Best Practice LCA
Water assessment methods

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Welcome to the webinar! You are on mute but please type in your questions here. We will answer them at the end of the webinar.
Your hosts

Daniel Thylmann
Consultant and Water Expert

Jim Craig
Product Marketing
Agenda

1. International initiatives and standards

2. Methodologies to calculate organizational and product water footprints

3. Example

4. Q&A

(Part II next week: Water footprinting in GaBi)
Agenda

1. International initiatives and standards
2. Methodologies to water footprints – The LCA perspective
3. Example
4. Q&A
## Water Resources – Global Scarcity

<table>
<thead>
<tr>
<th>No.</th>
<th>Global Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fiscal crises in key economies</td>
</tr>
<tr>
<td>2</td>
<td>Structurally high unemployment/underemployment</td>
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<tr>
<td>3</td>
<td>Water crises</td>
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<tr>
<td>4</td>
<td>Severe income disparity</td>
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<tr>
<td>5</td>
<td>Failure of climate change mitigation and adaptation</td>
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<tr>
<td>6</td>
<td>Greater incidence of extreme weather events (e.g. floods, storms, fires)</td>
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<td>7</td>
<td>Global governance failure</td>
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<tr>
<td>8</td>
<td>Food crises</td>
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<tr>
<td>9</td>
<td>Failure of a major financial mechanism/institution</td>
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<tr>
<td>10</td>
<td>Profound political and social instability</td>
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</tbody>
</table>

Note: From a list of 31 risks, survey respondents were asked to identify the five they are most concerned about.
Initiatives and Standards – Overview/ Examples

- **Risk assessment:**
  - CDP Water Disclosure (*revised questionnaire 2014*)
  - WBCSD Global Water Tool
  - Aqueduct Tool of WRI (World Resources Institute)

- **Management**
  - Alliance for Water Stewardship (AWS): *Version 1.0 launched 2014*

- **Environmental assessment (Water footprint)**
  - ISO Standard 14046
  - Water footprint Network - Water Footprint Assessment Manual
  - UNEP-SETAC working initiative “Water use in LCA”
A water footprint assessment conducted according to this International Standard:

- is based on a life cycle assessment (according to ISO 14044);
- is modular (i.e. the water footprint of different life cycle stages can be summed to represent the water footprint);
- identifies potential environmental impacts related to water;
- includes relevant geographical and temporal dimensions;
- identifies quantity of water use and changes in water quality;
- utilizes hydrological knowledge.
UNEP-SETAC working initiative “Water use in LCA”

Goals:
• Recommendations for scientists and practitioners

Outputs:
• Framework for water assessments and water footprinting
• Review of methods and further developments of methods
• Final goal: Harmonized method for water use in LCA

Alignment with ISO standard
Water Footprint Network

- Calculates the amount of water used/consumed or polluted (degraded) for a product/company/region/nation

- “Water footprint” of WFN = total water volume → inventory method

Helpful for awareness raising and overall water flow mapping and regional management but NOT useful for corporate, supply chain, and product sustainability assessments
Agenda

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2. Methodologies to calculate water footprints – The LCA perspective
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 Highlights of the ISO 14046 for practitioners (1)

- based on a **life cycle assessment**
- identifies **quantity** of water use and changes in water **quality**
- **stand-alone** assessment **or as part** of a life cycle assessment
- the term “water footprint” is **only** used when it is the result of an **impact assessment**

**water footprint**: metric(s) that quantify(ies) the potential environmental impacts related to water
- If water related impacts have **not** been **comprehensively** assessed, then the term water footprint can only be applied with a **qualifier**.
a set of different calculations, umbrella term rather than to communicate a single number

Examples

- **Water scarcity footprint**: weighting of water consumption with water scarcity index
- **Water availability footprint**: considers reduced availability due to changes in water quality
- **Water footprint profile**: quality aspects considered through standard LCA indicators like eutrophication, acidification and toxicity
principles, requirements and guidelines ≠ recommendation of a specific methodology

WULCA (see above) → working consensus methodology

Latest publication:
Terminology for Water inventories

- **Water use → umbrella term**: all types of anthropogenic water uses

Characterization of water use types - degredative vs. consumptive:

- **Degradative use (water degradation)**: Water used and released into the same watershed it was withdrawn from (wastewater, cooling water) (possibly with degraded quality)

- **Consumptive use (water consumption)**: Evaporation, product integration, water transfers to different river basins, release to sea → water loss on watershed level

Terminology for Water inventories

• Characterization of water use types - green vs. blue:
  • green water: rainwater and moisture stored in soil that evaporates during production process, mainly during crop growth (evapotranspiration)
  • blue water refers to surface and groundwater applied (e.g. irrigation in crop cultivation)

• Characterization of water use types - in-stream vs. off-stream:
  • In-stream use (hydroelectric generation, water transport, damming)
  • Off-stream use: (total) withdrawal from water body (irrigation, water supply, cooling)
Classification Examples
Water Stress Index (WSI)

WSI based on withdrawal-to-availability ratio (m$^3$/m$^3$) (Pfister et al. 2009)

Takes into account water availability, use, and seasonal/annual variation in precipitation
The Water Scarcity Footprint caused by consumptive use

\[ WSF = \sum_i \frac{CWU_i \times WSI_i}{WSI_{global}} \]

- **CWU**: consumptive water use
- **WSI\(_i\)**: regional water stress index
- **WSI\(_{global}\)**: global average water stress index (value: 0.602)

„Amount of water as if it was consumed globally“
Water Footprint - Overview

Water use

Inventory

Water Consumption

Application of the WSI

Midpoint

Impact Assessment

Water scarcity footprint

Endpoint?
Impact Assessment

Increasing level of uncertainty

Inventory  Midpoint  Endpoint
Water quality – Existing LCA impact categories

Assessment of Quantity (Water scarcity footprint) + Assessment of Quality (Impacts of water pollution)

Water Footprint Profile

- Eutrophication
- Toxicity
- Land Use
- Acidification
Challenge

- Understanding water use and water consumption of T-Shirts and its environmental relevance

Solution

- Water footprint study for cotton T-Shirts according to the latest water footprint methodology
- Focus on onsite manufacturing, all upstream processes and different water types
- Assessment of the local water scarcity at the different points of water withdrawal

Benefit

- The study revealed the significance of upstream processes for the product water footprint
- Integration of the result into the water strategy of the company

Reference

“Using the results of Anvil Knitwear’s first water footprint assessment, we are working on a fiber diversification and sustainability scorecard that takes into account the impact of water in our agricultural supply chain,”

Caterina Conti
Anvil’s Executive Vice President and Head of Sustainability
Cotton production in the US

The cotton belt – subdivision into four cultivation regions
Results

Water consumption in cotton cultivation modeled with GaBi

- Blue water consumption
- Green Water consumption

[m³/t fiber]

FW: 2500 m³/t fiber
SW: 1500 m³/t fiber
MS: 2000 m³/t fiber
SE: 2500 m³/t fiber
Results

WSI values on watershed level in the cotton belt in the USA
# Results

## Water footprint of cotton cultivation

<table>
<thead>
<tr>
<th>Region</th>
<th>Blue water [m³/t]</th>
<th>WSI [-]</th>
<th>Water scarcity [m³/t]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FW</td>
<td>2505</td>
<td>0.86</td>
<td>3585</td>
</tr>
<tr>
<td>SW</td>
<td>157</td>
<td>0.46</td>
<td>119</td>
</tr>
<tr>
<td>MS</td>
<td>174</td>
<td>0.05</td>
<td>14</td>
</tr>
<tr>
<td>SE</td>
<td>27</td>
<td>0.15</td>
<td>7</td>
</tr>
</tbody>
</table>

![Graph showing water footprint](chart.png)

The graph illustrates the water footprint consumption and water scarcity footprint for different regions. The bars represent the water footprint consumption, while the red bars indicate the water scarcity footprint.
A look further downstream

Example: Water Footprint of a T-Shirt
Cotton US, processing in Central America

![Water Use vs. Water Consumption vs. Water Scarcity Footprint](chart.png)

**Life Cycle Stages**
- Cut and sew
- Textile manufacturing
- Ginning
- Cultivation

**Liter/T-Shirt**
- 0
- 50
- 100
- 150
- 200
- 250
- 300
- 350
- 400
- 450
- 500

**Water Use**

**Water Consumption**

**Water Scarcity Footprint**
Contact

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