all datasets
  - Continuously developed and improved over 15 years

- **Transparent**
  - Full access to both unit process data and all calculation results
  - Individual documentation of each dataset

Versions of the ecoinvent database

- New versions of the database are being released once a year

	■ ecoinvent 1 and 2
2013	■ ecoinvent 3.0
2014	■ ecoinvent 3.1
2015	■ ecoinvent 3.2
2016	■ **ecoinvent 3.3** is the current version
	■ ecoinvent 3.4 is about to be released

What is ecoinvent?

- ecoinvent was created in Switzerland by a group of research institutes and government stakeholders

- ecoinvent **started out** as the Swiss national LCI network
  - Evolution out of several smaller, loosely connected data pools with significant additional development
  - **International** supply chains required a strong focus on European and Global data as well
  - ecoinvent has **grown** into a global database with a global userbase

Who uses the ecoinvent database?

- The database has **many thousands of users** from over **80 countries**

- Primary users are consultants, industry, researchers, policy makers

  - Revenue from commercial and academic users supports the maintenance and development of the database

  - Research and educational use in non-OECD regions is free

- Many users in **Life Cycle Assessment (LCA)** and **carbon footprinting**
  - More and more use in EPDs (e.g. EN 15804), PEF, water footprinting, resource criticality, Social LCA, and other sustainability assessments

Who uses the ecoinvent database?

- Included in or available for the leading LCA and eco-design software tools

What does the database contain?

- The database itself

  - Access to the raw process datasets

  - Access to linked, single-output unit processes (in different system models)

  - System processes/aggregated LCIs

  - Tables of Impact Assessment results

- Metadata

- Documentation

Unit Processes

- ecoinvent publishes data at the unit process (UPR) or gate-to-gate level
  - Allows supply chain and environmental hotspot analysis
  - Easier to maintain
  - Can be updated, expanded on or modified individually by the users

- The scope of a unit process is somewhat flexible in ecoinvent
  - As little as possible, as much as necessary for use in a **background database**
  - Resolution aims at meaningful assessments of supply chain impacts
  - **Aggregation level** depends also on data availability

System models in ecoinvent

- A **system model** is a collection of modeling choices made for the database, e.g.

    - Allocation of by-prodcuts or substitution
    - End of Life considerations
    - Consequential and forecasting LCAs

- ecoinvent version 3 supports multiple system models

    - Certain studies and standards require specific system model choices
    - Different perspectives at the same data

System models in version 3
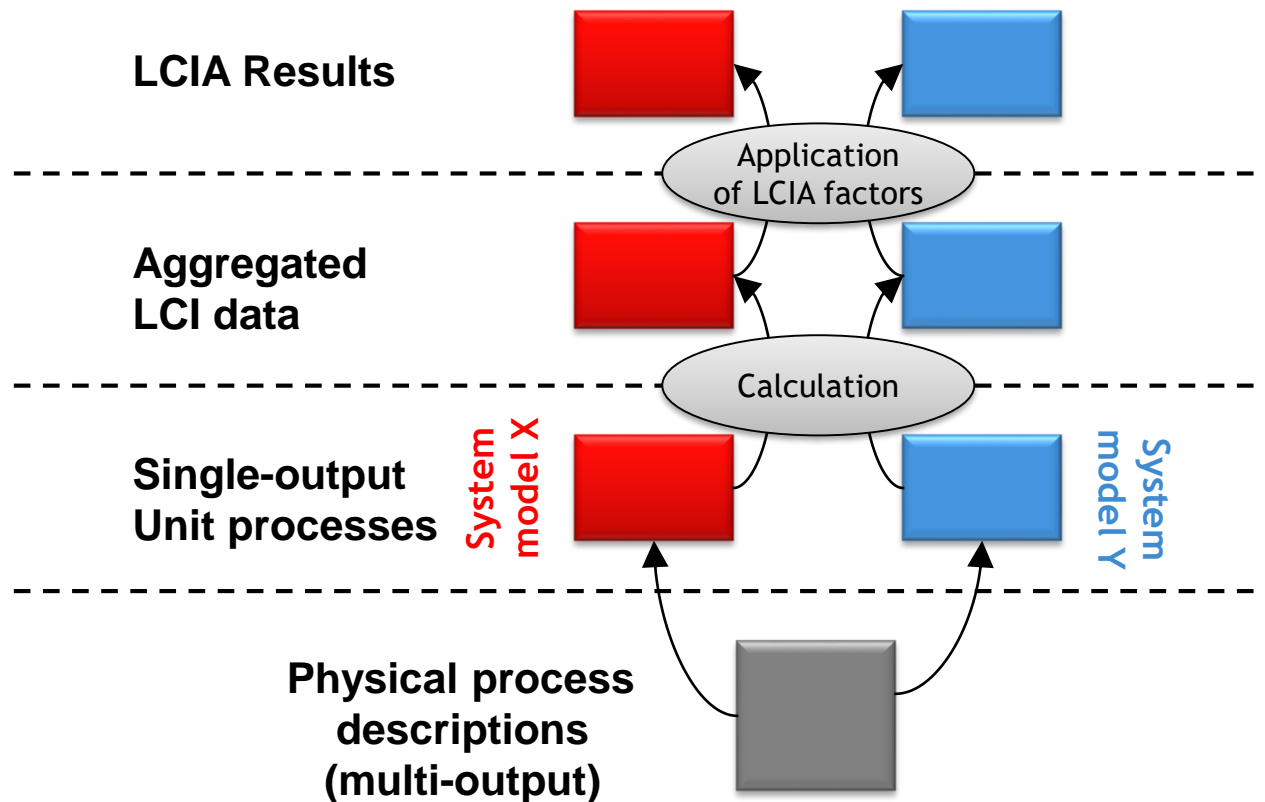
Allocation

- Allocation approach is based on ISO 14040/44
    - Sub-division of the system: e.g. petroleum and natural gas extraction
    - Allocation using physico-chemical properties: e.g. exergy for energy co-production
    - Allocation using revenue, mass or others: often but not always economic

- Allocation choice is confirmed for each process between the data provider and the reviewers
    - Should reflect the drivers of the impacts

What does the database contain?

- **Supporting metadata** such as

  - Product and Process classifications

  - price information (for e.g. LCC or integration of Social LCA data)

  - Properties of products and environmental flows

    - Water content, Carbon content (fossil and biogenic), ...

  - Uncertainty and data quality information, on a flow-specific level

- **Documentation**

  - Transparency, understandability, reproducibility

    - Sources

Documentation

- ecoinvent website
  - Quality Guidelines, Data submission support, FAQ, Glossary, User forum

- Dataset documentation
  - In sectorial reports and within datasets

- Individual reports for each dataset in PDF form
  - Combines documentation, unit process information, LCIA results and a contribution analysis in one overview document

Documentation of new releases

- Activity overview

- Change report
  - Change report annex

- Correspondence files

PDF Documentation

PDF Documentation

- Overview of the process
  - Quick list of inputs and putputs

- Background information
  - Authorship and sourcing
  - Process and product descriptions
  - Important background data
  - etc..

PDF Documentation

- Individual exchange information

  - Author comments
  - Uncertainty and quality

  - Contributions to environmental impacts

- Selected LCIA results

Detailed information for exchanges
Back to table of content
Impact contribution legend: IPCC 2007 GWP100 | ecoscarcity 2013 total | ReCiPe H total, relative to dataset total score

Reference product	Annual prod.vol.	Amount
intermodal shipping container, 40-foot, high-cube	2.64e+5 unit	1.0 unit

Comment: Standard 40-food, high-cube intermodal shipping container. External dimensions; length - 12.192 m, width - 2.438 m and height - 2.896 m. Interior dimensions: length - 12.000 m, width - 2.311 m and height - 2.2.650 m. Internal volume: 75.3 m3. Maximum gross weight: 30.848 tons. Empty weight: 3.9 tons. Net load: 26.58 tons.
Production volume comment: Calculated value. 1.6 million TEU (Twenty-foot Equivalent unit) is newly added to the total capacity of shipping containers in the world (World Shipping Council, http://www.worldshipping.org/about-the-industry/containers/global-container-fleet, accessed 20141014). Out of that 33% is 40-food, high-cube containers (Containerization International Market Analysis, World Container Census 2008, http://people.hofstra.edu/geotrans/eng/ch3en/conc3en/containerfleet.html, accessed 20141014).

Inputs from technosphere	Amount
	impact contributions
building, hall	0.0163 m2
	<0.1%	<0.1%	<0.1%

Activity link: market for building, hall - GLO
Comment: Calculated value based on estimates. 1m2 of hall is available every day for 50 years. 1 container occupies the area of its base

Selected impact assessment results
Back to table of content

method	category	indicator	score
IPCC 2007	climate change	GWP 100a	1.783e+4 kg CO2-Eq
IPCC 2013	climate change	GWP 100a	1.843e+4 kg CO2-Eq
ecological scarcity 2013	total	total	8.058e+7 UBP
USEtox	human toxicity	carcinogenic	0.01033 CTU
USEtox	human toxicity	non-carcinogenic	0.03794 CTU

Core aspects of ecoinvent v3

- How datasets are named and grouped

- Market datasets

- System models in version 3

Naming of activities

- While version 2 had **Processes**, version 3 is organized in **Activities** and **Products**

lime, hydraulic, at plant / CH → lime, hydraulic, at plant / CH

lime production, hydraulic / CH → lime, hydraulic

- Users can search activities and products separately
- All activities with the same product can easily be identified
- Classifications provide additional structure

- **Separation** of product and activity names
  - More that one activity can produce the same product
- **Market datasets** are available for all products
- Markets describe the **consumption mix** for a product and region
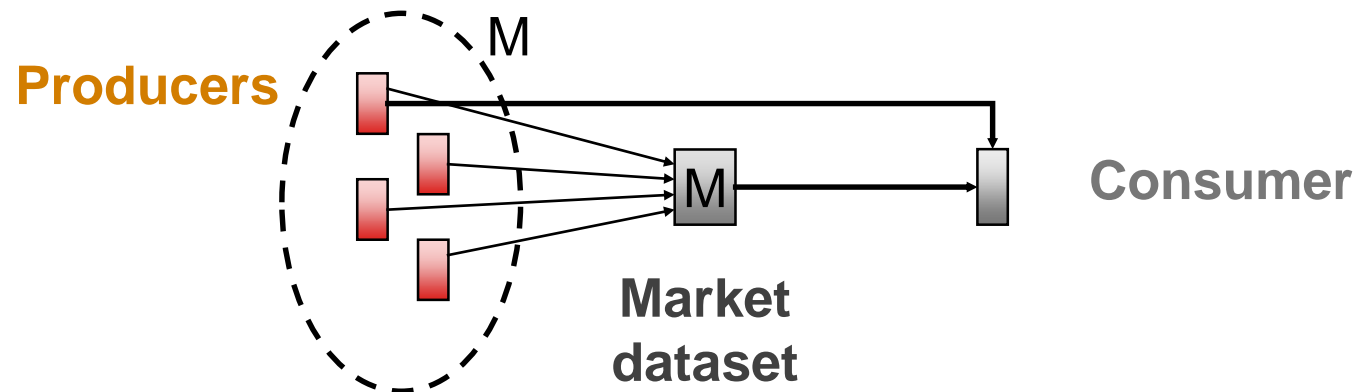
Market datasets

- **Market datasets** provide convenient input mixes of a product for a region

- **Additional information** is included

  - Transport

  - Losses during transport

  - ...

The choice remains

- As user, you can always choose between the supplying activities and the consumption mix

https://ecoquery.ecoinvent.org

System models in version 3

- A **system model** is a collection of modeling choices made for the database

  - Solving the allocation problem

  - Recycling and waste streams

  - Handling constraints in suppliers

- In version 3, **multiple system models** are possible

  - Different perspectives at the same database

System models in ecoinvent v3

- Allocation at the point of substitution

- Allocation, Recycled Content cut-off

- Consequential (long-term, small-scale)

- Other models are possible

  - Different End of Life approaches

  - Integration with specific standards

  - …

Recycled content cut-off

- Modeling approach of older ecoinvent versions

- Based on a **product-level** classification

  - *Ordinary, allocatable by-products*

  - *Recyclable materials*

  - *Wastes*

  - All products are **classified consistently** throughout the database

Recycled content cut-off

- Fundamental concept:

  - **No credit** for recycling or waste treatment by-products

  - **Full burdens** for waste treatment, but **no burdens** for recycling

- Creates a **cut** between the primary and secondary use phases

- Consequence: Burden of **primary production** is completely with the **first use** of the product

  - Use of recycled products is encouraged

  - Waste treatment with beneficial by-products is **not** encouraged

Recycled content cut-off

- Ordinary by-products

  - Allocated directly

  - Most products in the database

  - Allocated according to values chosen by the data provider to reflect the ISO hierarchy

Recycled content cut-off

- Wastes

Inputs and resources

Activity

Product

Waste treatment

- Waste

By-product

Emissions

By-product is burden-free
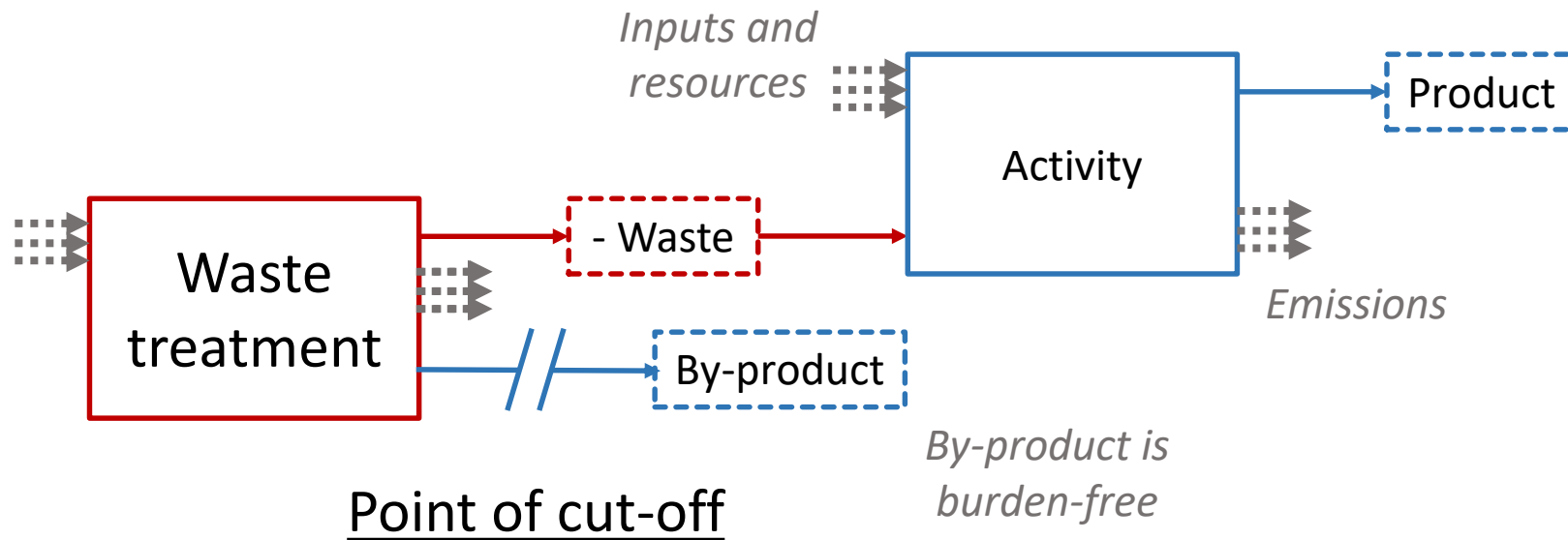
Point of cut-off

Recycled content cut-off

- Recyclable Materials

This dataset contains no inputs or outputs besides the recyclable material itself

Recycled Content cut-off

- Recyclable material

Activity

Product

Disposal of the recyclable material is burden-free
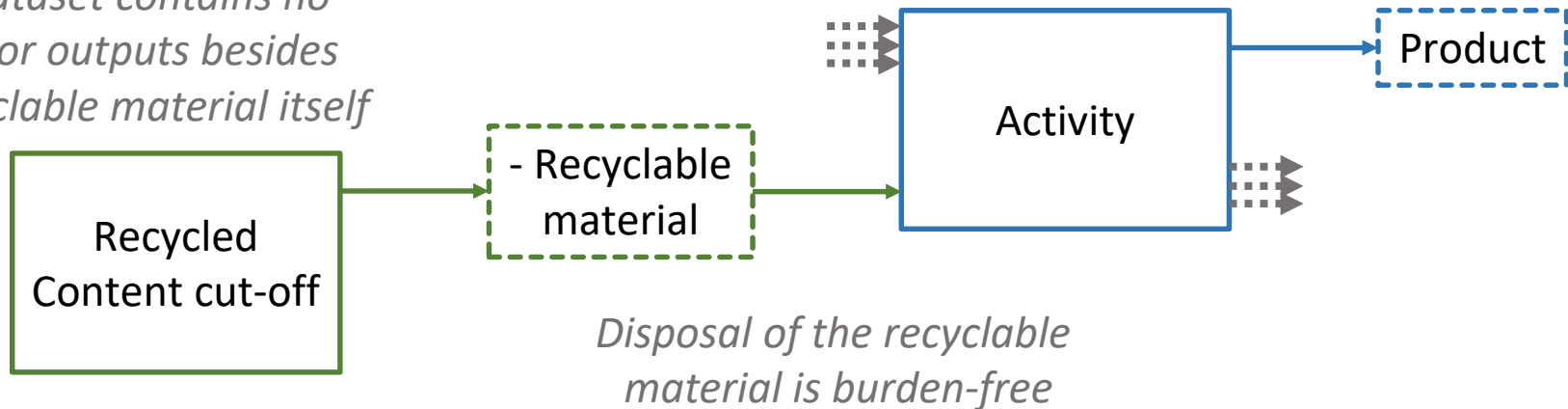
Point of cut-off

Recycled content cut-off

- Overview of allocation

Disposal of waste, comes with burdens

Recyclable material, burden-free

Activity before allocation

Product 1

Product 2

Allocated activity 1

Product 1

Allocated activity 2

Product 2

Recycled content cut-off

eco**i**nvent
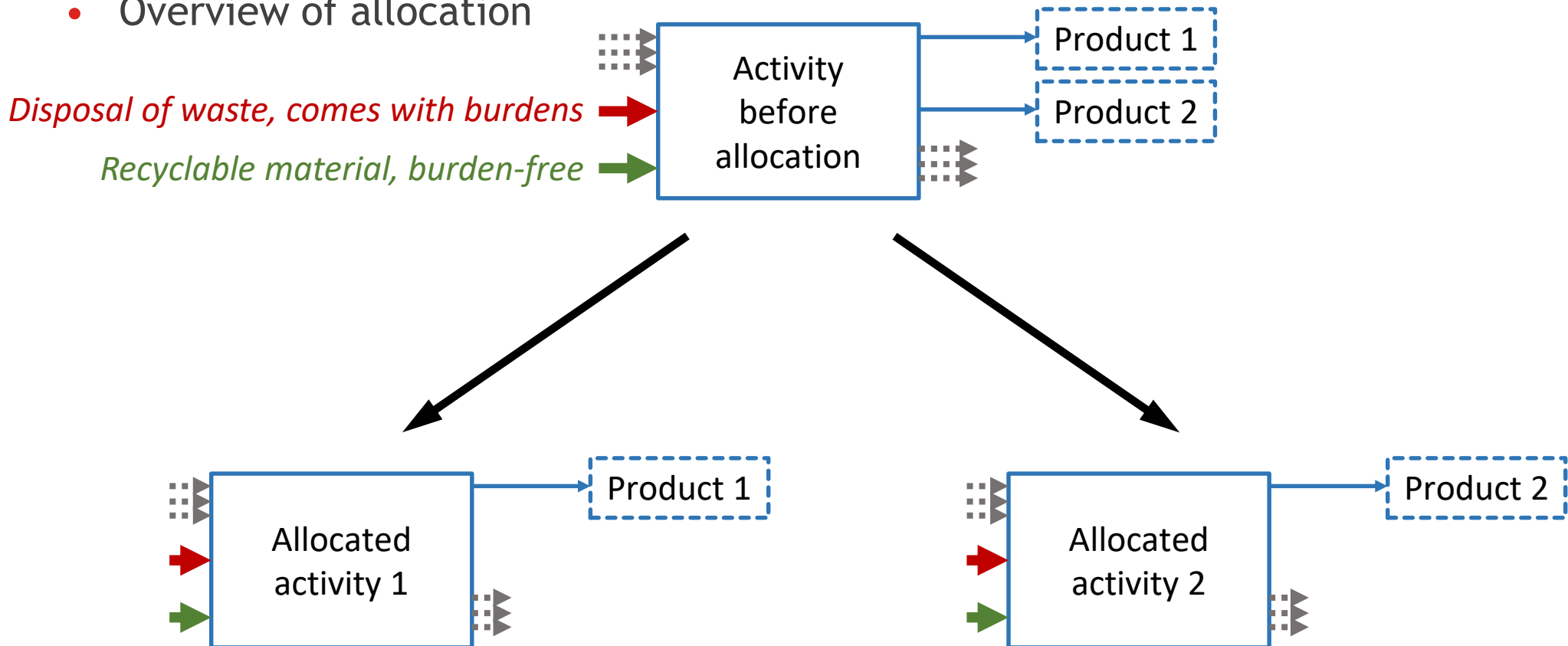
- Consistent separation of first and secondary uses based on the product classification

- Flexible application through product choice

- Simple allocation process to follow and reproduce

- Clear datasets to modify or adapt

Allocation at the point of substitution

- Physical allocation where possible, otherwise **allocation at the point of substitution**

- The **point of substitution** is the point where a recycling/treatment process results in a **marketable product** (i.e. a good produced purely for economic gain)

  - At this point economic allocation is feasible

Allocation at the point of substitution
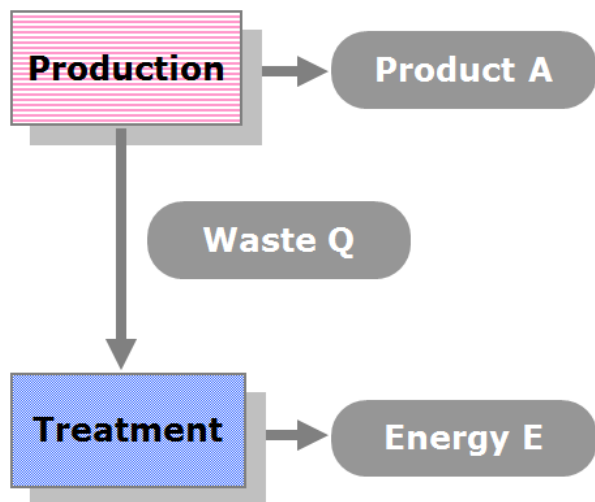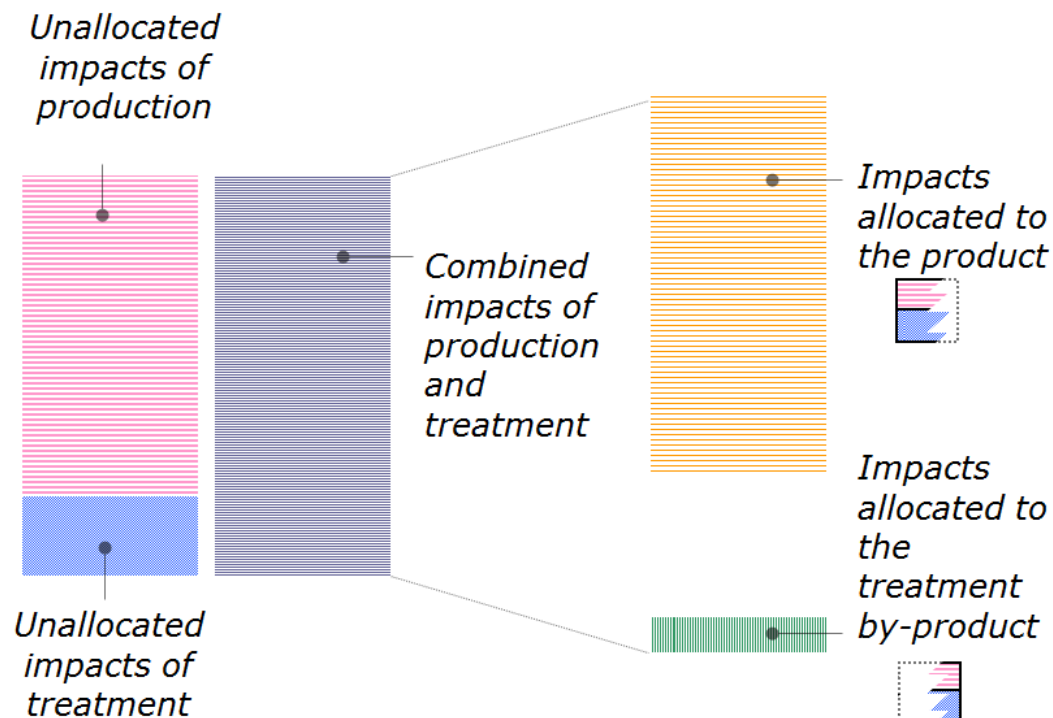
Graph: G. Doka

Cut-off vs APOS

- Difference in allocation of **wastes treatment products** and **recyclable materials**
  - No other differences in the models
- Differences **only for these products**
  - Few wastes have significant by-products in treatment

Cut-off vs APOS

APOS divided by Cut-off

Cut-off vs APOS

Electricity, medium voltage, ES

(y-axis) GWP IPCC 2007 100a

MSW incineration, Cut-off — MSW incineration, APOS — Electricity mix (APOS)

Cut-off vs APOS

Electricity mix, medium voltage, ES

GWP IPCC 2007 100a

Allocation, RC (Cut-off)   Allocation, APOS
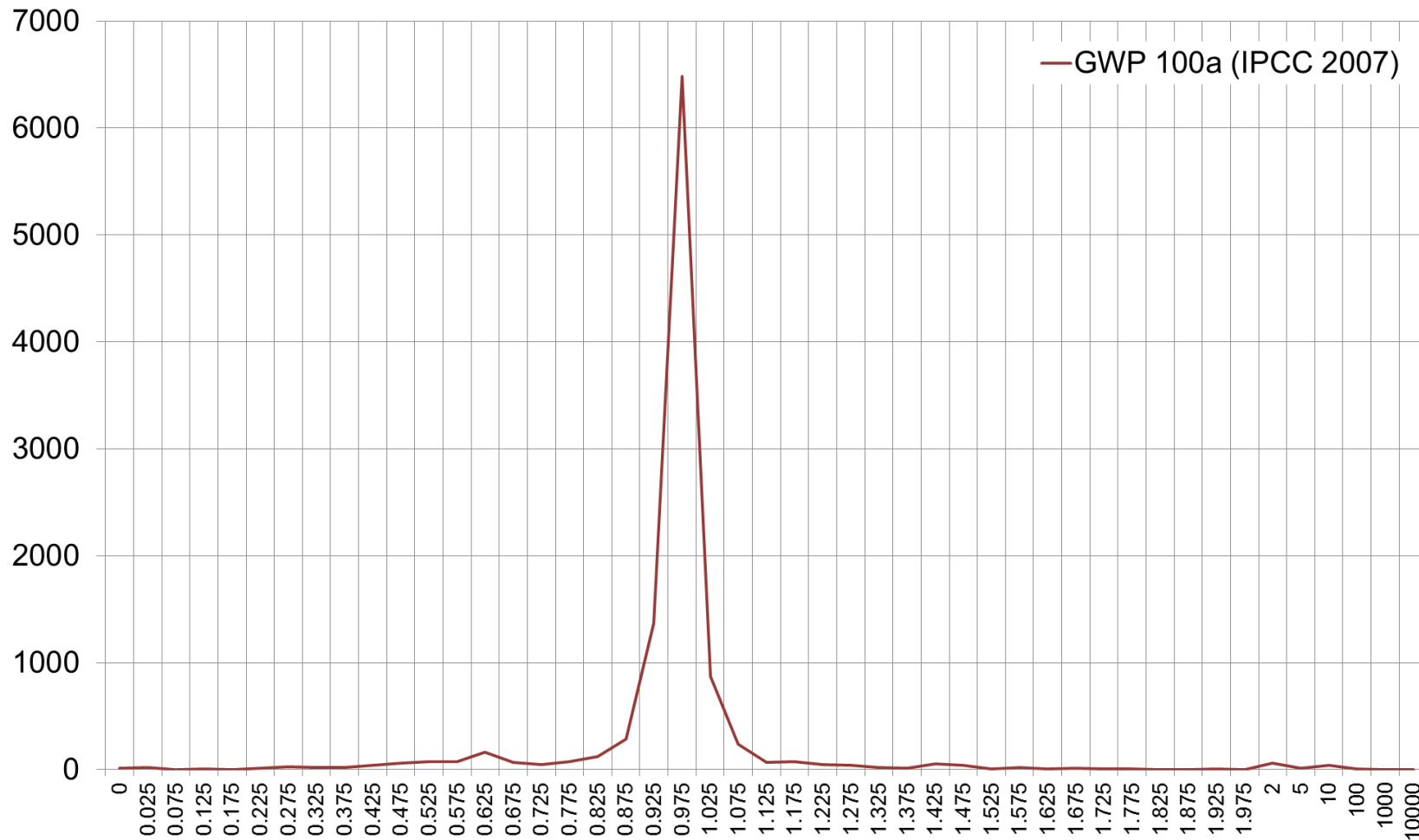
Cut-off vs APOS

Cut-off vs APOS

- Slightly **lower impacts** for most products in the database **in APOS**

- **Non-zero impacts** for products no longer cut off

- Impacts are **shifted** between products, but of course not created or removed

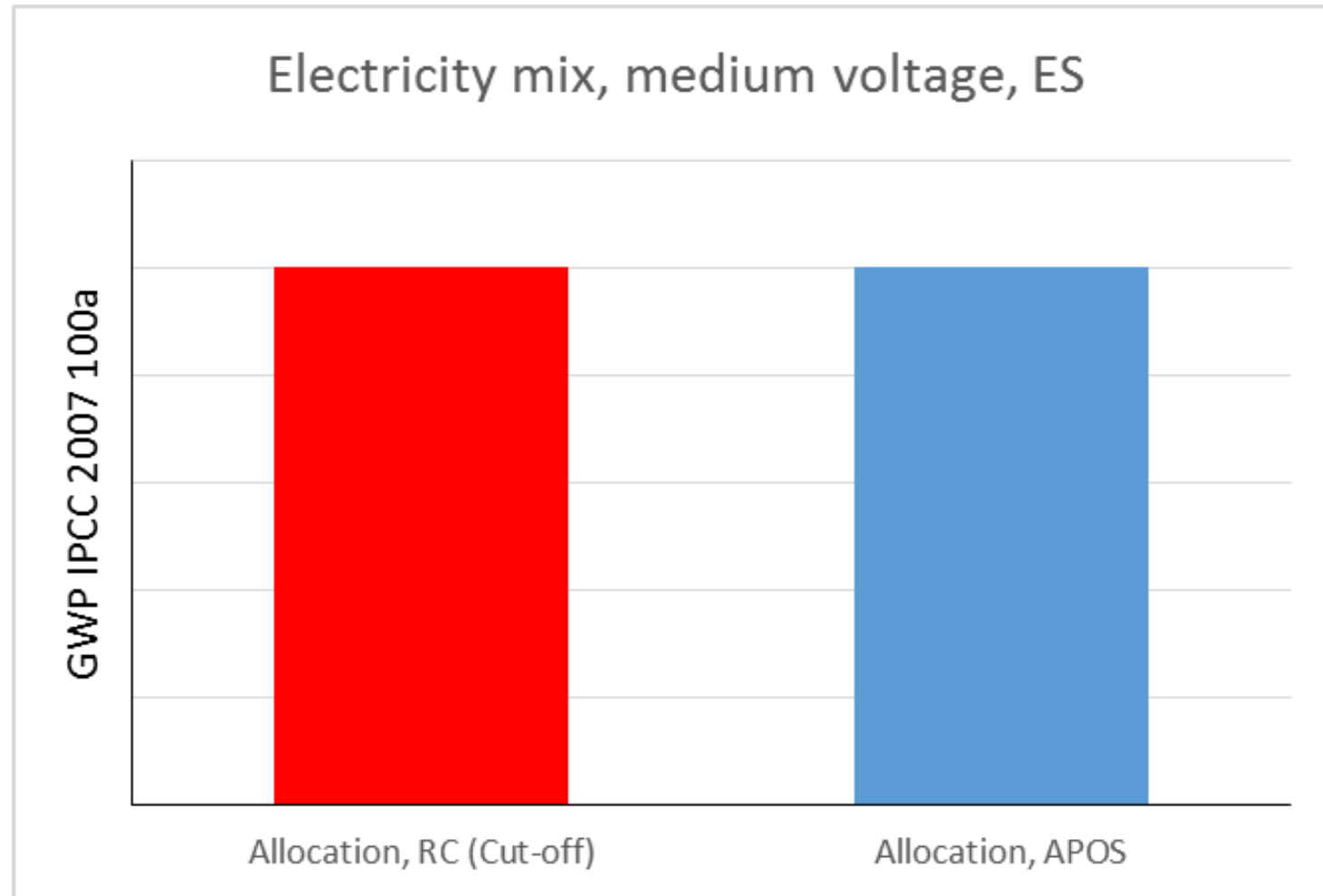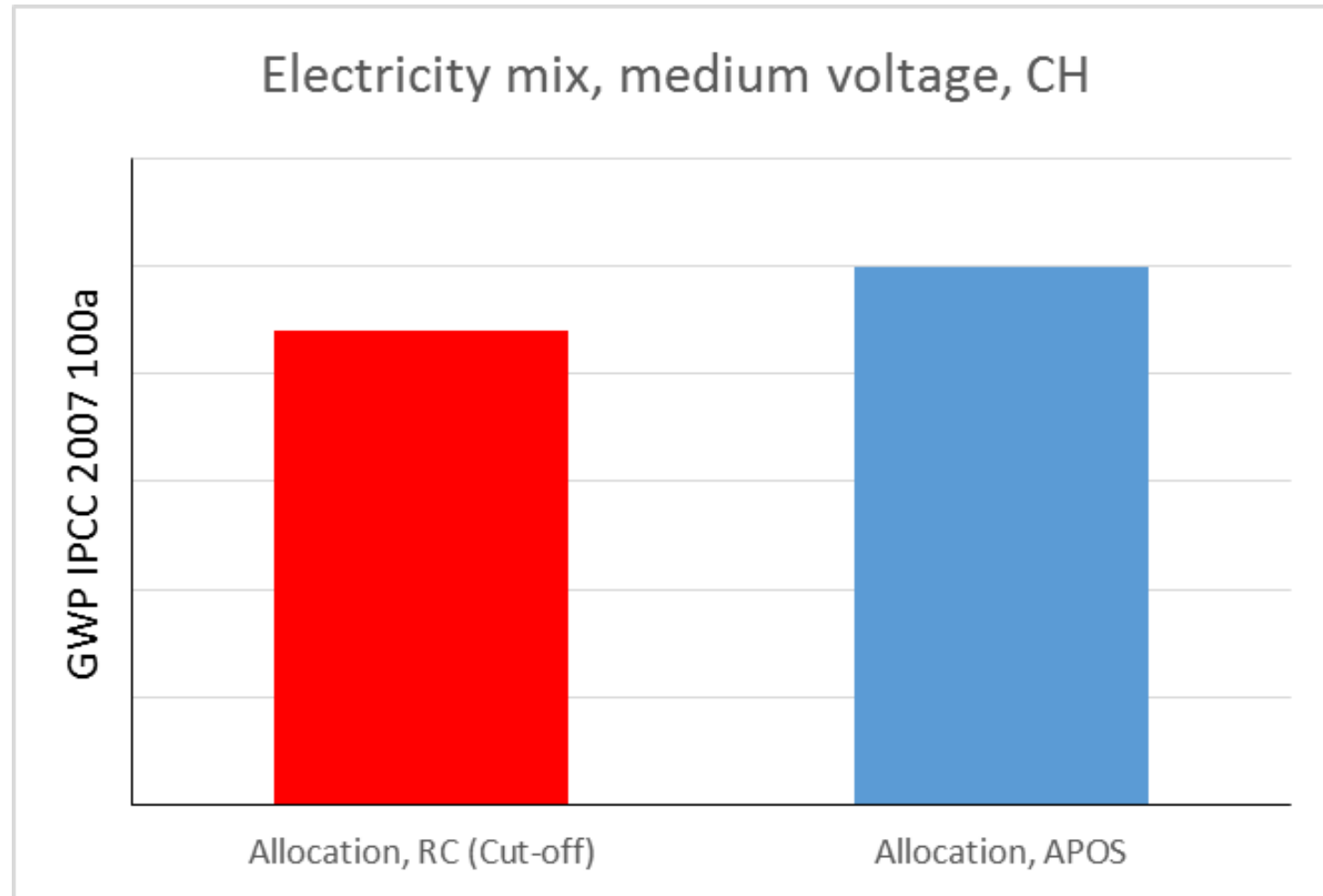- Two available system models allow a **sensitivity analysis** in cases where recycling or cut materials are important
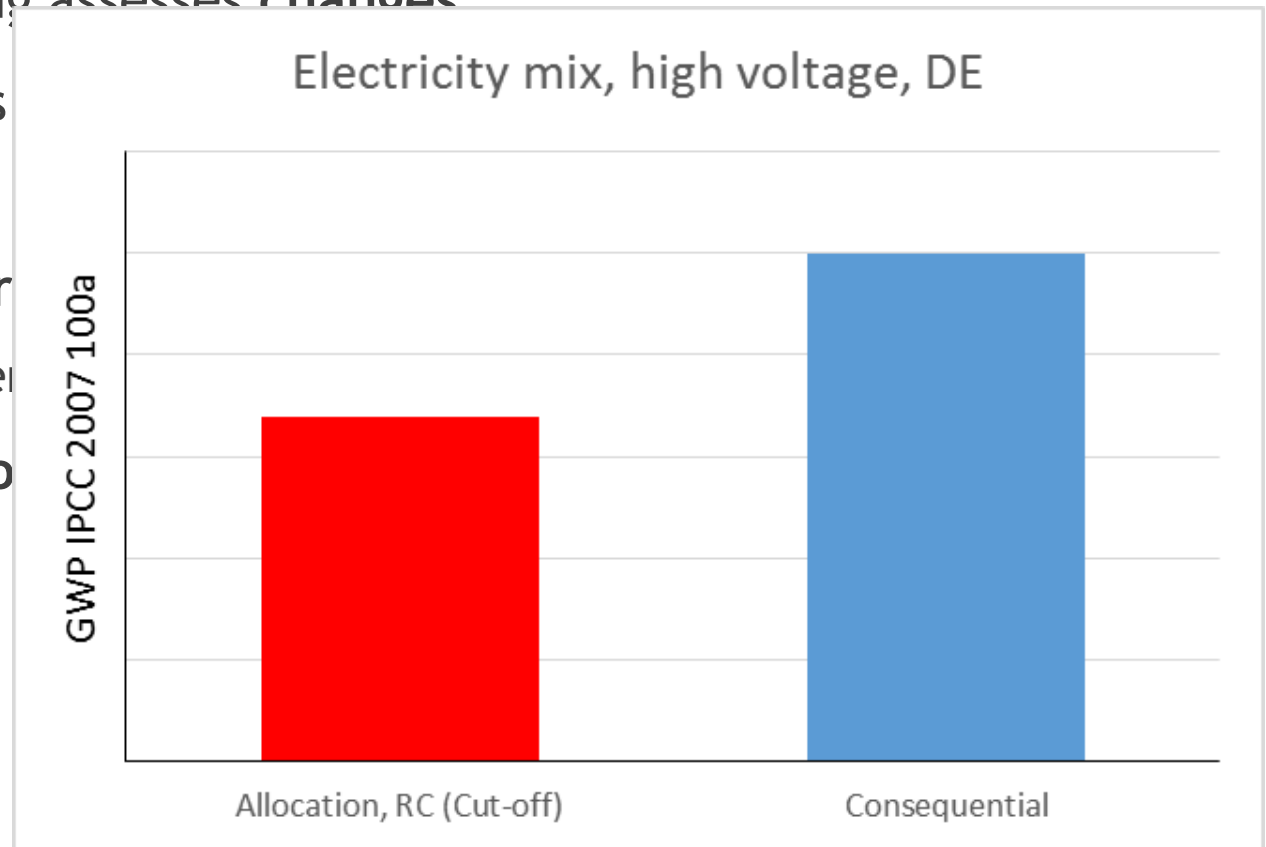
Attributional vs Consequential

- Consequential modelling assesses **changes**

- Use of **Substitution** has
  significant by-products

- Consequential uses **mar**
  - may be an improveme

- **Consumption of by-pro**
  in consequential

Electricity mix, high voltage, DE

GWP IPCC 2007 100a

Allocation, RC (Cut-off)   Consequential

Procedure of datasets submission
The main steps

1) Data collection and dataset generation

- **Data providers** collect the data and organise them into datasets
- The **ecoinvent team** provides technical support to the **data providers,** e.g. on connections to other sectors

2) Dataset review and correction

- The **ecoinvent team** reviews the datasets for consistency and technical quality
- **Editors** review the datasets
- **Data providers** and **reviewers** discuss and implement revisions if needed

3) Further review before publishing

- The **ecoinvent team** provides calculated LCIA results and full supply chain data to both the **data provider** and the **editor** for review
- **Data providers** and **editors** review the LCIA results and correct the datasets if necessary

4) After publication

- **Data providers** are listed as the data generator, with contact details if desired
- **Users** are encouraged to contact data providers with questions or comments

Thank you for your attention!

Agroscope   EMPA   EPFL   ETH   PSI

- N
- Co
- G
  -
- Cl
  -
- D

V3.1

GWP IPCC 2007 100a

Lithium   Chlorine