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 — *Excel*
- Raw water average quality data
- Case-specific / User-defined water quality data
- Drinking water standards

Umberto® environment

User-defined parameter values

Background processes

Input WQD → **UP_1 model** → **UP_2 model** → **UP_i model** → **Output WQD**

Foreground processes - Water treatment plant

LCI of the modelled plant → **Valuation system** → **LCIA results**

Sensitivity Analysis Toolbox

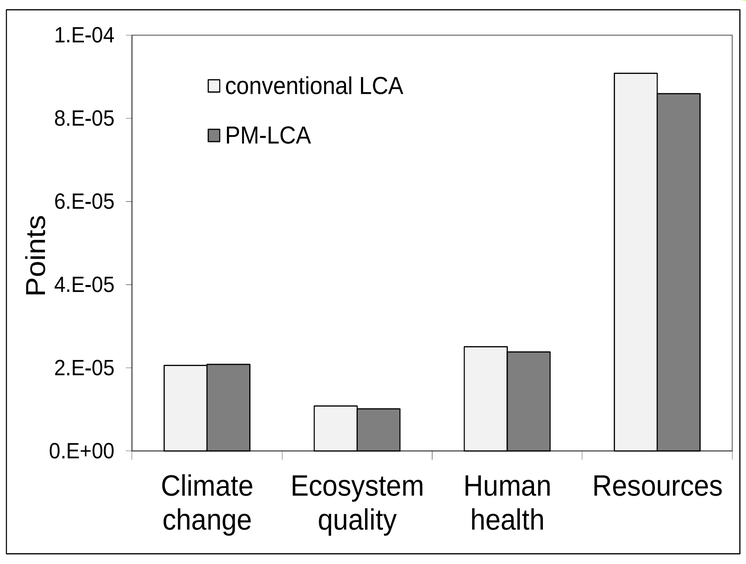
Morris method
- Mathematical algorithm = Python™ script
- User interface = Excel file (from template)
- Result = Morris graphs

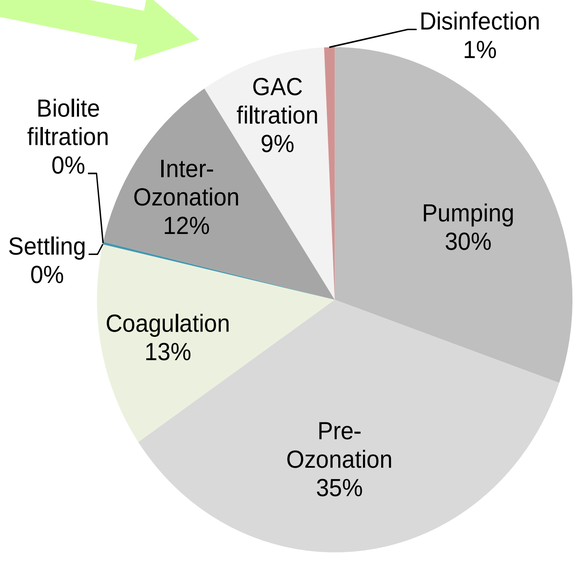
Results
- ***Environmental impacts***
- ***Engineering design data***
- ***Treated water quality data***
- ***Parameters of influence – Morris graphs***

The EVALEAU tool

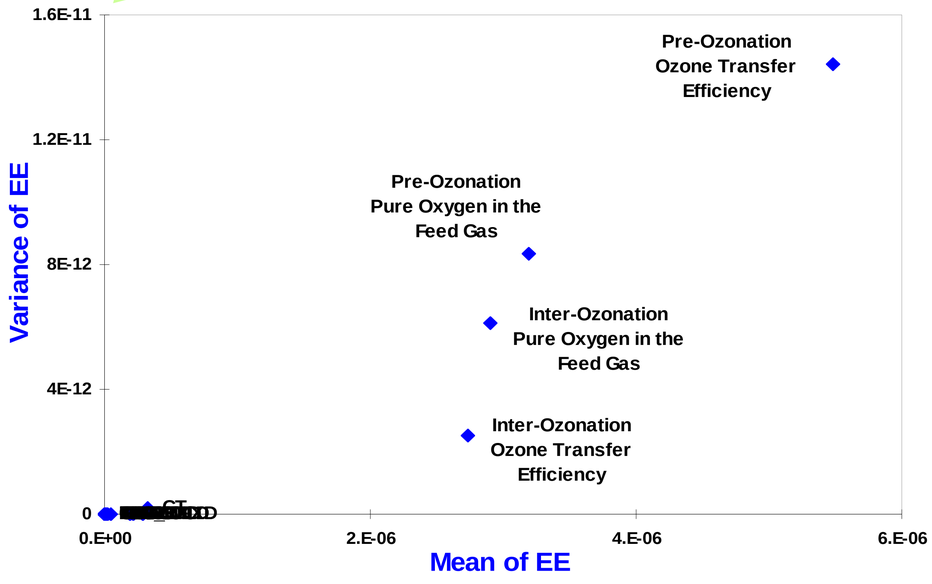
Engineering Design Report
- Electrical power
- Equipment sizing
- Process performances

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





Morris Graph - Climate Change



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