Emerging efforts to contextualize water quantity/quality information to give it meaning to respective stakeholders

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Overview

- UNEP and the RE/SCP subprogramme
- UNEP/SETAC Life Cycle Initiative
- Water Footprint Network and ISO
- From what is possible to what is needed
UN Environment Programme

Thematic priorities

• Climate change
• Disasters and conflicts
• Ecosystem management
• Environmental governance
• Harmful substances and hazardous waste
• Resource Efficiency/ Sustainable Consumption and Production
Resource Efficiency defined...

Efficiency at economic level
+ Environmental dimension
= Resource efficiency
(materials, energy, water, land & emissions)

Reducing the environmental impact of consumption and production of goods and services over their full life cycles

→ By producing more wellbeing with less resource consumption, RE enhances the means to meet human needs while respecting the ecological carrying capacity of the Earth.
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LCIA Midpoint-Damage Framework of the UNEP/SETAC Life Cycle Initiative

- **Environmental interventions**
  - Water
  - Raw Material extraction
  - Emissions (in air, water and soil)
  - Physical modification of natural area (e.g. land conversion)
  - Noise

- **Impact categories**
  - Climate change
  - Resource depletion
  - Land use
  - Water use
  - Human toxic effects
  - Ozone depletion
  - Photochemical ozone creation
  - Ecotoxic effects
  - Eutrophication
  - Acidification
  - Biodiversity

- **Damage categories**
  - Human Health
  - Resource Depletion
  - Ecosystem Quality

**Areas of Protection**
Assessing Chemicals: Usetox Framework

- Emissions into compartment m
- Fraction transferred to n
- Time integrated concentration \( \uparrow \) in n
- Chemic al fate
- Intake fraction iF
- Human exposure Potency (Dose - response)
- Severity
- Effect factor EF
- Fate factor FF
- Concentration - response
- Effect factor EF
- Severity

Species exposure - intake

- Potentially affected fraction of species
- Dose taken in
- Risk of affected persons
- Damage on human health
- Damage on ecosystems

Ecotoxicity: \( CF = FF \cdot EF \)

Human toxicity: \( CF = iF \cdot EF \)
Water use in LCA - Framework

Different types of water use

- In-stream VS Off-Stream
- Degradative VS Consumptive

Different types of water

- Quality
- Surface VS groundwater

Availability
Frequently quoted ‘water’ impact assessment method

- Pfister et al.
  - Development of
    - « Human Health » Indicator: water used is not available for agriculture -> malnutrition
    - «Ecosystem quality » indicator: ecosystems water needs
    - « Natural ressources » indicator: energy needs for desalination


Ecosystem damage potential (CF$_{EQ}$)
- Per m3 of water consumed
- Damage factors on watershed level
Other ‘water’ impact assessment methods

- Frischknecht et al.
  - Ecopoint (Swiss Ecological Scarcity) based on scarcity

- Van Zelm et al.
  - « Ecosystem » indicator relating the impact of the level of the water table on ecosystems

- Motoshita et al.
  - « Human Health » indicator

- Mila i Canals et al.
  - Impacts on ecosystems
  - Impacts on natural ressources (Stock/ availability ratio)

- Humbert et al.
  - Impact on ecosystems related to dams

- ...
Review of methods addressing water

How much ($m^3$) / What?

Can it be / Potential problem?

Actual consequences

Inventory (accounting)
- Ecoinvent
- Chapagain Hoekstra
- Global Water Tool
- Mila-I-Canals
- GaBi
- Bayart
- Vince

Midpoint (benchmarking)
- Chapagain Hoekstra
- Frischnecht (Ecopoints)

Humans (health and welfare)
- Boulay
- Pfister

Ecosystems (biotic environment)
- Mila-I-Canals
- Pfister

Resource (abiotic environment)
- Mila-I-Canals
- Pfister

Scarcity indexes
- Volkmer
- Ohlsson
- Gleick

Water Use Per Resource
- Seckler
- Smakhtin
- Alcamo
- Pfister

Water Resources Vulnerability Index
- Raskin

Water Poverty Index
- Sullivan
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Green water footprint
► volume of rainwater evaporated or incorporated into product.

Blue water footprint
► volume of surface or groundwater evaporated, incorporated or returned to other catchment or the sea.

Grey water footprint
► volume of polluted water
LCA and WFN Methods lead to different results: Coffee example

- Two water footprinting results

Chapagain and Hoekstra

Humbert et al.

- Differences?
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Overarching objective:

Stocktaking exercise to clarify commonalities and differences among existing and emerging water accounting methods and tools in private sector

- Elucidate applicability, strengths, and weaknesses
- Identify gaps and challenges
- Suggest benefits from harmonization and testing
Accounting Methods and Tools

Focus on four key accounting methods/tools:

1. Life Cycle Assessment (LCA)
2. The Water Footprint Network’s “water footprint”
3. WBCSD Global Water Tool
4. GEMI Water Sustainability Planner/Tool
Applications of Corporate Water Accounting

Corporate water accounting can be seen as serving four general purposes:

1. Operational efficiency, product eco-design, sustainable manufacturing
2. Water risk assessment
3. Managing social and environmental impacts and response
4. Communicating with stakeholders
5. Addressing the water-energy-carbon nexus
## Findings on Methods and Tools

<table>
<thead>
<tr>
<th></th>
<th>WFN Water Footprinting</th>
<th>Life Cycle Assessment</th>
<th>WBCSD Global Water Tool</th>
<th>GEMI Water Sustainability Tools</th>
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</thead>
<tbody>
<tr>
<td><strong>General Strengths</strong></td>
<td>• Good tool for “big picture” strategic planning purposes</td>
<td>• Uniquely well-suited for cross-media environmental assessments</td>
<td>• Good first-tier risk screen</td>
<td>• Useful for companies just beginning to think about water stewardship</td>
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<td>• Easily understood by non-technical audiences</td>
<td>• Mature science-based methods for assessing water quality impacts</td>
<td>• Inexpensive, fast, and does not require company expertise</td>
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<td>• Best for volume assessments, as opposed to water quality</td>
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<td>• Simple inventory for companies to compile their water data</td>
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<tr>
<td><strong>General Weaknesses</strong></td>
<td>• Generic, aggregated blue-green-grey WF figures are misleading</td>
<td>• No universally accepted method of assessing water use impacts</td>
<td>• Does not address water quality/discharge-related risks</td>
<td>• Rudimentary assessment of relative risks</td>
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<td>• Grey WF deemed ineffective by companies</td>
<td>• Results can be difficult to communicate to nontechnical audiences</td>
<td>• Does not address impacts</td>
<td>• No quantified results</td>
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