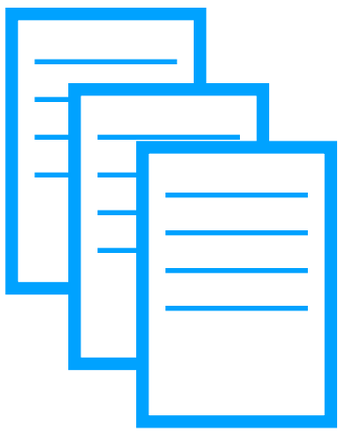
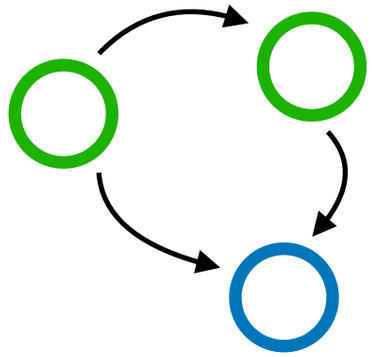
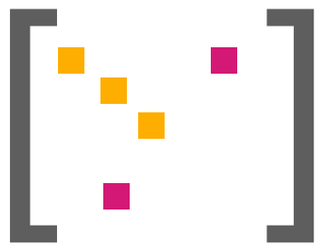
Three perspectives





$$h = CB \cdot diag(A^{-1}f)$$



Document

Metadata
List of inputs and outputs

bw2io

Graph

Nodes and edges
Nodes have metadata
Edges are relationships (usually numeric)
Can be built in many ways

bw2data

Matrix

Sparse matrices
Only numbers

bw2calc

bw_processing

What data do we need to build matrices?

- Datapackages
  - Standard from Open Knowledge (frictionlessdata.io)
    - Includes author, version, and license
- Resource groups define one part of a matrix
  - Need data vector and row & column indices (and *flip*)
  - Optional data for uncertainty & scenarios
- Can be stored on different filesystems

matrix_utils

How do we build matrices

- Loads data packages, creates matrices
- Matrices are mapped from database IDs (arbitrary) to row & columns indices (start from 0)
- Builds mappings for activities, products, and biosphere flows (stressors)
- Also handles uncertainty & scenarios

bw2calc

How do we solve our specific LCA system

- Tells *matrix_utils* which matrices to build
- Knows which linear system to solve and which matrices to multiply
- Convenience functions like *switch_method* or *redo_lcia*

bw2data

How do we load and store graphs

- Projects, databases, methods
- Two database tables: Nodes and Edges
- Nodes and edges can have types. Types are used to separate the graph into technosphere (flow matrix), biosphere (stressor), and characterisation components.

bw2data

Type conventions

- Nodes: (*process* or no type) versus anything else
- Edges:
- In technosphere (flow matrix):
    - *production* and *substitution* are positive
    - *technosphere* is negative
- In biosphere (stressor matrix):
    - Only type *biosphere* is used
- Characterization factors are stored separately