



Water Footprint

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The contents of the SSWM Toolbox reflect the opinions of the respective authors and not necessarily the official opinion of the funding or supporting partner organisations.

Depending on the initial situations and respective local circumstances, there is no guarantee that single measures described in the toolbox will make the local water and sanitation system more sustainable. The main aim of the SSWM Toolbox is to be a reference tool to provide ideas for improving the local water and sanitation situation in a sustainable manner. Results depend largely on the respective situation and the implementation and combination of the measures described. An in-depth analysis of respective advantages and disadvantages and the suitability of the measure is necessary in every single case. We do not assume any responsibility for and make no warranty with respect to the results that may be obtained from the use of the information provided.



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1. Introduction

What is a Water Footprint?

Water Footprint is a multi-dimensional indicator showing:

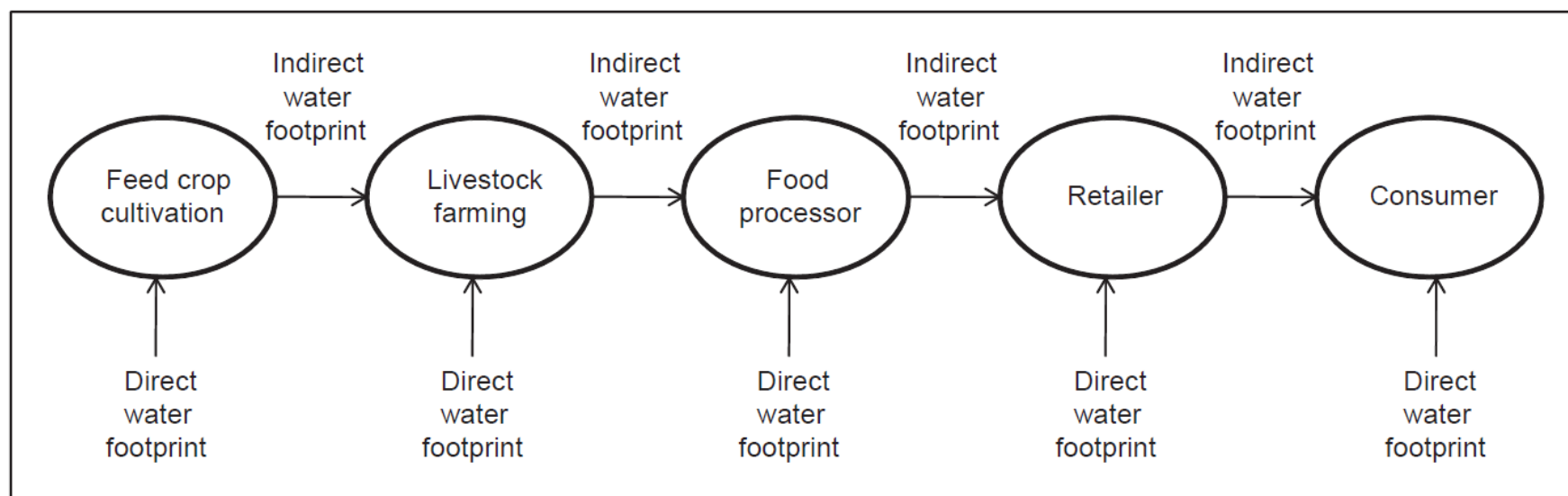
- **HOW MUCH** (Volume) ...
- **WHEN** (Time of the year e.g. dry season) ...
- **WHERE** (Location)...
- **TYPE** (Freshwater, rainwater, freshwater needed to dilute water pollution to an acceptable level) ...

... of water is used for the production of a product **over the whole supply chain.**

1. Introduction

Adding the indirect water footprints

When you consume the product you do not only consume the **direct water** in the product but also the **indirect water** accumulated for producing the product!



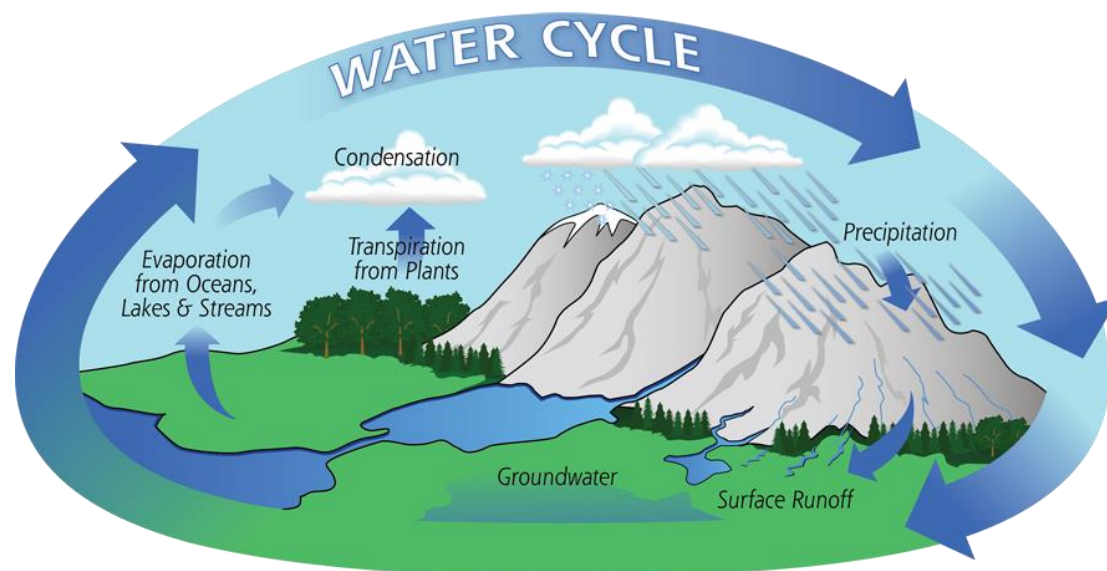
Water Footprint in each stage of supply chain of an animal product. *Source: HOEKSTRA et al. (2011)*

1. Introduction

Why doing a Water Footprint? (1/5)

Water is renewable and a constant total amount of water is cycling through the environment...

.... So, why do we bother making a Water Footprint?

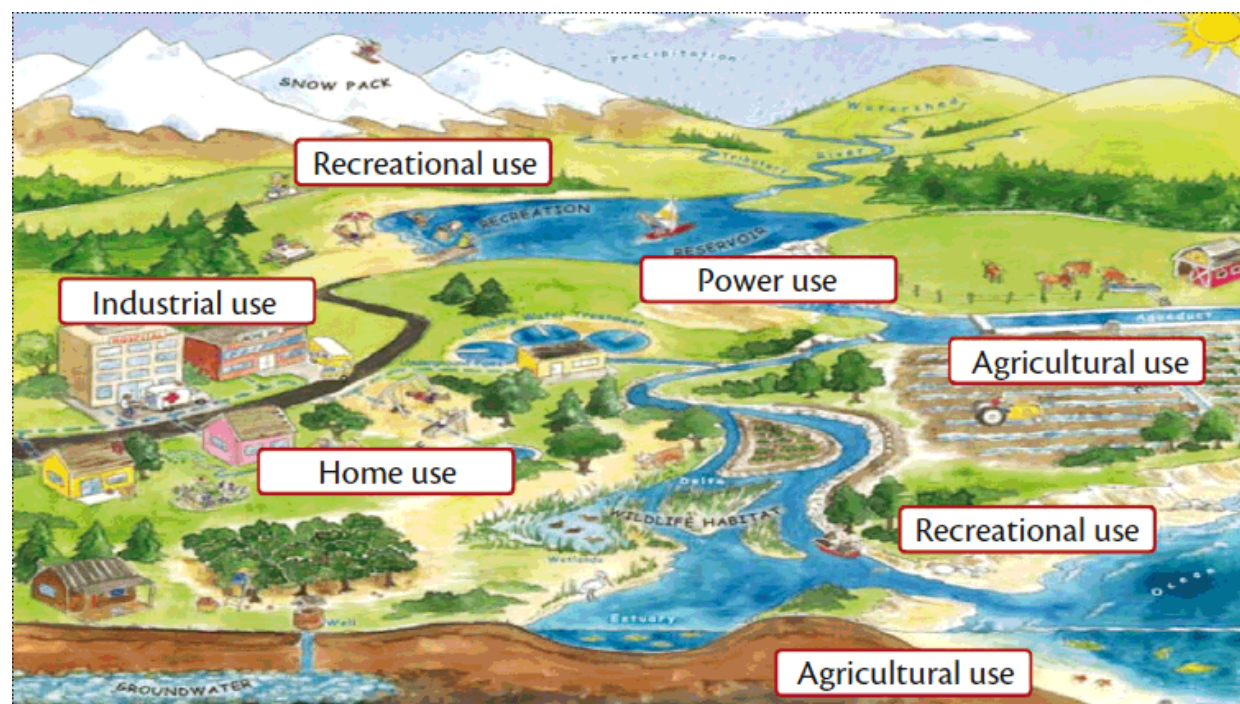


The water cycle - Total amount of water on earth is always constant. Source: <http://pmm.nasa.gov/education/water-cycle> [Accessed: 22.10.2013]

1. Introduction

Why doing a Water Footprint? (2/5)

For almost all human purposes *freshwater* is needed ...



Human water uses. Source: MARTIN&CHRISTEY (2012)

Only about 0,01% of global water resources is directly accessible freshwater!

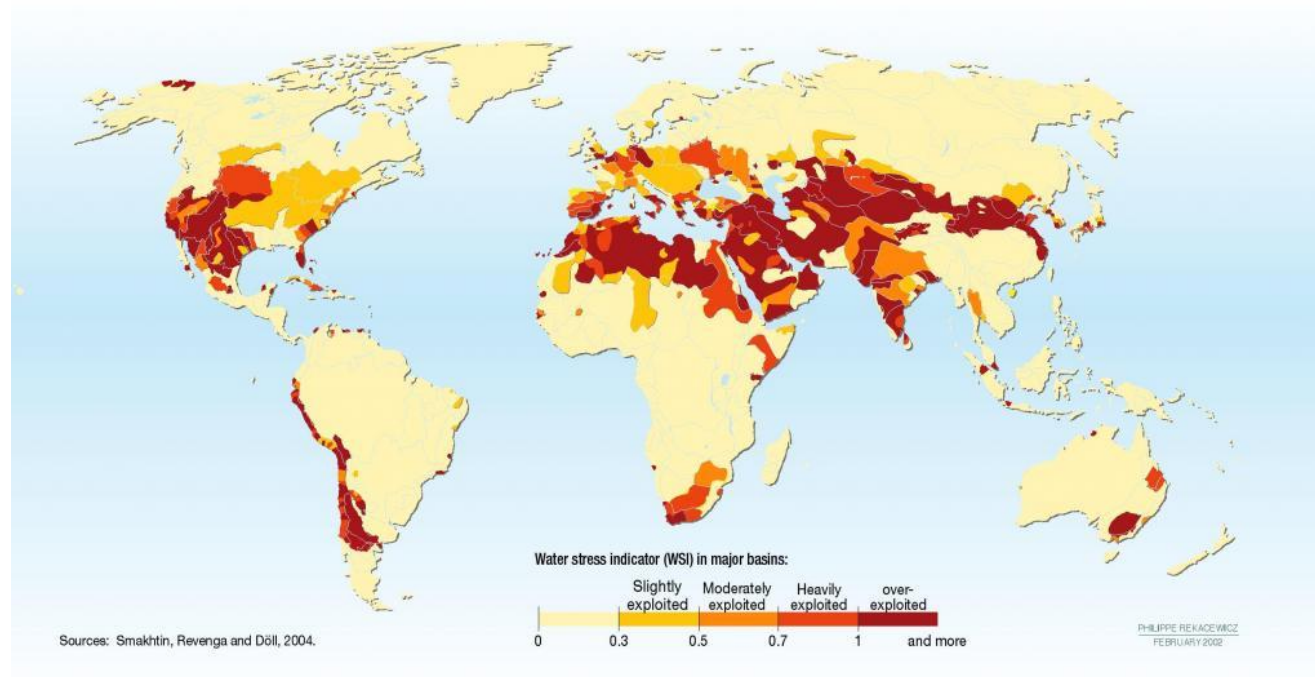
→ Only a certain amount of water available for all these uses at one moment!

1. Introduction

Why doing a Water Footprint? (3/5)

Freshwater resources distribution is characterized by:

- Strong **regional** differences
- **Annual** and **seasonal** variation



Freshwater scarcity differs between regions. *Source: REKACEWICZ (2009)*

1. Introduction

Why doing a Water Footprint? (4/5)

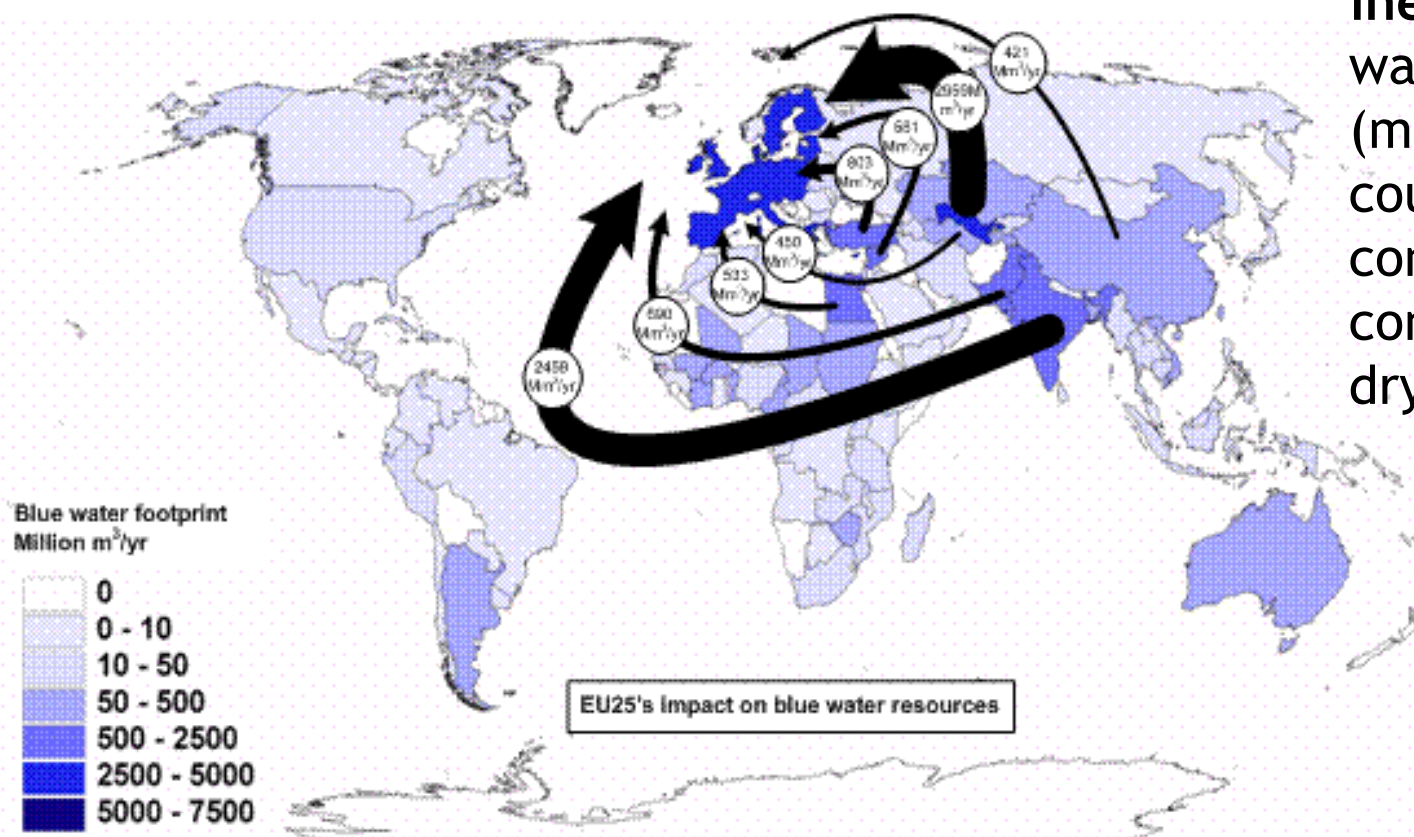
... Due to the **dependency** and **temporary limitation** of *freshwater* a water footprint can help:

- Identify products that can be risky to produce at a certain location and certain period of time due to **water scarcity**
- Achieve a more sustainable and equitable use of freshwater

1. Introduction

Why doing a Water Footprint? (5/5)

Unsustainable and inequitable: The water the EU25 (mostly water-rich countries) cotton consumption uses comes mainly from dry regions!



The impact of consumption of cotton products (e.g. T-shirts) in EU25 states on the freshwater resources. About 84% of the water footprint is located outside Europe - mainly in dry regions. *Source: CHAPAGAIN et al. (2006)*

2. Applications of Water Footprints

Water Footprints can be applied to a:

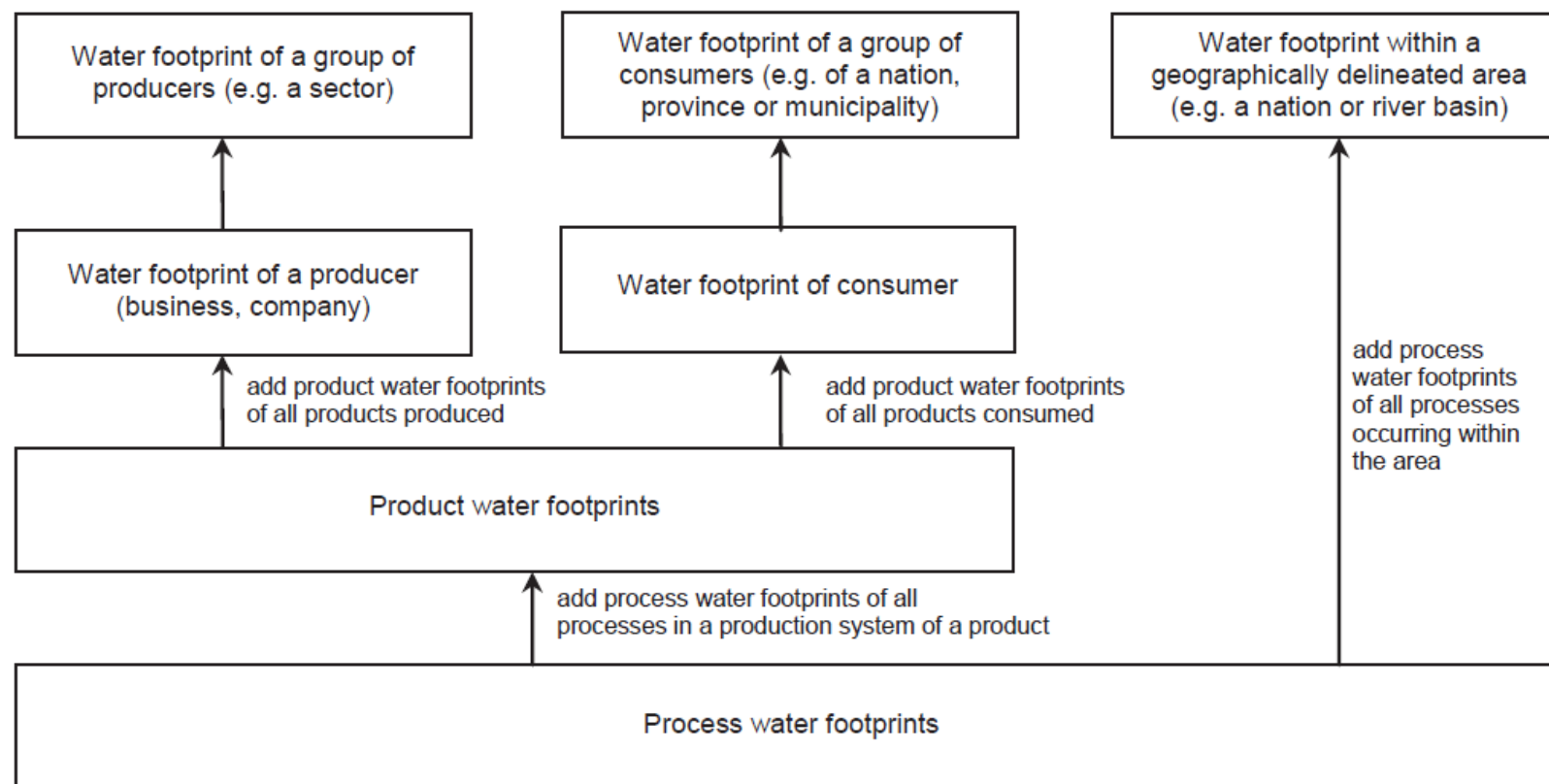
- Process step
- Product
- Person/consumer
- Community
- Producer/business
- Area
- Nation
- Humanity

A process step is always the basis for the calculations and the process steps are added up respectively.

E.g. Water Footprint for a person
= sum of the water footprints of the products that are consumed by a person; a product water footprint is the sum of the water footprints of all the process steps that make up a product.

2. Applications of Water Footprints

Process water footprints as a basis for other footprints



Applications of water footprint. Process water footprints are the basic building blocks.

Source: HOEKSTRA et al. (2011)

3. *Components of Water Footprints*

The Global Water Footprint Standard (1/3)

Various standards for Water Footprints exist. Probably the most well-known is the ***Global Water Footprint Standard***.

It accounts for:

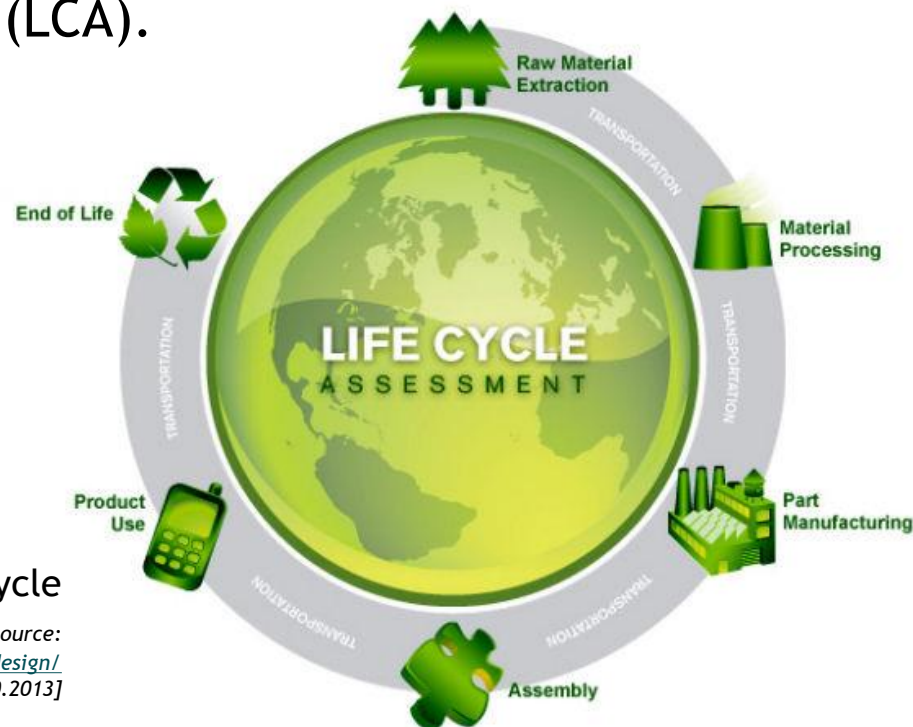
- Direct and indirect water use
- Water consumption and water pollution
- Water footprint for freshwater (**bluewater**), rainwater (**greenwater**) and freshwater required to dilute polluted water to an acceptable quality (**greywater**)
- Total water footprint is the sum of **blue**, **green** and greywater consumption

3. Components of Water Footprints

The Global Water Footprint Standard (2/3)

No universally valid standard for Water Footprint exists.

Yet, an ISO standard 14046 is currently under development that provides a norm for Water Footprints and how to integrate them into a Life Cycle Analysis (LCA).

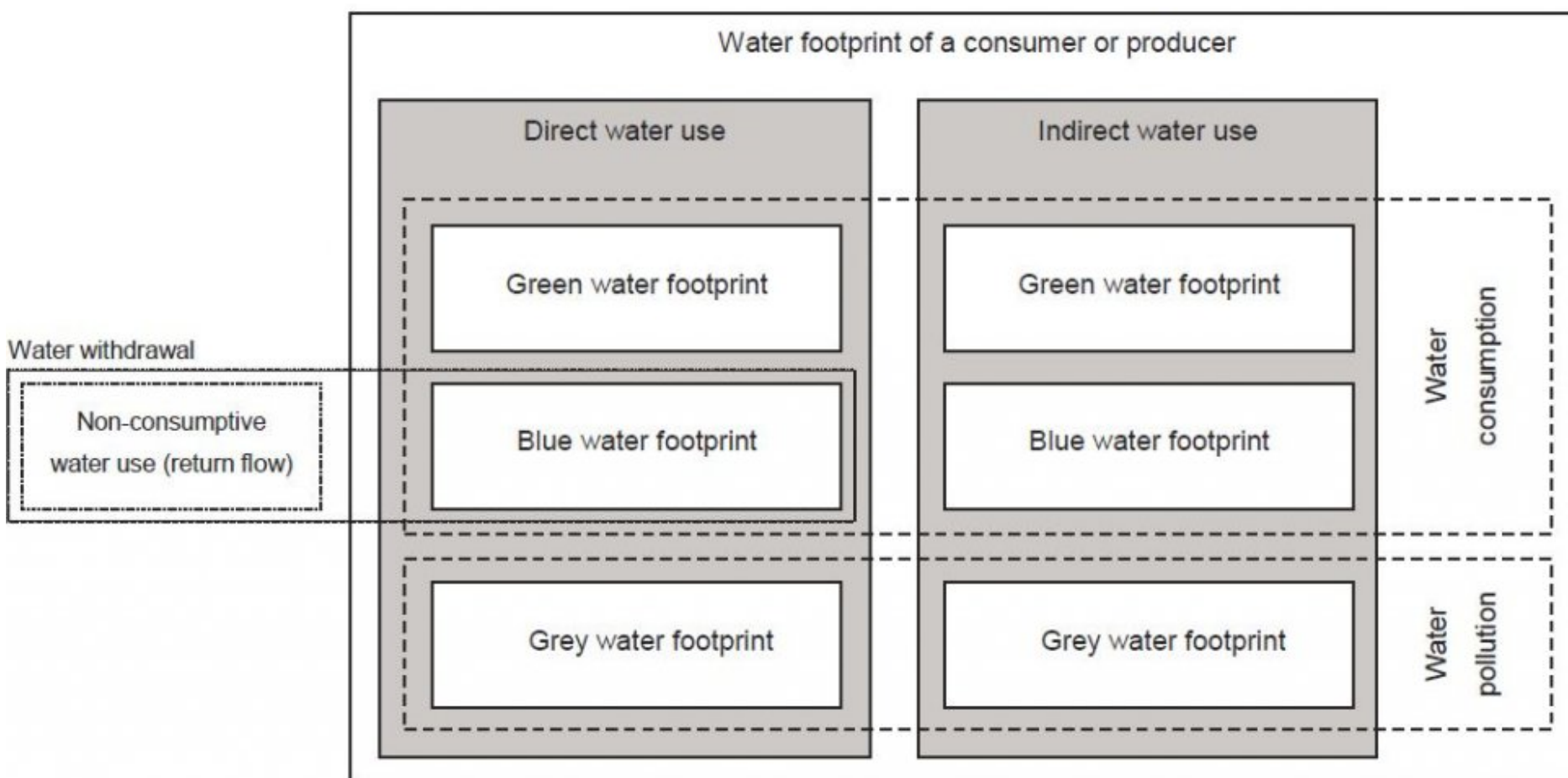


Steps of a life cycle
assessment. Source:

http://www.solidworks.com/sustainability/design/2722_ENU_HTML.htm [Accessed: 23.20.2013]

3. Components of Water Footprints

The Global Water Footprint Standard (3/3)



Components of a water footprint. The non-consumptive part of water withdrawals (return flow) is not part of the water footprint. *Source: HOEKSTRA et al. (2011)*

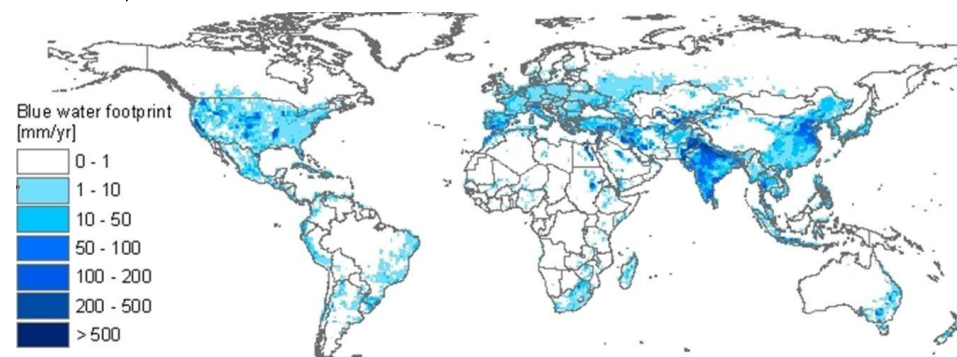
3. Components of Water Footprints

Blue water footprint

= Consumption of fresh surface or groundwater.

Taking into account water that:

- Evaporates and transpires
- Is incorporated into the product
- Does not return to the same catchment area (but might return to the sea or another catchment area)
- Does not return in the same period (might be withdrawn in a dry period and returned in a wet period)



Global blue water footprint of consumption.

Source: <http://www.waterfootprint.org/?page=files/WaterStat> [Accessed: 22.10.2013]

3. Components of Water Footprints

Green water footprint

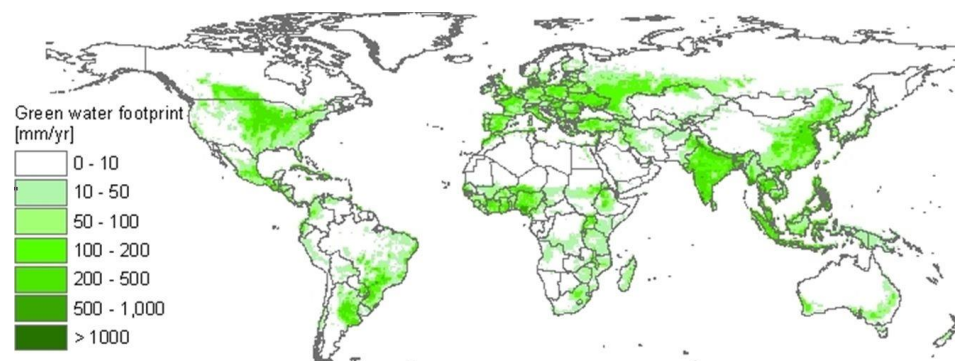
= Consumption of water that refers to precipitation on land that does not run off or recharge the groundwater but is stored in soil or temporarily stays on top of the soil or vegetation.

Taking into account water that:

- Evaporates and transpires from fields and plantations
- Is incorporated into the harvested crop or wood

Global green water footprint of consumption.

Source: <http://www.waterfootprint.org/?page=files/WaterStat> [Accessed: 22.10.2013]



3. Components of Water Footprints

Grey water footprint

= Consumption of freshwater that is required to assimilate the load of pollutants based on natural background concentrations and existing ambient water quality standards.

Global grey water footprint of consumption.

Source: <http://www.waterfootprint.org/?page=files/WaterStat> [Accessed: 22.10.2013]



4. *Virtual Water*

Differences between Virtual Water and the Water Footprint

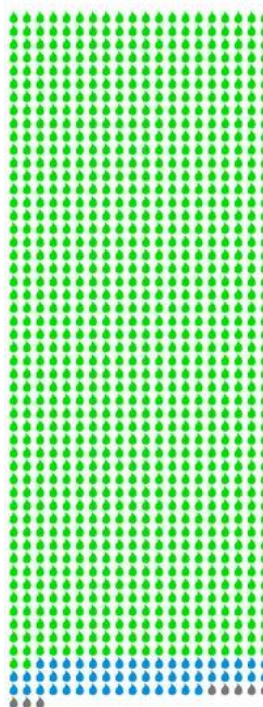
	Virtual Water	Water Footprint
Application	Products only	Products, Consumer, Producer, Nation, Humanity, etc.
Dimensions	- Volume of consumed water	- Volume of consumed water - Type of consumed water (blue, green, grey) - Location of water source - Time of water withdrawal

5. Examples of Water Footprint

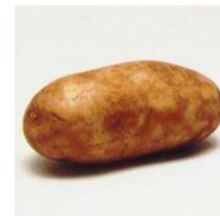
Products

Animal products generally have a larger water footprint than crop products.

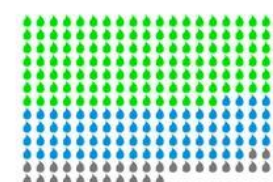
Primarily, because animals need more time to grow and need to be fed: 98% of animal's water footprint is due to feed.



Sheep meat:
10412 l/kg



Potato:
287 l/kg



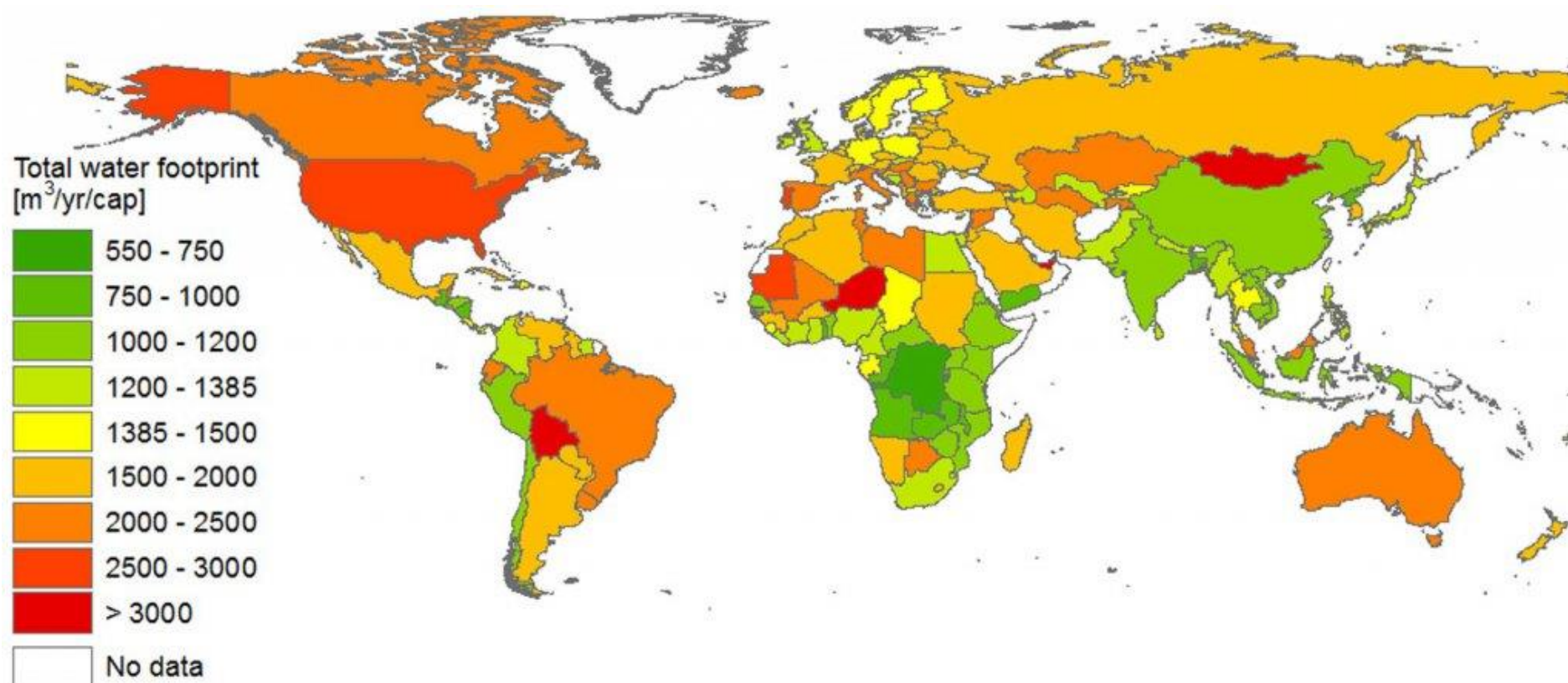
Cotton:
2495 l/shirt of
250 gram

Product global water footprint and the share of green, blue and greywater.

Source: www.waterfootprint.org [Accessed: 22.10.2013]

5. Examples of Water Footprint

National Water Footprint (1/2)



National total water footprint of consumption. *Source: MEKONNEN & HOEKSTRA (2011)*

5. *Examples of Water Footprint*

National Water Footprint (2/2)

Consumption of agricultural products largely determines the global water footprint related to consumption (MEKONNEN & HOEKSTRA 2011):

- Agricultural products: 92%
- Industrial products: 4,7%
- Domestic water use: 3,8%

Differences in water footprints vary primarily due to differences in consumption patterns:

High bovine meat consumption (highly water intensive production) leads to higher national water footprint.

5. *Examples of Water Footprint*

National Water Footprint - Importance

Traditionally, National Water Plan looks only at water used within a nation - saving national water by importing water through products produced in other countries:

→ Water saved in own country, but neglecting that national consumption might be unsustainable on a global level

National Water Footprint shows imported water, too:

→ Formulating policies that protect the world's scarce freshwater sources, too

6. Are We Sustainable? - Assessing the Water Footprint

Water Footprint Assessment (1/3)

Water Footprint by itself does **NOT** provide information about whether the activity or product is **sustainable or not!**

→ Water Footprint Assessment

assesses whether the water consumption of a product/person/nation etc. is **sustainable**.

The Water Footprint Assessment Manual by the Water
Footprint Network. *Source: HOESTRA et al. (2011)*



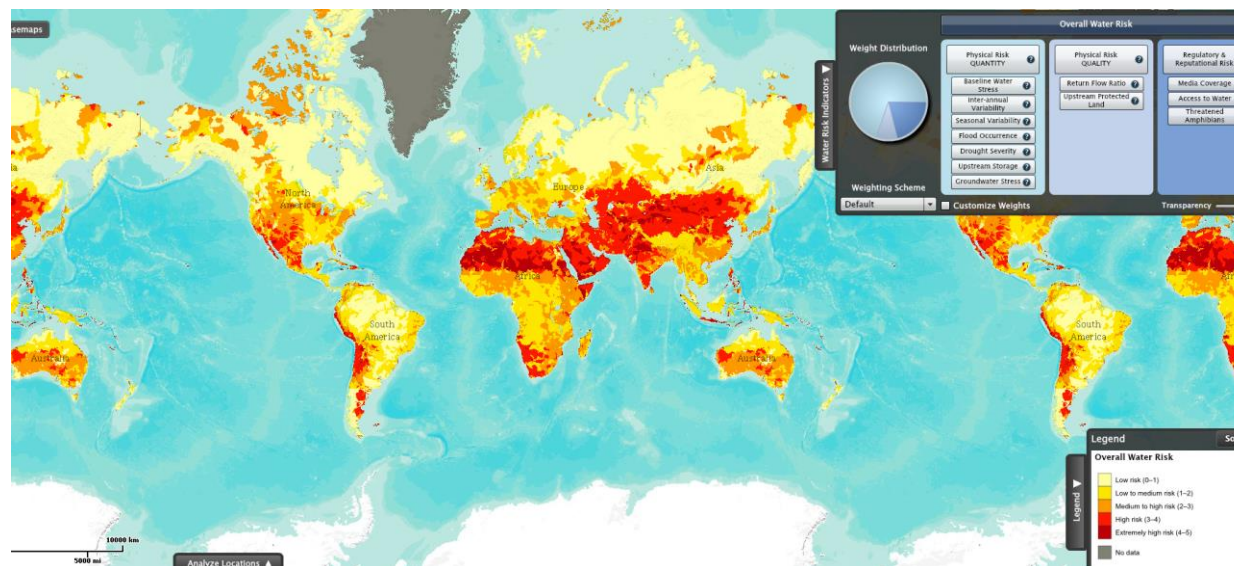
6. Are We Sustainable? - Assessing the Water Footprint

Water Footprint Assessment (2/3)

Environmental sustainability:

Compare **water footprint** with **availability of water** in the affected water bodies at the location and time of withdrawal.

Water Risk Maps (including filters for season and different water sources/quality and quantity) are open source available online:



Source: <http://aqueduct.wri.org/atlas>

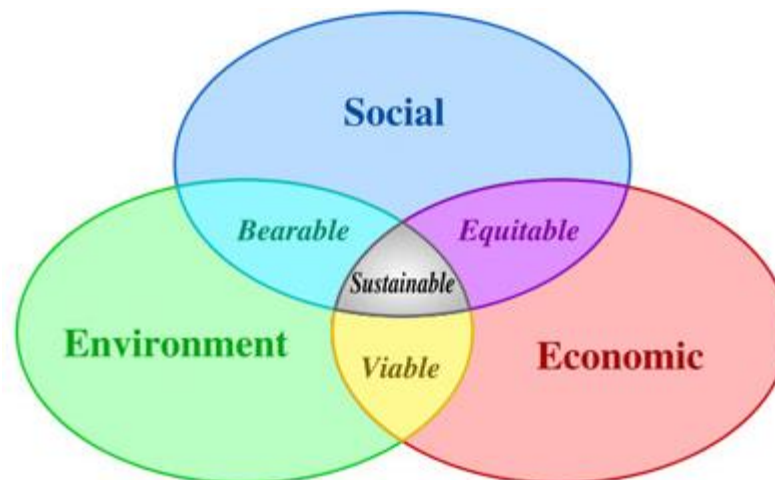
6. Are We Sustainable? - Assessing the Water Footprint

Water Footprint Assessment (3/3)

Next to **environmental** impact, also **social** (basic human needs in the catchment areas and fairness) and **economic** (price of water versus its real economic costs) impact are assessed.

→ Response strategies can be formulated to directly target activities that lead to water scarcity and pollution

→ Improve **water source protection** and **sustainability of water use**



Water use should be bearable, equitable and viable. Source:

http://www.sustainability.umd.edu/content/about/what_is_sustainability.php [Accessed: 22.10.2013]

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