Integrating Water Footprint and Life Cycle Assessment frameworks: IMPACT World+

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A Barbie Doll to illustrate the concept of global economy:

- Barbie’s body is made of plastic from Taiwan
- it is produced in China
- using some frames from USA
- thanks to European and Japanese machinery
- her nylon hair is Japanese
- her clothes are Chinese
- after production, she goes by boat to 150 different countries, to be sold all around the planet!
Evaluate product systems within a global economy
Evaluate product systems within a global economy
IMPACT World +: a LCIA method that:

- Ensures modelling the entire world in a consistent way
- Accounts for regional specificity
- Allows accounting for uncertainty and spatial variability
- IMPACT World+ was developed in response to the need of regionalized impact assessment covering the whole world, implementing state-of-the-art characterization modeling approaches developed as a joint major update to IMPACT 2002+, EDIP, and LUCAS.
Global default characterization factor:

Continental characterization factors:

Country level characterization factors:

Fine resolution characterization factors:

Spatial variability can be accounted for by using:

- Regionalised characterization factors
- Generic characterization factors including a spatial variability
IMPACT World+ Framework

**Groups of midpoint categories**

- Human toxicity
- Photochem. oxydation
- Ozone layer depletion
- Global warming
- Ecotoxicity
- Acidification
- Eutrophication
- Water use
- Land use
- Resource use

**Outputs**
- Pesticide
- PM$_{2.5}$
- Cu
- CO$_2$
- Phosphate

**Inputs**
- Water well
- Arable land
- Crude oil
- Iron ore

And hundreds more...

**Inputs**

**Outputs**

**Damage or endpoint**

- Climate change
- Water impacts
- Ecosystem quality
- Resources & ecosystem services

(optional reporting categories)
IMPACT World+ Framework

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Climate change
Water impacts
Which “water impacts”?

Impact from water consumption...

But also impacts from water degradation:

• emissions to water?
  • what about an emission to water which is instantaneously volatilized?
  • emission which fate leads to water?
  • emissions to water, but also to soil and to air having an impact on aquatic ecosystems?
  • human exposure through water?
• other impacts on water resource?
  • land use
  • water stream use and management
Water Footprint in IMPACT World+ = All « water impacts »

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( optional reporting categories )
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And hundreds more...
Water footprint profile in IMPACT World+ = "water impacts"

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(optional reporting categories)

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Direct impacts from pollution
- Impacts from lower water availability
- Other impacts on water resource

More...

Just another way to "classify" in LCIA
Human health water footprint

Ecosystems quality water footprint

PDF.m2.yr

CIRAIAG
Water footprint profile in IMPACT World+ = « water impacts »

- **Human health water footprint**
  - Carcinogens: 1.40E-06
  - Non-carcinogens: 1.20E-06
  - Ionizing radiation: 8.00E-07
  - Water withdr., HH: 6.00E-07
  - Aquatic ecotoxicity: 6.00E-07
  - Aquatic acidification: 4.00E-07
  - Aquatic eutrophication: 4.00E-07
  - Thermally polluted water: 2.00E-07
  - Water Stream Use and Dredging: 2.00E-07
  - Water withdr., terr. eco.: 2.00E-07
  - Water withdr., aqu. eco.: 2.00E-07
  - Water table lowering: 2.00E-07

- **Ecosystems quality water footprint**
  - 1.40E-02

Only water related exposure (through water and fish)

DALY

PDF.m2.yr
Water footprint as part of a full LCA

Human health water footprint

Ecosystems quality water footprint
Water footprint as part of a full LCA
Water footprint as part of a full LCA

- HH carbon footprint (DALY)
- HH water footprint (DALY)
- Other HH impacts (DALY)
- EQ carbon footprint (PDF.m2.yr)
- EQ water footprint (PDF.m2.yr)
- EQ other impacts (PDF.m2.yr)
Water Footprint is compatible with LCA and already operational in IMPACT World+ “optional reporting categories” version.