Implementation of an integrated technological-LCA modeling tool within the water industry. A pragmatic contribution to decision-making.

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Industrial context

- Various water sources & highly variable processes
- Many possible technological solutions (processes & sequences, operating conditions, etc.)
- Each plant is unique – generalization and extrapolation of the LCA results not possible

Scientific challenge

- Providing a reliable and predictive LCI (prerequisite for eco-design based on LCA) leading to various fields of results (material consumptions / LCA results / engineering design)
- Giving a complete overview of industrial projects.

The integrated Process Modeling-LCA (PM-LCA) tool

Ecoinvent Database
- Materials
- Processes
- Valuation systems

EVALEAU library
- Unit Process Modules
  - I/O specifications: Python™ scripts
  - Parameterized models

Water chemistry
- Scripts
- PHREEQC®

Water Quality Database
- Raw water average quality data
- Case-specific / User-defined water quality data
- Drinking water standards

Results

- Environmental impacts
- Engineering design data
- Treated water quality data

The EVALEAU tool

- Input WQD
- UP1 model
- UP2 model
- UPi model
- Output WQD

- LCI of the modelled plant
- Valuation system
- LCIA results

- Sensitivity Analysis Toolbox
- Morris method
  - Mathematical algorithm = Python™ script
  - User interface = Excel file (from template)
  - Result = Morris graphs

- Engineering Design Report
  - Electrical power
  - Equipment sizing
  - Process performances

- Water Quality Data
  - General characteristics
  - Salts composition
  - Organic matter parameters
  - Microbiological risks
  - Micropollutants & DBPs

Outcome

An IT tool for multi-criteria decision support

Conclusion

Environmental impacts considered at the early stage of the plant design, in parallel of technical specifications and operating costs