Towards Global Sustainability: How can water footprint help?
Globalisation of water

- Water problems - tied to the structure of the global economy
- Human impacts on freshwater systems - linked to human consumption
- Water shortages and pollution - consider production and supply chains

Arjen Hoekstra
“Not only governments, but also consumers, businesses and civil society communities can play a role in achieving a better management of water resources.”

Arjen Hoekstra
What is the water footprint?

The water footprint maps and measures how, when and where we use freshwater resources.

► Water footprint is a measurement of the volume of water consumed (evaporated or otherwise not returned) or assimilation capacity used.

► The water footprint is a geographically & temporally explicit indicator.

► The water footprint is an indicator of water use that looks at both direct & indirect water use of a consumer or producer.

► A water footprint can be calculated for a process, a product, a consumer, group of consumers (e.g. municipality, province, state or nation) or a producer (e.g. a private enterprise, public organization).

[Hoekstra et al., 2011]
An analogy: The ecological footprint

The pressure people put on land and water through the demand for goods and services and the assimilation of GHG emissions

**Biocapacity:** How much bioproductive area is available to us?

**Ecological Footprint:** How much bioproductive area do we demand?

[Graph showing the increase in ecological footprint over time with different categories of land use.]
Water footprint of EU’s cotton consumption

Former Aral Sea, Central Asia

[1989] [2008]

Green water footprint
Million m³/yr
- 0
- 0 - 10
- 10 - 50
- 50 - 500
- 500 - 2500
- 2500 - 5000
- 5000 - 7500

EU25’s impact on green water resources

Blue water footprint
Million m³/yr
- 0
- 0 - 10
- 10 - 50
- 50 - 2500
- 2500 - 5000
- 5000 - 7500

EU25’s impact on blue water resources

Dilution water footprint
Million m³/yr
- 0
- 0 - 10
- 10 - 50
- 50 - 2500
- 2500 - 5000
- 5000 - 7500

EU25’s impact on global water resources due to pollution

[Hoekstra & Chapagain, 2008]
A framework for action: Water Footprint Assessment

• Understand the **geographic & temporal allocation of water resources** for industry, agriculture & domestic water supply

• Assess the **sustainability, efficiency & equitability of water use**: consumption & pollution

• Identify the most **strategic actions** to be taken in local, regional, national & global scales, individually & collectively
After prioritising locations & processes where water footprints are not sustainable, the next step is to **design appropriate action.**

Questions to be asked are:

- Is internal action sufficient e.g. improve your own water footprint? What are the management options?
- Do you need to work with external parties for collective action?
- If yes, with whom; around what?
Four phases of Water Footprint Assessment

Phase 1: Setting goals and scope
- Where is my WF the largest?
- Where is my WF unsustainable?
- Where can my WF be reduced?

Phase 2: Water footprint accounting
- What is my green, blue, grey WF in my operations & value chain?

Phase 3: Water footprint sustainability assessment
- Is my WF environmentally sustainable, economically efficient & socially equitable?

Phase 4: Water footprint response formulation
- How can I reduce my WF in my operations, value chain, sector, basin?
- Where should I work first?
### 1 – Goal & Scope definition

**Sugarcane supply chain**

<table>
<thead>
<tr>
<th>Tier 3 Suppliers</th>
<th>Tier 2 Suppliers</th>
<th>Tier 1 Suppliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural stage [Farms]</td>
<td>Sugar Mill</td>
<td>Sugar Refineries</td>
</tr>
<tr>
<td>Stage 1</td>
<td>Stage 2</td>
<td>Stage 3</td>
</tr>
</tbody>
</table>

- **Tier 3 Suppliers**
  - Agricultural stage [Farms]
  - Stage 1

- **Tier 2 Suppliers**
  - Sugar Mill
  - Stage 2
  - Crushing → Carbonation → Filtration → Evaporators → Vacuum Pans → Filtration → Centrifugal Pans → Raw sugar

- **Tier 1 Suppliers**
  - Sugar Refineries
  - Stage 3
  - Mingler → Centrifugal → Melters → Filtration → Charcoal filtration → Refined sugar [cane sugar]
Integration in the Hydrological cycle: the colors of water

**Green water footprint**
- volume of rainwater evaporated or incorporated into product

**Blue water footprint**
- volume of surface or groundwater evaporated or incorporated into product, lost return flow

**Grey water footprint**
- an indicator of assimilation capacity used.

[Hoekstra et al., 2011]
Global distribution of total water footprint

Total WF: 391,571,000 m³/y
2 - Water footprint accounting

- **Global average water footprint**
  - 1 kg wheat bread: 1600 litres water
  - 1 kg rice: 2500 litres water
  - 1 litre beer: 300 litres water

Mekonnen & Hoekstra., 2012
3 - Water footprint sustainability assessment

Establish sustainability criteria

Environmental

Blue water footprint: environmental flow requirements, groundwater levels

Green water footprint: environmental green water requirements

Grey water footprint: ambient water quality standards

Social

• Basic human needs – drinking water, food security, employment

• Rules of fairness – equitable allocation, water user & polluter pays principle

Economic

Efficient allocation and use of water; value of water in the economy

[Hoekstra et al., 2011]
Sustainability Assessments are a basis for stakeholder involvement, help to create good will & avoid situations where companies are caught off guard by new concerns or preferences.

Sustainability Assessments identify social sustainability issues & work toward solutions where needs are not being met.

Sustainability Assessments form a basis for watershed cooperation & thus can help in avoiding conflicts before they start.

[Hoekstra et al., 2011]

3 - Water footprint sustainability assessment
Sustainability Assessment to guide sustainability strategy

Is the supply chain water footprint sustainable?

For each green, blue & grey water footprint component:

**Geographic hotspots:** Is the water footprint component located in a river basin & period of the year where environmental criteria are violated?

[checked using blue water scarcity & water pollution levels]

**Process efficiency:** Is the water footprint of the process itself unsustainable?

[checked using global benchmarks]

Identification of priority Points for Action
Global blue water footprint of a company located in the Netherlands

River basin hotspot map - per river basin the number of months with blue water scarcity > 100%

Unsustainable components of the company's blue water footprint
Efficient: Is water being used as efficiently as possible?

- Benchmarking
- Best Available Practice & technology
- Progress evaluation
What can companies do?

Integrate Water Footprint Assessment into their sustainability & business strategy

• Set quantitative water footprint reduction targets
• Use standardized terminology & calculation methods
• Certification of Water Footprint Assessments
• Water Footprint reporting/disclosure

Use Water Footprint Assessment to engage in collective action

• In catchments: as a common language among multi-stakeholders
• With supplier: collaboration programmes & incentives; roundtables
• With consumers: Integration in communications
Selecting priority river basins for strategic action

Raw sugar processing and sugarcane farming in supply chain occurs in 277 river basins around the world

277 river basins

Priority river basins

Priority regions

Region 1
- Priority river basins
- Adjacent river basins

Region 2
- Priority river basins
- Adjacent river basins

Region 3
- Priority river basins
- Adjacent river basins
Strategic response formulation in priority river basins

Response formulation is guided by sustainability assessment

- Is water footprint in a hotspot? NO
  - Has water footprint exceed benchmark? NO
    - Reduce water footprint through improved practices & technologies
  - Has water footprint exceed benchmark? YES
    - Large share of basin water footprint? NO
      - Not a priority
    - Large share of basin water footprint? YES
      - Collective action to reduce basin water footprint
  - Is water footprint in a hotspot? YES
    - Collective action with other sectors & stakeholders
  - Collective action within sugarcane sector

- Is water footprint in a hotspot? YES
  - Collective action within sugarcane sector
  - Collective action with other sectors & stakeholders
WHY? To address water-related business risk

Assessing and mitigating the water footprint of a business is a way to reduce risk

- Physical
- Regulatory
- Reputational
- Financial
WHY? To support corporate sustainability strategy

General framework to address water risks & sustainability

1. Assessing the global and local water situations
2. Accounting for and understanding impacts
3. Identifying water risks and opportunities
4. Determining actions and setting targets
5. Monitoring and communicating performance
Developing a Corporate Sustainability Strategy

- **Collective action**: Advance sustainable water management via collective action

- **Supply chain engagement**: Leverage improved performance in the value chain
  - Develop a comprehensive strategy covering full supply chain
  - Understand supply chain impact

- **Improve operational performance**: Internal action
  - Knowledge of direct impact

- **Water awareness**
Water Footprint Assessment – Water Stewardship Progression

- **Direct Water Footprint**
  - Within the fence efficiency improvements

- **Indirect Water Footprint**
  - Addressing water risk in supply chain

- **Sustainability Assessment**
  - Are sustainability criteria violated?

- **Sustainable Water Strategy**
  - Water footprint reduction targets & action plan

- **Improve operational performance**
- **Improve performance in supply chain**
- **Understand local watershed context**
- **Watershed & collective action**
Water Footprint Assessment: Conclusions

Water Footprint Assessment is a simple & elegant concept which enables us to:

- Understand the *geographic allocation of water resources* for industry, agriculture & domestic water supply
- Evaluate the *efficiency of water use*: consumption & pollution
- Determine the *sustainability of water use*: e.g. water scarcity & water pollution levels; social & economic issues
- Identify the most *strategic actions* to improve the sustainability, efficiency & equitability of water use

[Hoekstra et al., 2011]
Water footprint: What’s new for business?

- From operations to supply-chain thinking.
- Shifting focus from water withdrawals to consumptive water use.
- From securing the ‘right to abstract & emit’ to assessing the full range of economic, social & environmental impacts of water use in space and time.
- From meeting emission standards to managing grey water footprint.
The Water Footprint Network

Dynamic, international learning community with hundreds of partners worldwide

Promotes efficient, equitable & sustainable use of freshwater resources

Engages companies, investors, research institutes & government agencies

Promotes knowledge exchange between practitioners, sharing case studies

Developed the Global Water Footprint Assessment Standard

Conducts projects demonstrating implementation of Water Footprint Assessment

Delivers training & capacity building

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Thank you!

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