Contribuciones a la producción y el consumo sostenible

Seminario metodológico sobre seguridad hídrica y alimentaria

Madrid, 20 October 2011

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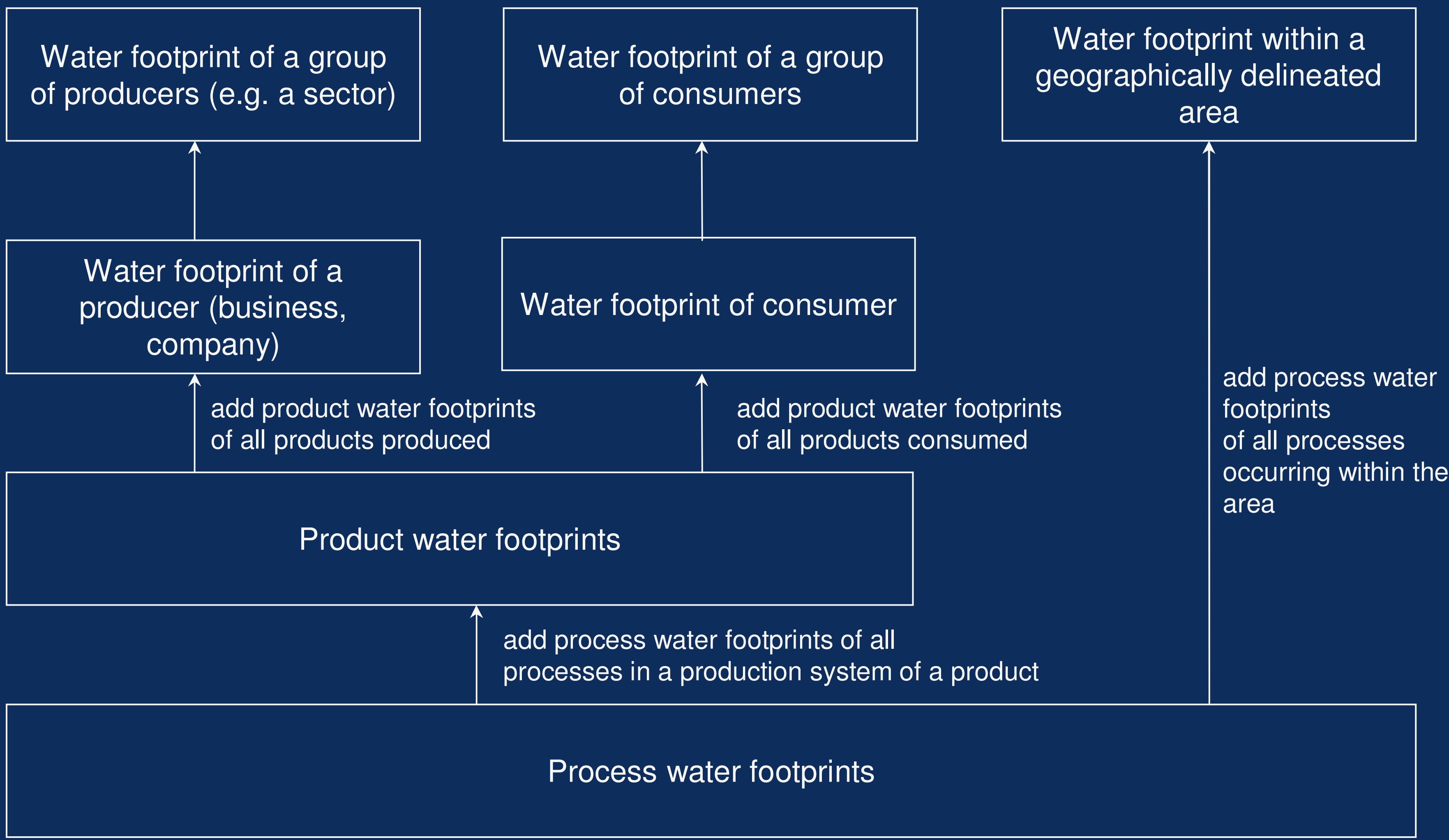
Water Footprint Network

Coherence in water footprint accounts



[Hoekstra et al., 2011]

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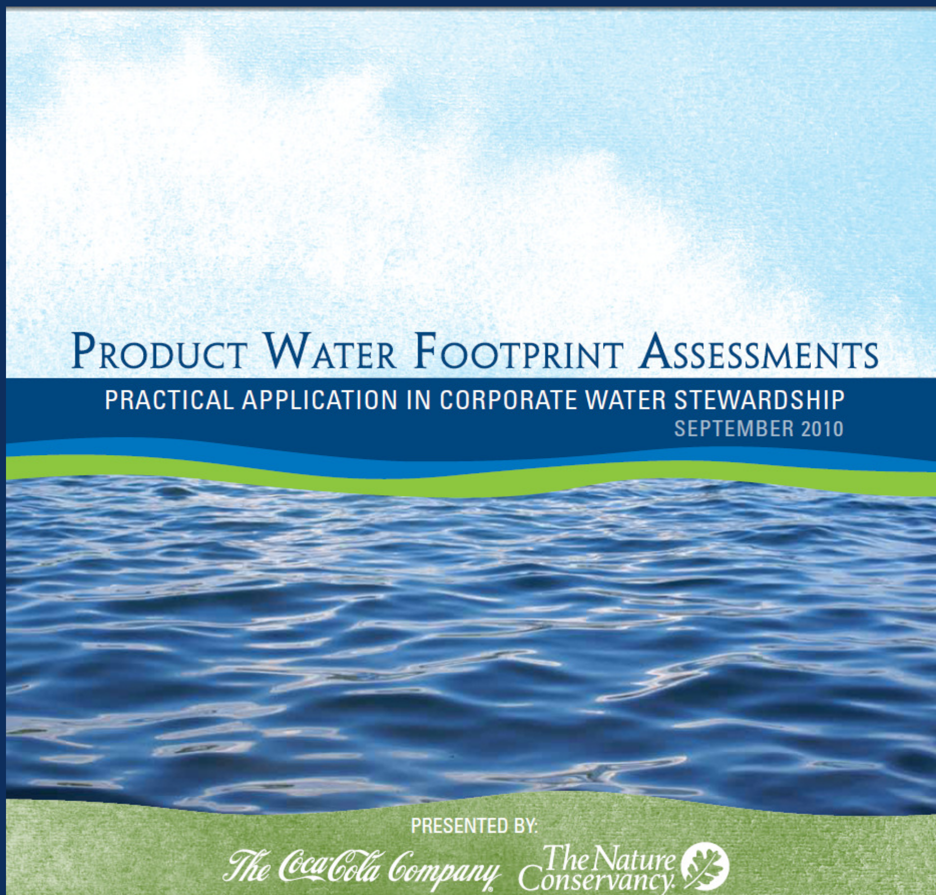
The product /business perspective: the Coca-Cola pilot case study

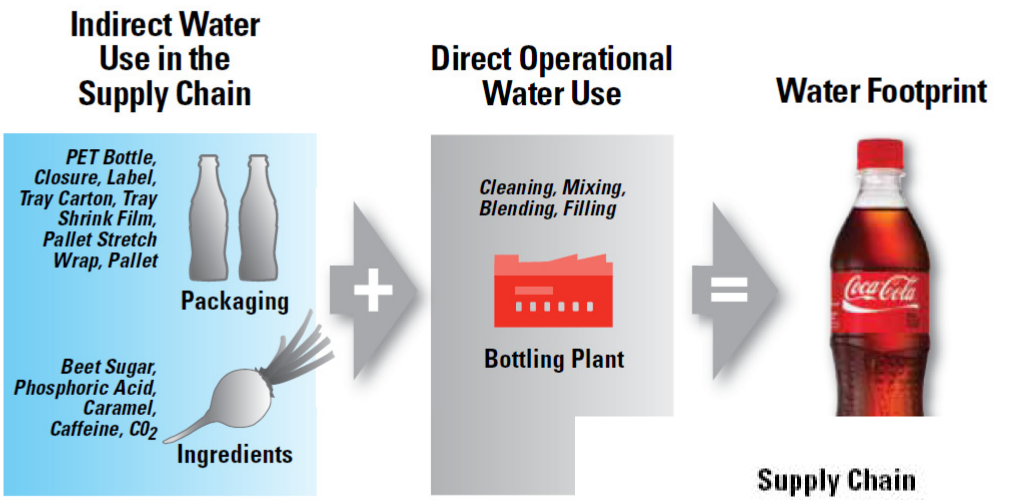
The Coca-Cola Company pilot case study

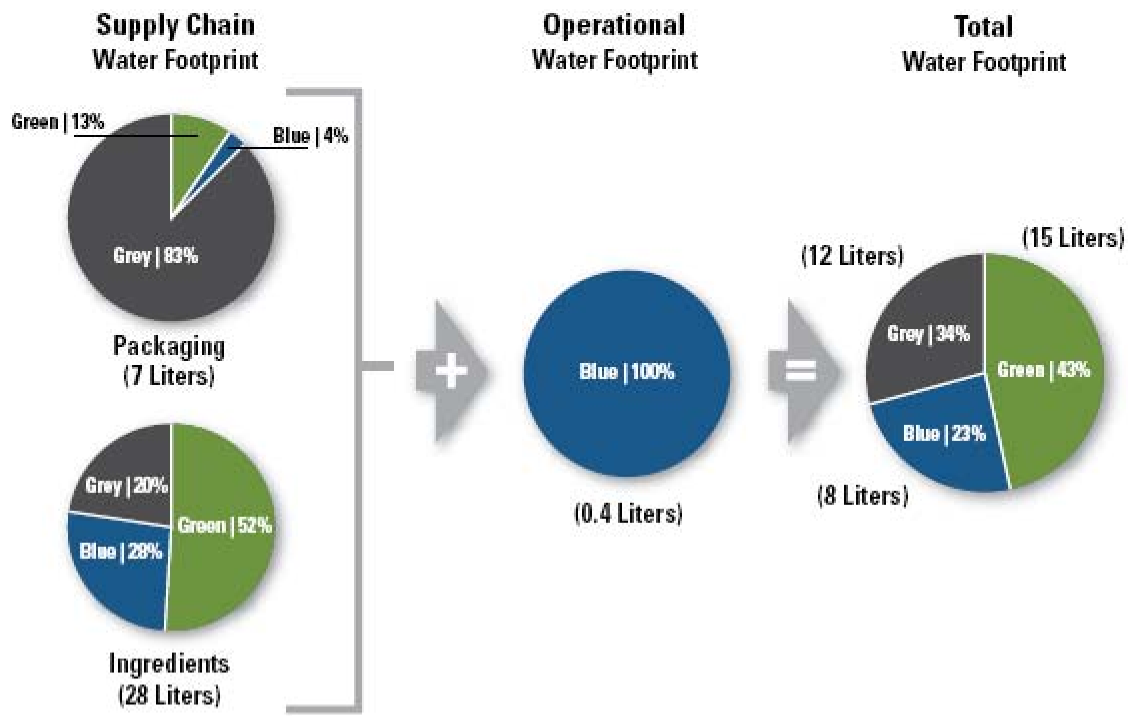


http://www.waterfootprint.org/Reports/CocaCola-TNC-2010-ProductWaterFootprintAssessments.pdf

http://www.waterfootprint.org/Reports/CocaCola-2011-WaterFootprintSustainabilityAssessment.pdf

The Coca-Cola Company pilot case study
1. Water Footprint of 0.5 litre Coca-Cola in PET bottle, produced in Dongen bottling plant





The Coca-Cola Company pilot case study

1. Water Footprint of 0.5 litre Coca-Cola in PET bottle, produced in Dongen bottling plant

Key findings

What was learned from the Coca-Cola water footprint study?

- **More than two-thirds of the total water footprint of a 0.5 liter PET bottle of Coca-Cola from the Netherlands comes from blue and green water used in the supply chain to grow sugar beets.** Nearly half of the total water footprint is rainwater (green) used by sugar beets in this water-rich temperate climate. Blue water accounts for approximately one-quarter of the total water footprint.[18]

- **Approximately one-third of the total water footprint is grey water associated with the supply chain.** Some nitrogen associated with fertilizer used on sugar beet fields is released to the environment. The grey water footprint also is associated with cooling water for PET production, which results in a thermal load.

- **The operational water footprint comprises only about 1% of the total water footprint.** The operational water footprint is all blue and represents water added as an ingredient. The operational grey water footprint is zero, because the wastewater is treated to meet or exceed wastewater treatment standards. Under The Coca-Cola Company's "Recycle" commitment, all plants will attain local and the Company's rigorous global treatment standards.

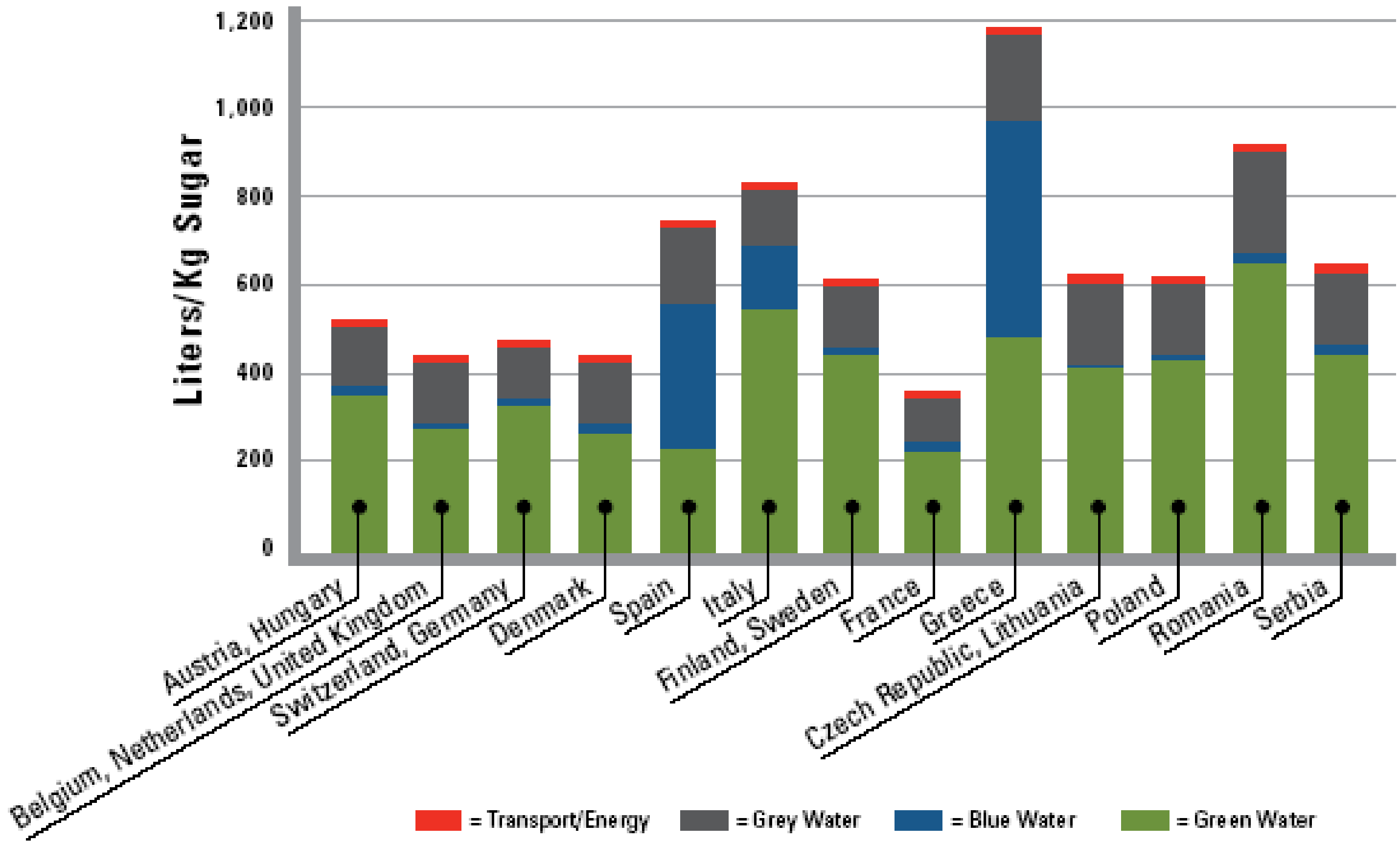
- **The overhead water footprint for the products evaluated is negligible.** This was one of the first studies to quantify the overhead water footprint of a product. Prior to the study, there was recognition that the overhead component is a part of the overall water footprint of a product, but it was unclear how relevant it was.

The Coca-Cola Company pilot case study

2. Water Footprint of beet sugar across growing regions, supplied to TCCC system

What are the implications for the Coca-Cola system?

- **The results of this pilot study suggest that a closer look at the water footprints of sugar produced from sugar beets, as well as other sweeteners supplied to the Coca-Cola system across Europe, is warranted.** The sugar beet pilot study described in the following section was conducted with the intent to increase understanding of water use associated with sugar beets produced in Europe.



The Coca-Cola Company pilot case study

2. Water Footprint of beet sugar across growing regions, supplied to TCCC system

Key findings

What was learned from the beet sugar water footprint study?

- **European sugar beets are generally grown in water-rich temperate climates using mainly green water.** Most EU countries use very little irrigation (blue) water to grow sugar beets, with some noted exceptions in the Mediterranean region.

- **Differences in the consumptive (green plus blue) water footprint between countries can be more than three-fold.** The total consumptive water footprints range from 279 liters/kg (France) to 974 liters/kg (Greece). The countries with the largest consumptive water footprint have high evapotranspiration rates and/or low yields.

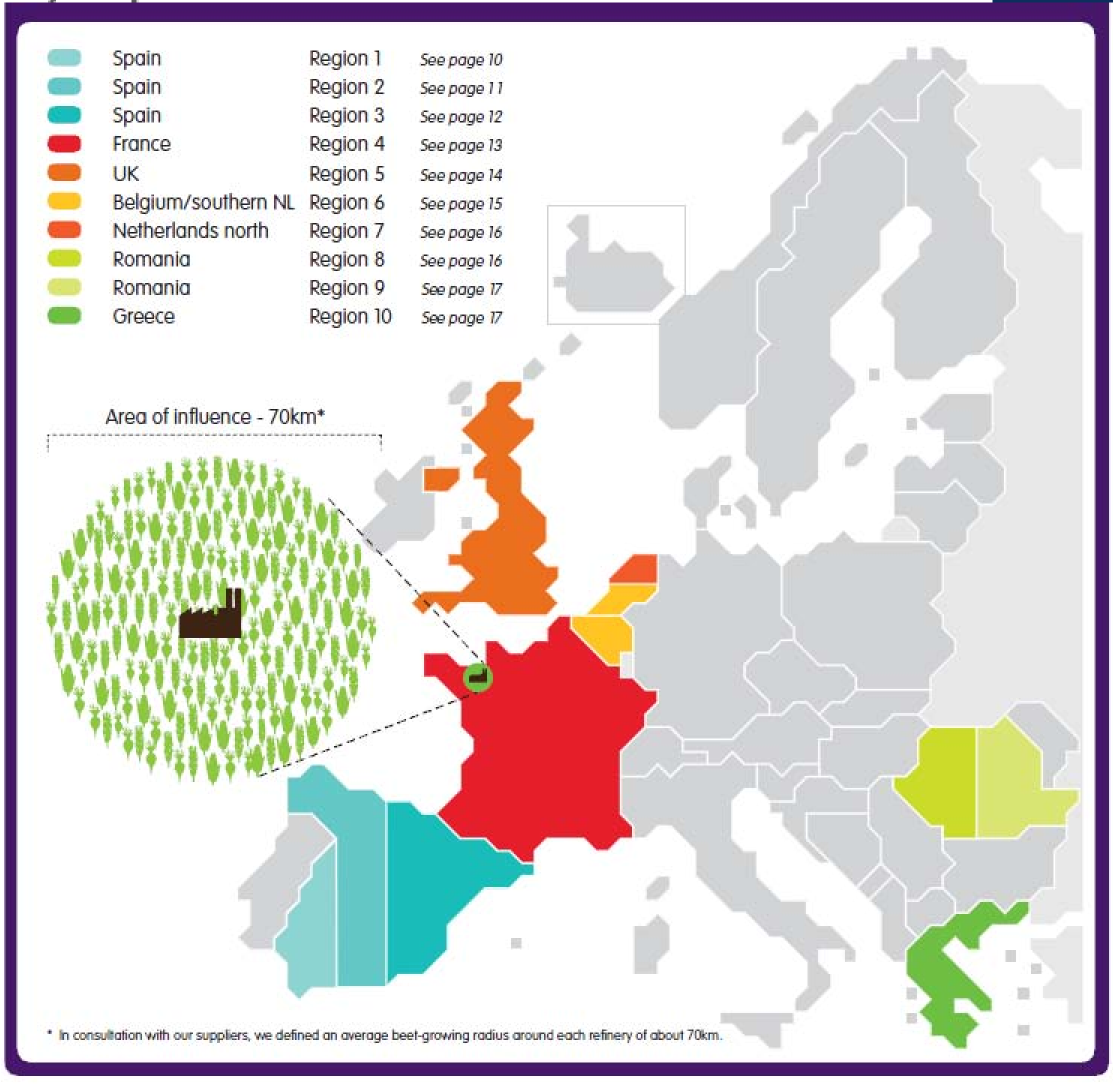
- **Grey water footprints in the sugar beet supply chain come mainly from the field, not the factory.** However, sugar plants in some countries have large grey water footprints due to low levels of wastewater treatment. Almost three-quarters of the water footprint for sugar factories is grey.

- **The use of supplier-based data provides a more realistic picture of water use in the supply chain compared to footprints based on public data.** Public data are based on assumptions, whereas supplier data are based on actual performance. Actual crop management practices for sugar beets grown in Europe utilized less irrigation water than indicated by public data. This is because periods of soil moisture deficit during the last months of growth are allowed in order to optimize yields.

The Coca-Cola Company pilot case study
3. Towards sustainable sugar sourcing in Europe

What are the implications for the Coca-Cola system?

- The findings of this pilot study helped define future actions related to supply chain sustainability



The Coca-Cola Company pilot case study

3. Towards sustainable sugar sourcing in Europe

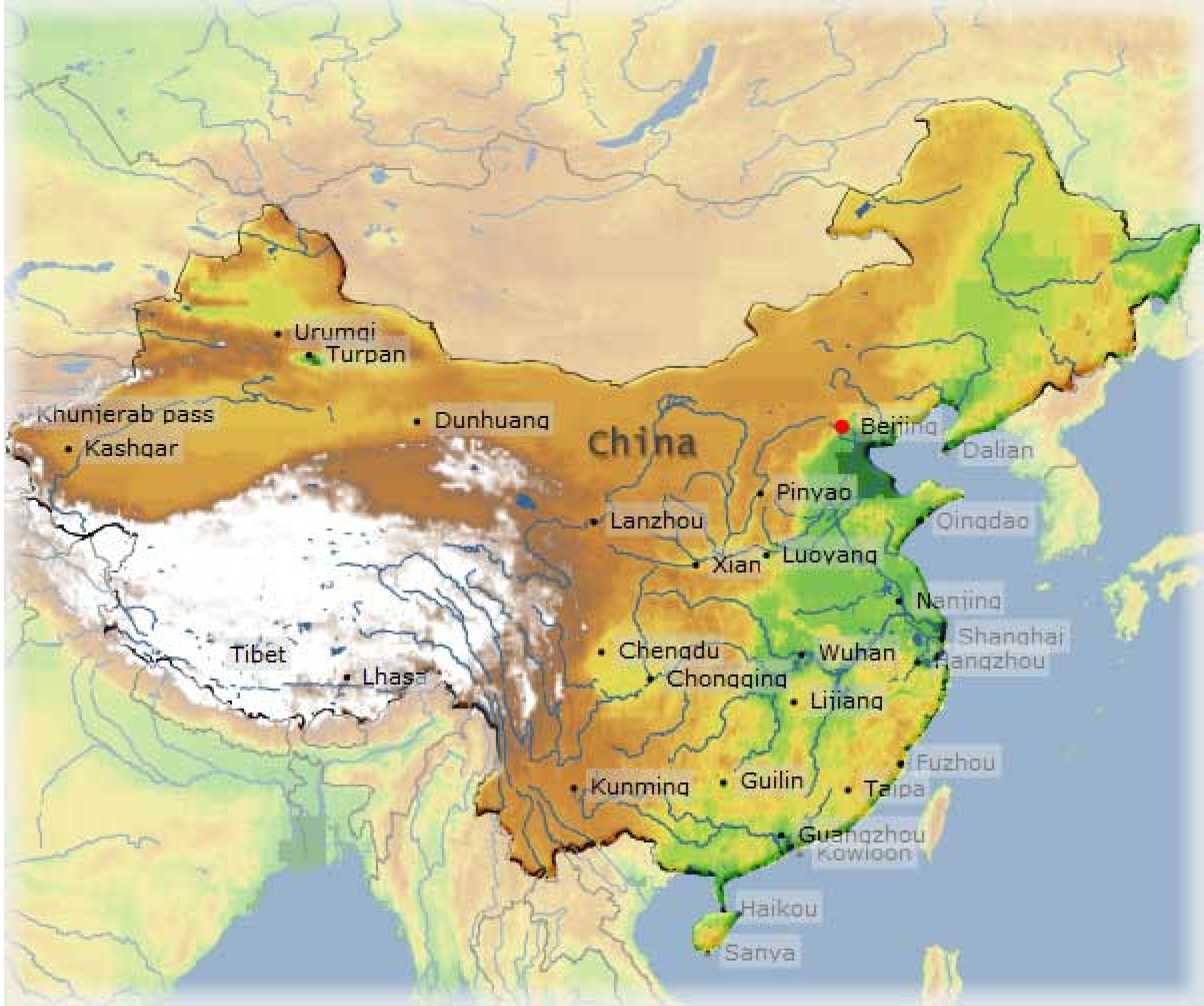
When we combine these regional investigations, we can build an overall view of water quality, quantity and assess the potential impact of sugar production.

- For two out of ten regions, the application of the selected approach was not possible due to the lack of data.
- In one region, the results indicate a severe water availability risk with a relatively high share of sugar beet growing.
- The pollution levels for phosphorus were severely exceeded in five regions, and for ammonia in four regions. For phosphorus, the share of sugar production is low and for ammonia, the share of sugar production is moderate in all of these cases.
- In five regions, we found a relatively high share of sugar beet growing in nitrate level in groundwater. However, we believe that the assumptions on nitrate leaching from the field into groundwater are exaggerated and more work is needed to assess the actual effect.

2

The consumer perspective: the Chinese case

China



Liu, J. and Savenije, H.H.G. (2008) Food consumption patterns and their effect on water requirement in China, *Hydrology and Earth System Sciences* 12(3): 887-898.

China

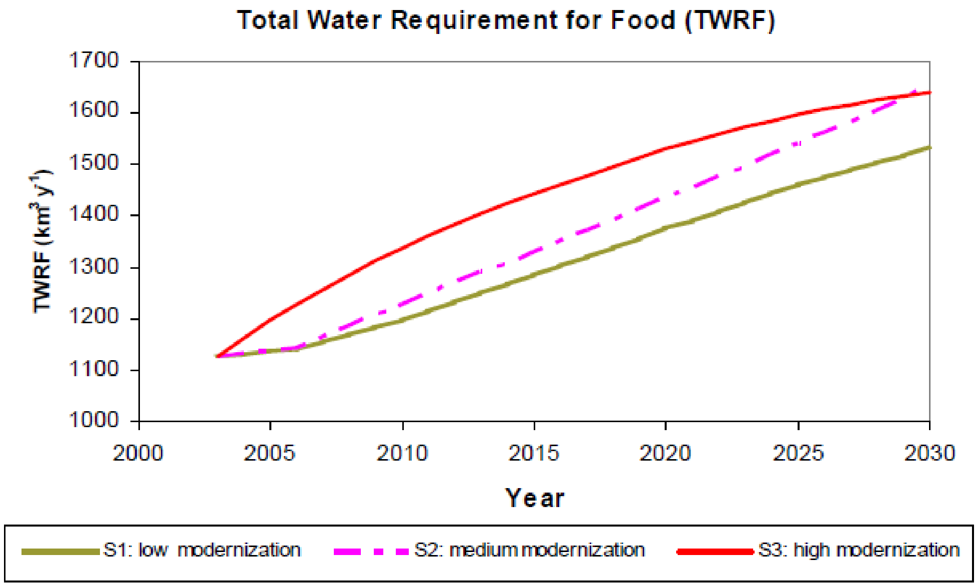
Context

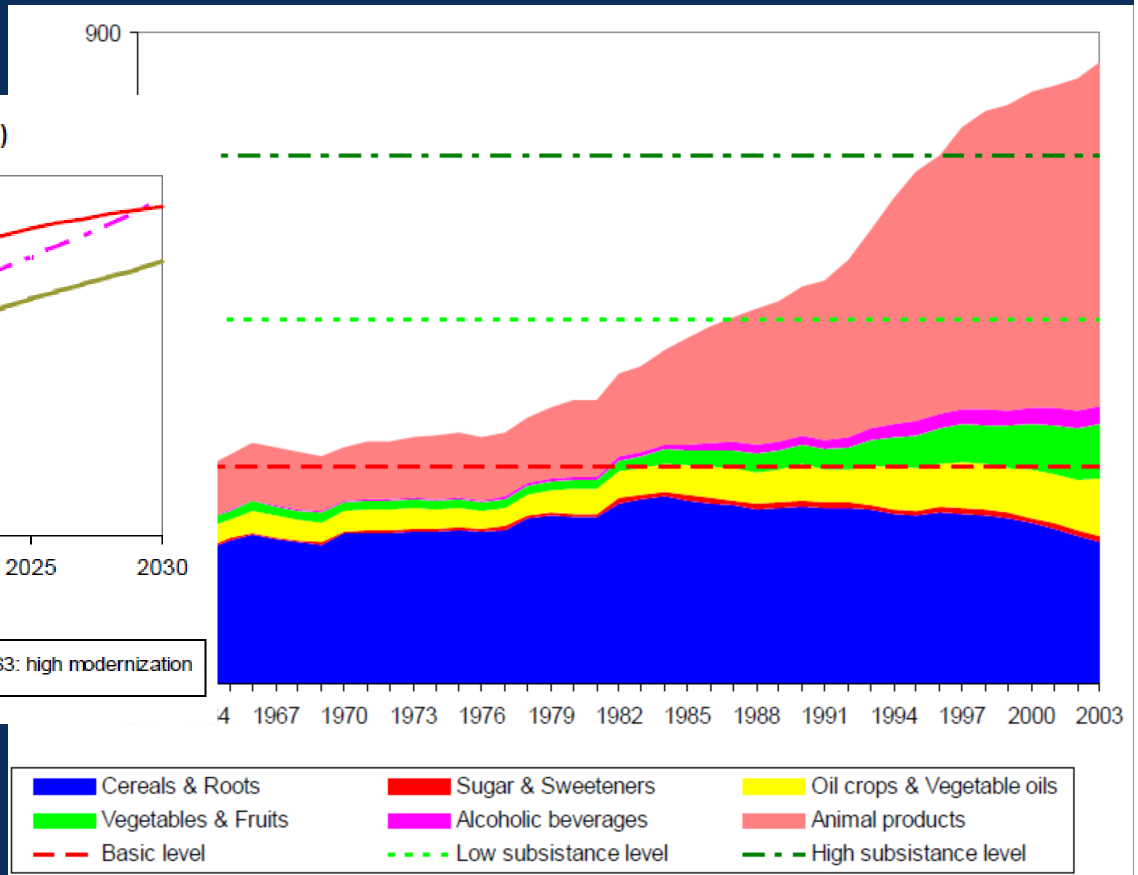
- Huge water availability differences within the country
- Rapidly growing consumption patterns

Main Question

How do food consumption patterns in China influence water requirements, in the past and in the future?

China



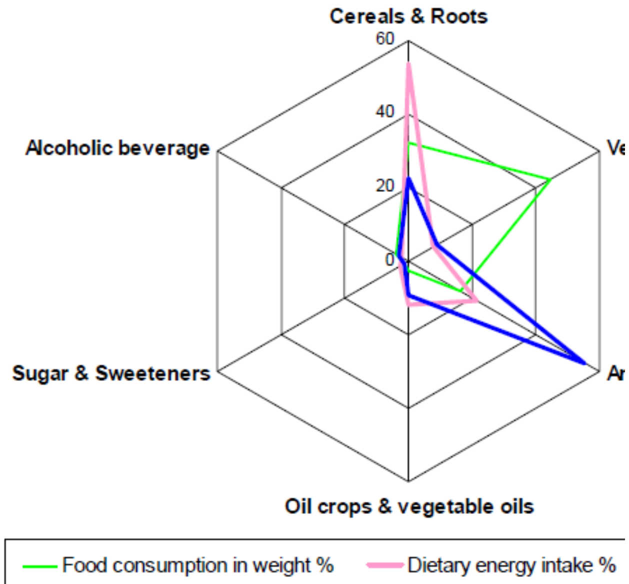


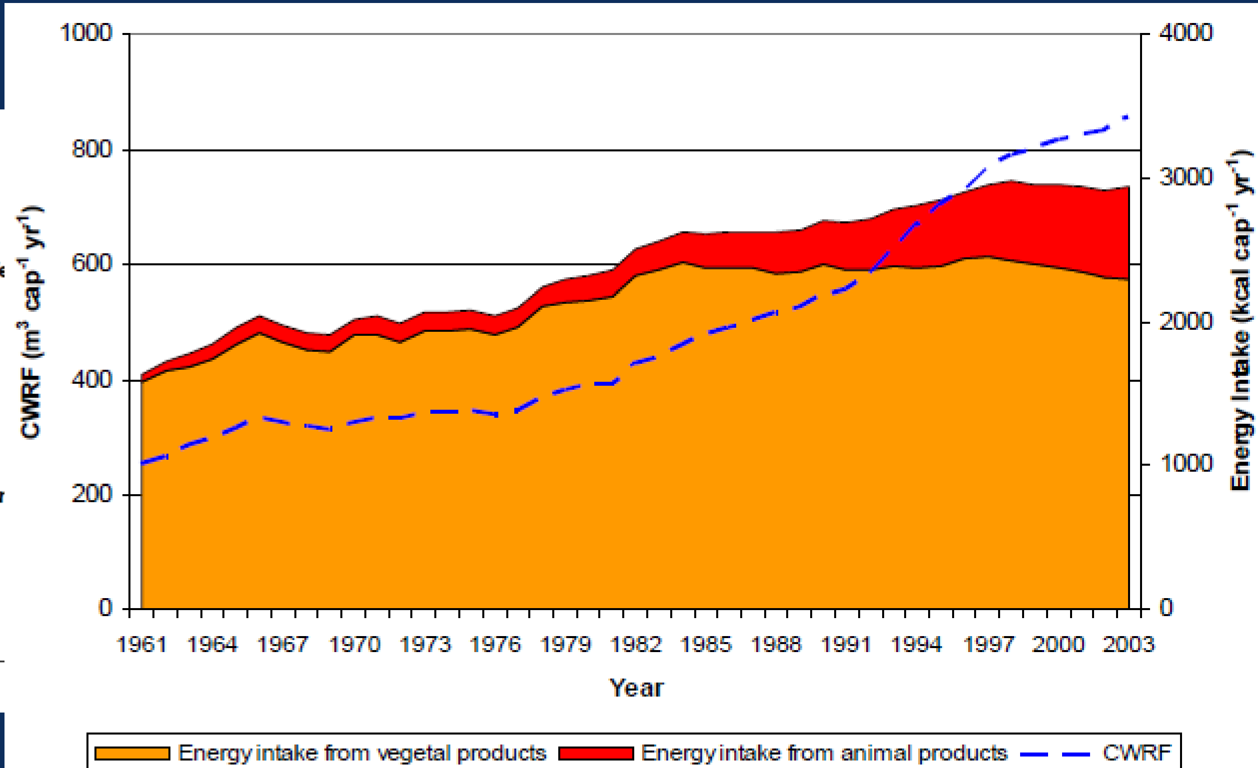
Indicators used

1. WF / VWC of crop and livestock products.

- Historical CWRF (Crop water requirement for food)
- Scenario evaluation

China





Indicators used

2. Energy water productivity

3. Energy intake

China

Key findings

- CWRF has increased ~ 3.5 times between 1961 – 2003 -> increase in consumption of animal products. CWRF increased much faster than energy intake.

- Change in food consumption patterns → Affect the partitioning between green and blue water and influence VW trade worldwide.

The indicators used show future water requirements for China and results are supportive information in policy making.

3

The geographical application: the basin approach - Lake Naivasha, Kenya

Lake Naivasha, Kenya

Mekonnen, M.M. & Hoekstra, A. (2010) Mitigating the Water Footprint of Export Flowers from the Lake Naivasha Basin, Kenya. Value of Water Research Report Series No. 44, UNESCO-IHE

Lake Naivasha, Kenya

Context

- Economic success of the flower industry
- Lake levels drop, water quality deterioration and biodiversity at risk
- Lake recognised as a Ramsar wetland

Main Questions

What is the water footprint within the Lake Naivasha related to cut flowers?

Lake Naivasha, Kenya

Land use	Area cultivated* Area (ha)	Irrigated (%)	Water footprint (1000 m³/yr) Green	Blue	Grey	Total
Commercial farms around the lake**						
Total flower	1911	100	3640	7576	5627	16842
Flowers open	721	100	3640	1770	2122	7532
Flowers greenhouse	1190	100	0	5805	3504	9310
Vegetables	1824	100	7887	7375	1834	17097
Fodder	665	100	3716	3194	452	7362
Macadamia	50	100	278	303	34	615
Total of commercial farms	4450	100	15521	18448	7947	41916
Farms in the upper catchment of the basin***						
Coffee	15724	3	105133	678	7224	113036
Cereals	12125	1	34776	82	1655	36513
Tea	9380	0	69808	10	4531	74349
Pulses	2199	0	3958	0	2673	6631
Others	3562	7	15876	382	809	17067
Total of upper catchment farms	43241	2	229550	1153	16893	247596
Grand total	47691	9	245071	19601	24840	289512

* Source: Musota (2008); Becht (2007).

** See Appendix VI for details on the water footprint of the commercial farms around the lake.

*** See Appendix I for details on the water footprint of crop production in the upper catchment.

40% of the blue WF is attributed to flowers

85 % green
8% grey
7 % blue

Indicators used

1. Blue, green and grey WFs of crops growing in the basin at a grid level [m³/yr, m³/t]

2. Virtual water exports related to cut flowers and vegetables

Lake Naivasha, Kenya

3. Water Footprint for each farm, m^3/yr, cultivating cut flower, vegetables of fodder

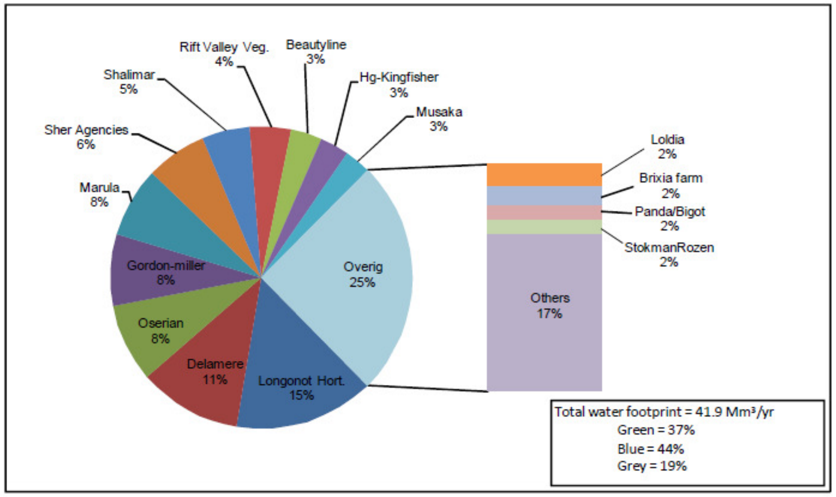


Figure 3. Contribution of major farms to the total operational water footprint of crop production around Lake Naivasha. Period 1996-2005.

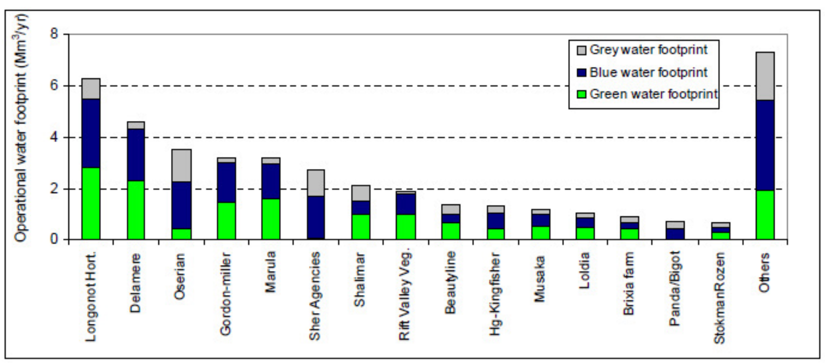
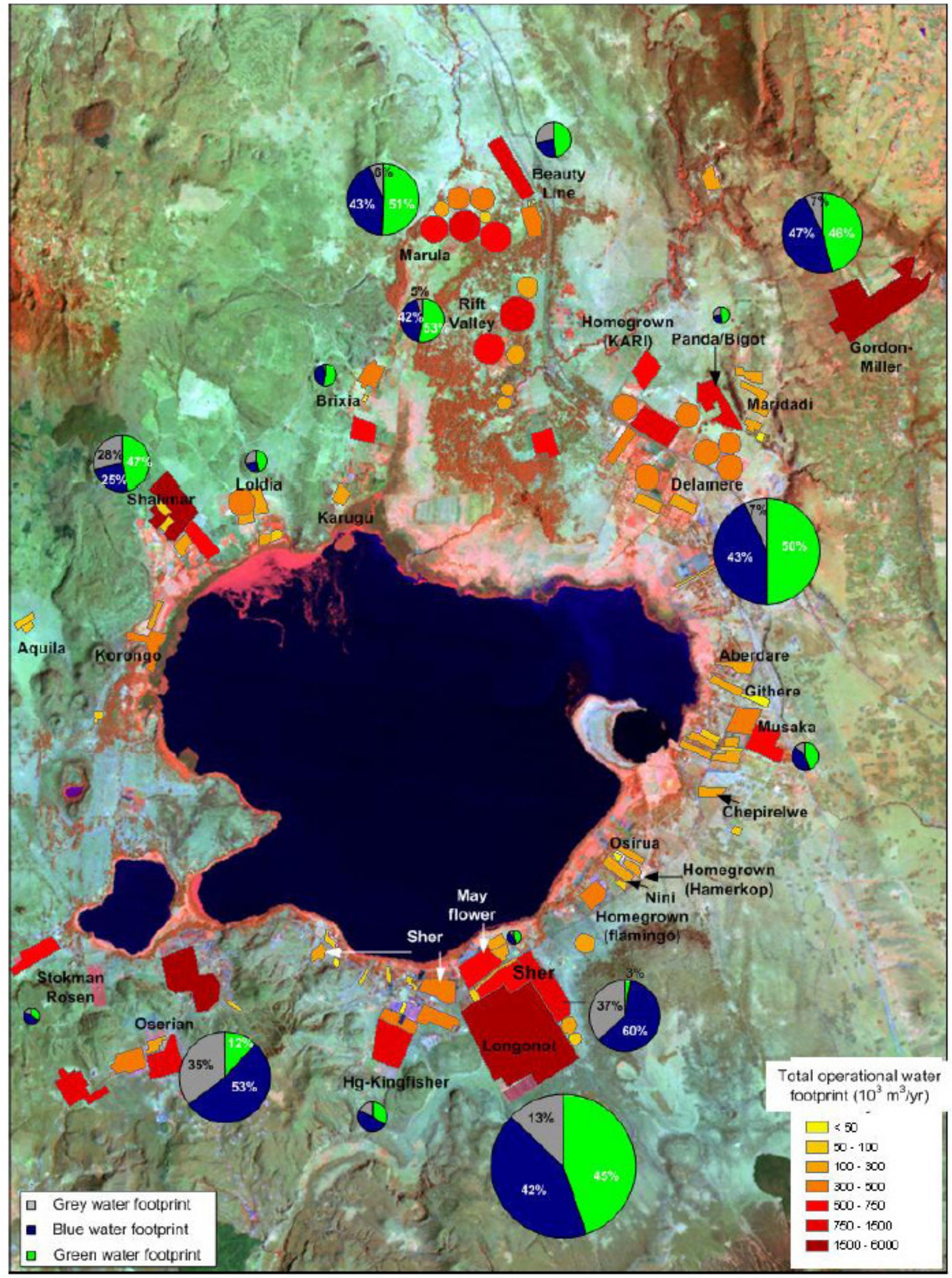
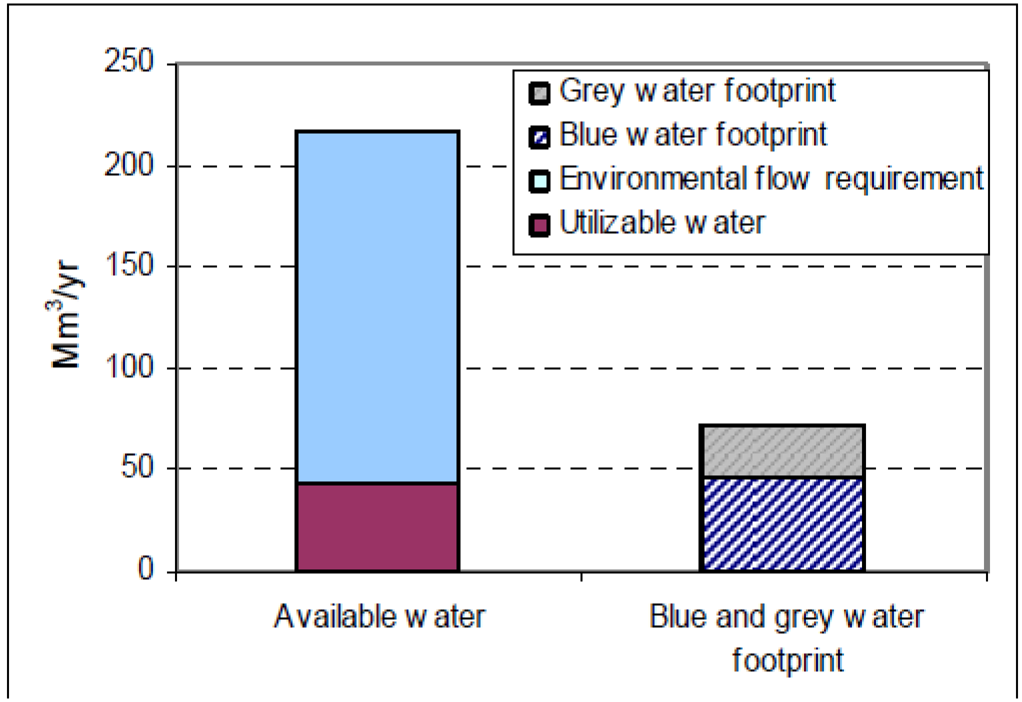


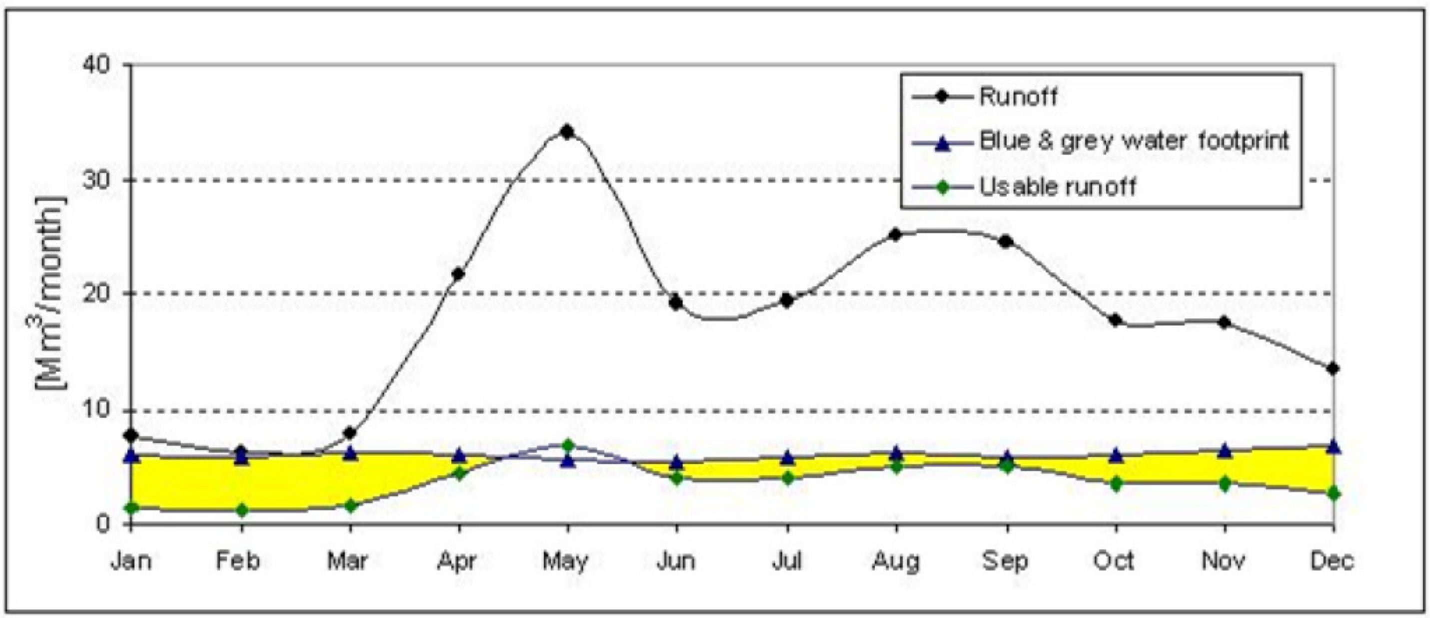
Figure 4. Operational water footprint of major farms around Lake Naivasha. Period 1996-2005



Lake Naivasha, Kenya

4. Blue and grey WFs vs water availability





Lake Naivasha, Kenya

Key findings

- Recent reduction in the lake water level can be attributed mainly to the commercial farms around the lake.
- The water quality deterioration is to a large extent due to the farm activitities in the upper catchment.
- Need to define the maximum allowable water abstraction level at the basin scale. Although equitable allocation of water is required, decisions should also take into consideration the difference in economic water productivity among different crops.
- Cut flowers generate more economic return that the low-value fodder crops and grasses.
- The use of blue water for the production of water intensive products such as beans and low-value products such as grass and fodder should be discouraged.
- The alternative of a water sustainability premium to flowers sold at the retailer may be an effective measure.

4

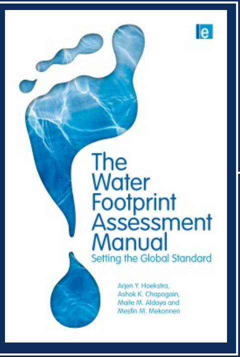
Global Water Scarcity: the Monthly Blue Water Footprint Compared to Blue Water Availability for the World's Major River Basins

[Hoekstra, A. & Mekonnen, M. 2011]

From definitions and method to practice

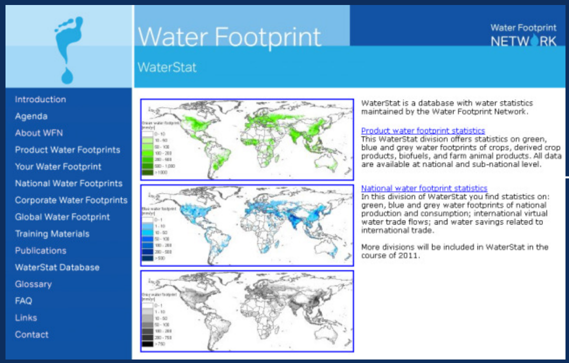
Definitions and method

Water
Footprint
Assessment
Manual



Published Feb 2011

WaterStat database

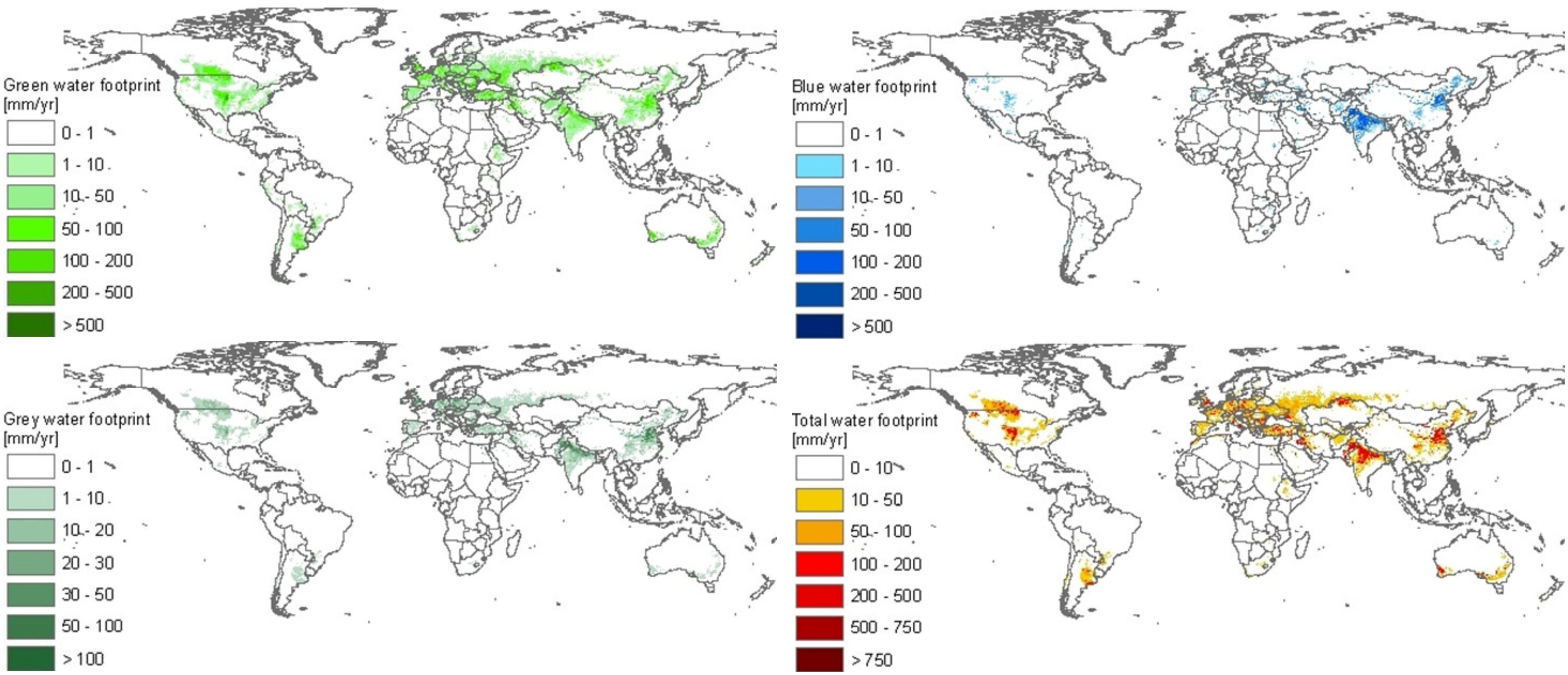


Launched May 2011

Water Footprint Assessment Tool

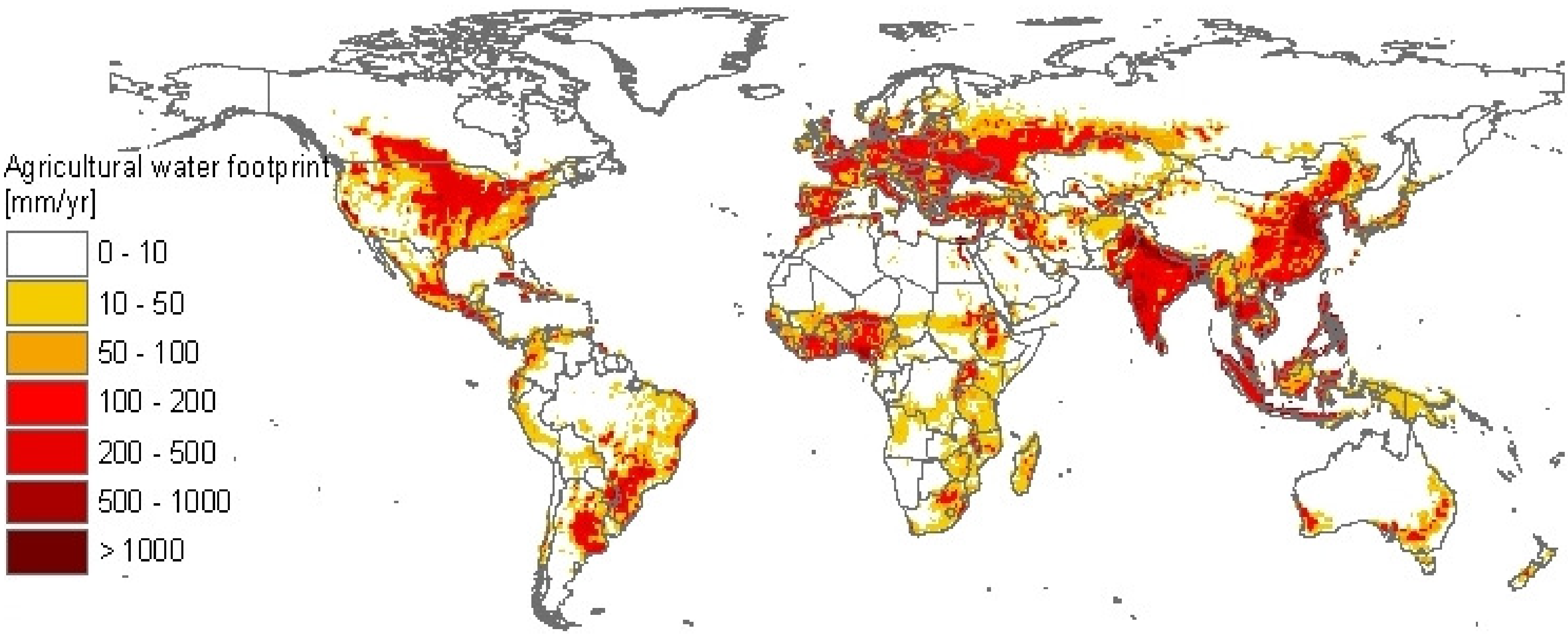
Online 2012

Global water footprint of wheat



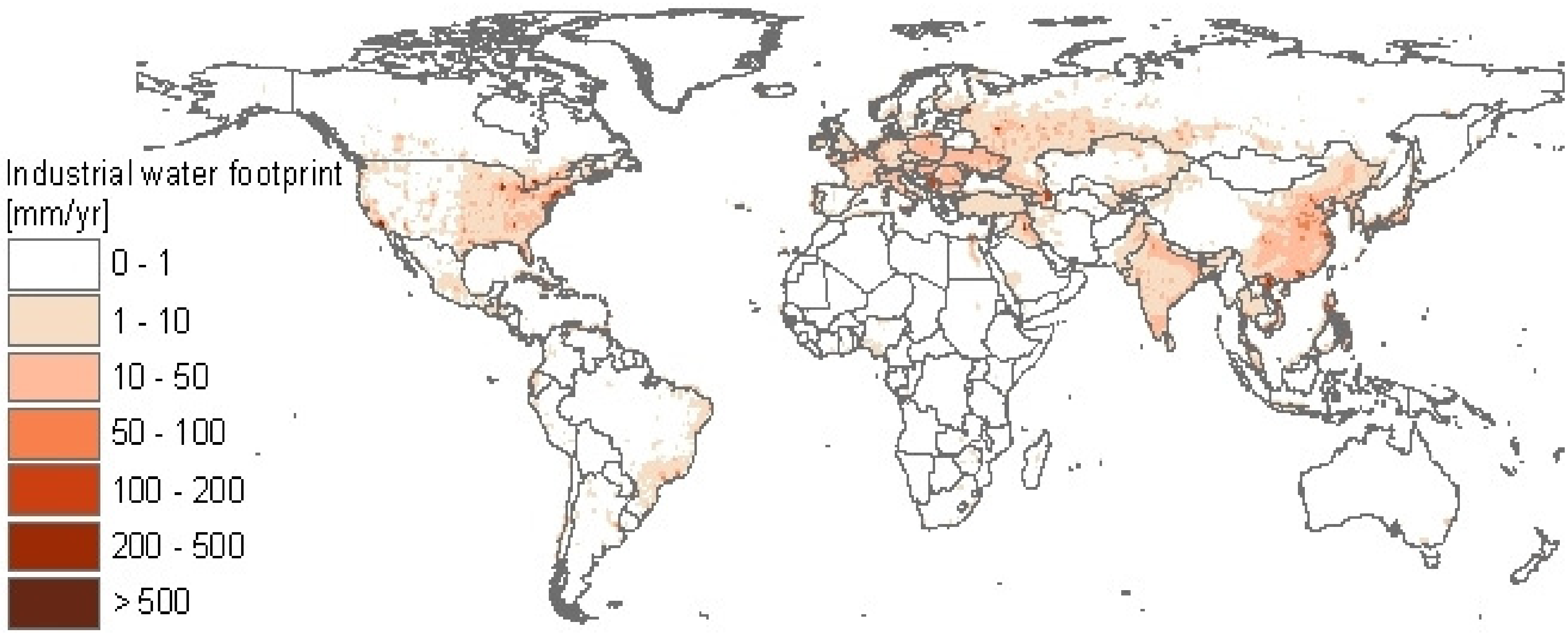
[Mekonnen & Hoekstra, 2010]

Global agricultural water footprint



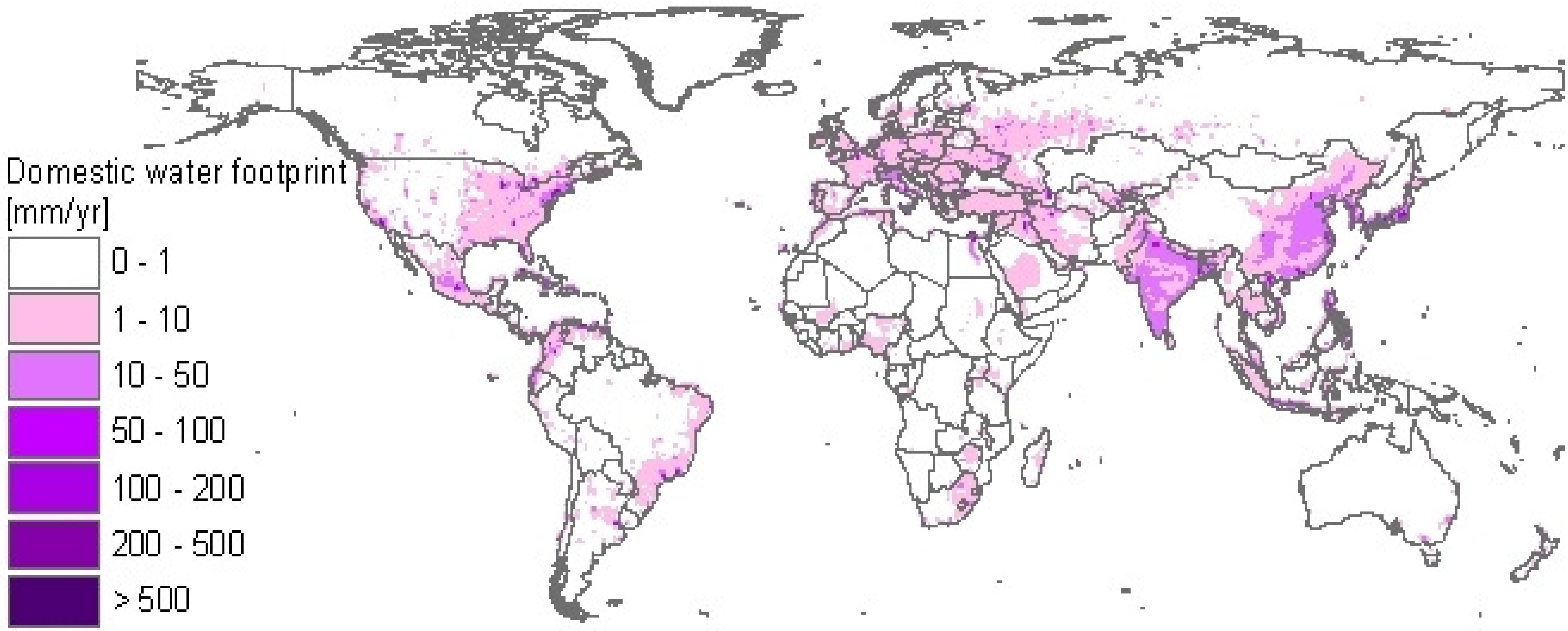
[Mekonnen & Hoekstra, 2011]

Global industrial water footprint



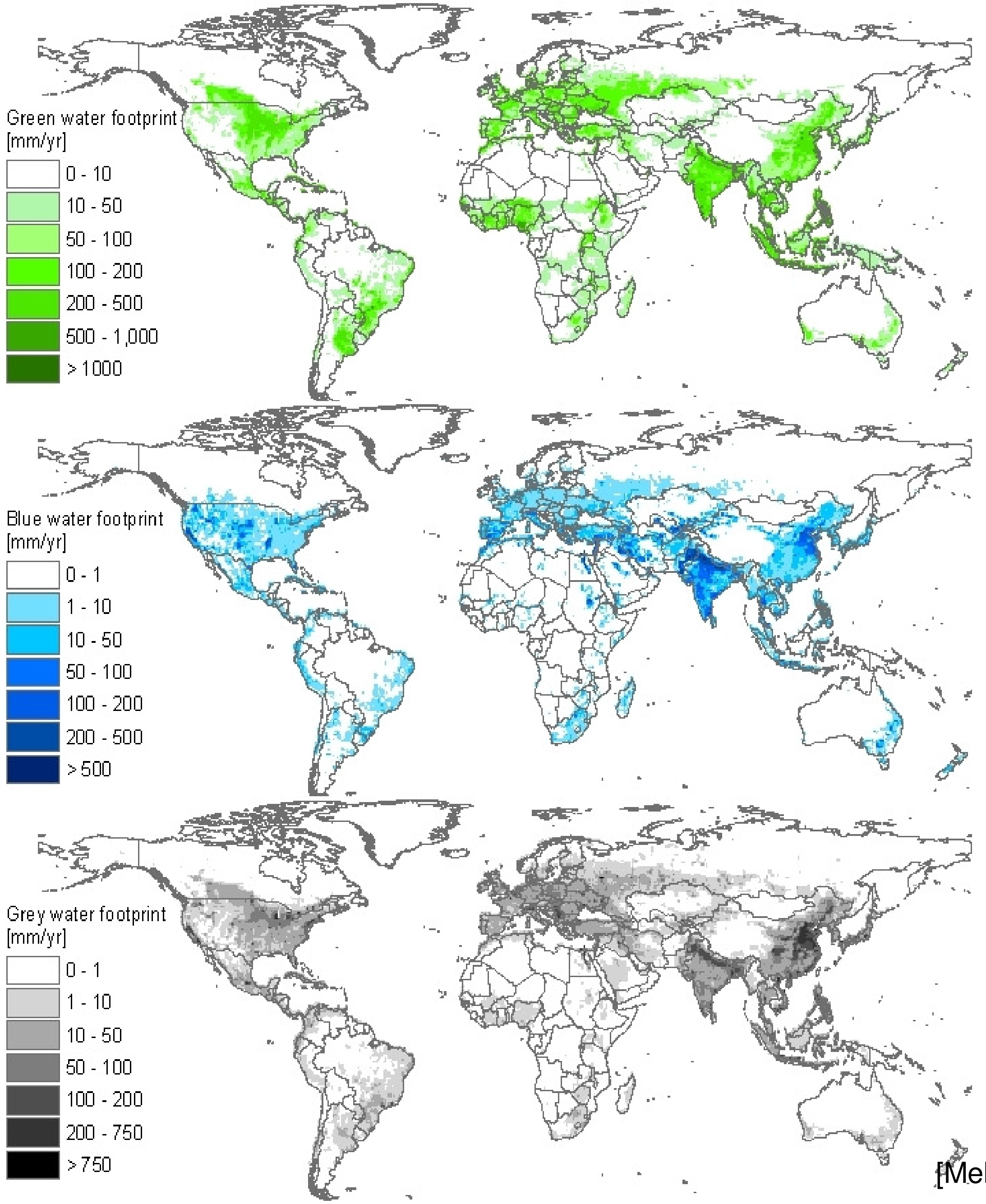
[Mekonnen & Hoekstra, 2011]

Global domestic water footprint

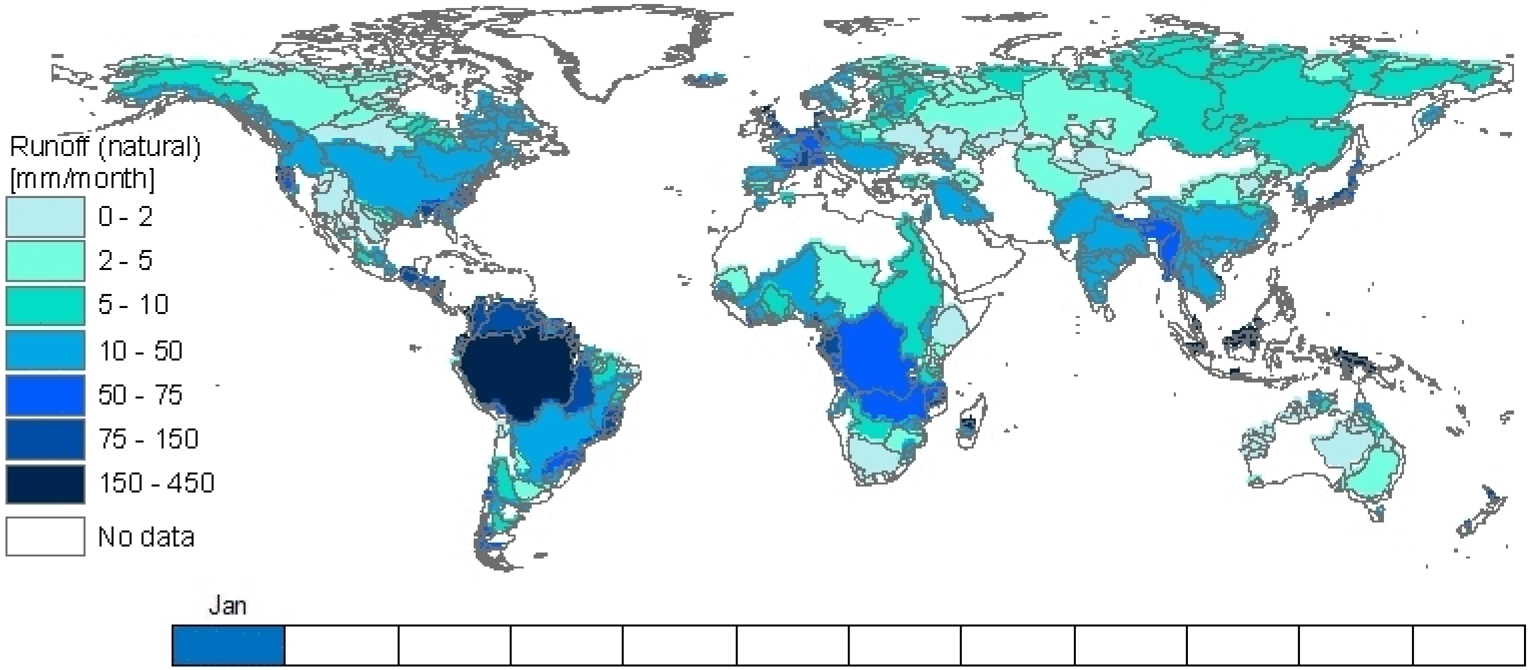


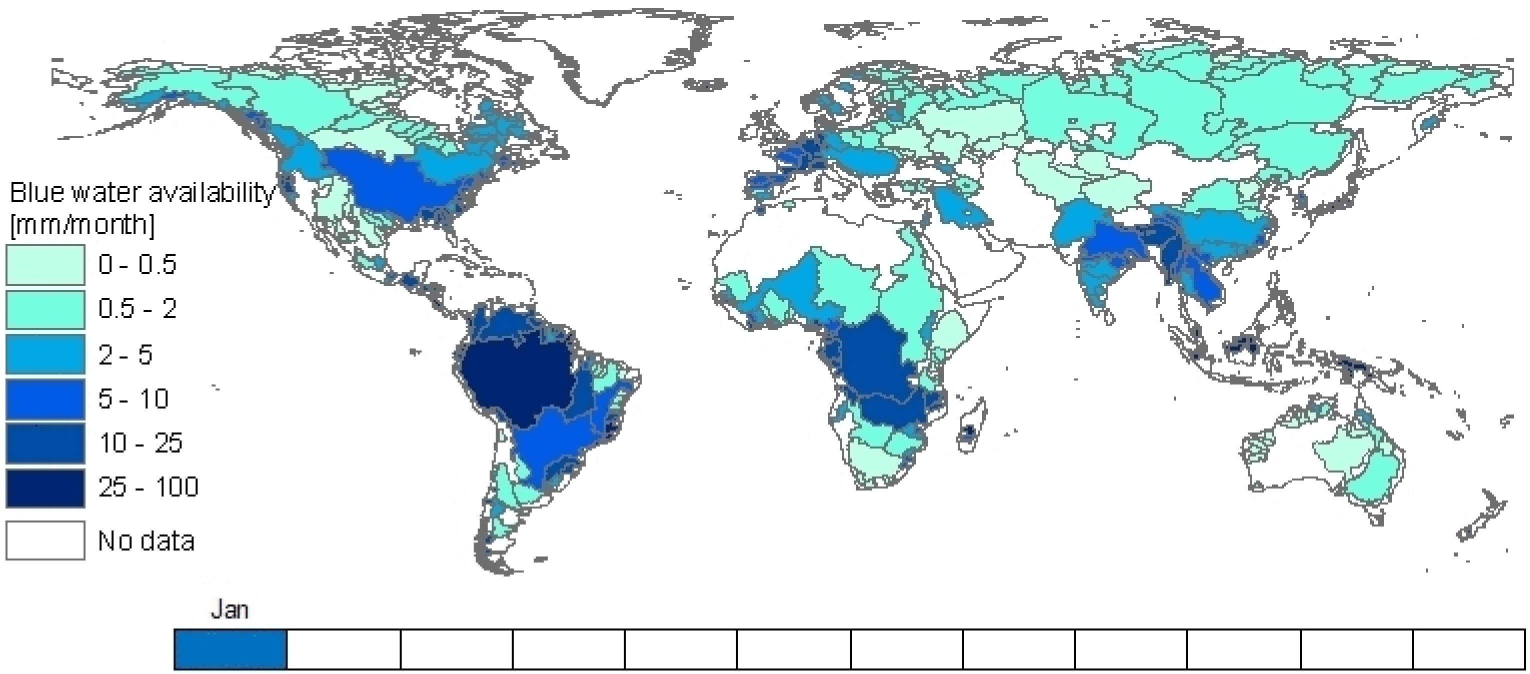
[Mekonnen & Hoekstra, 2011]

Global water footprint by color



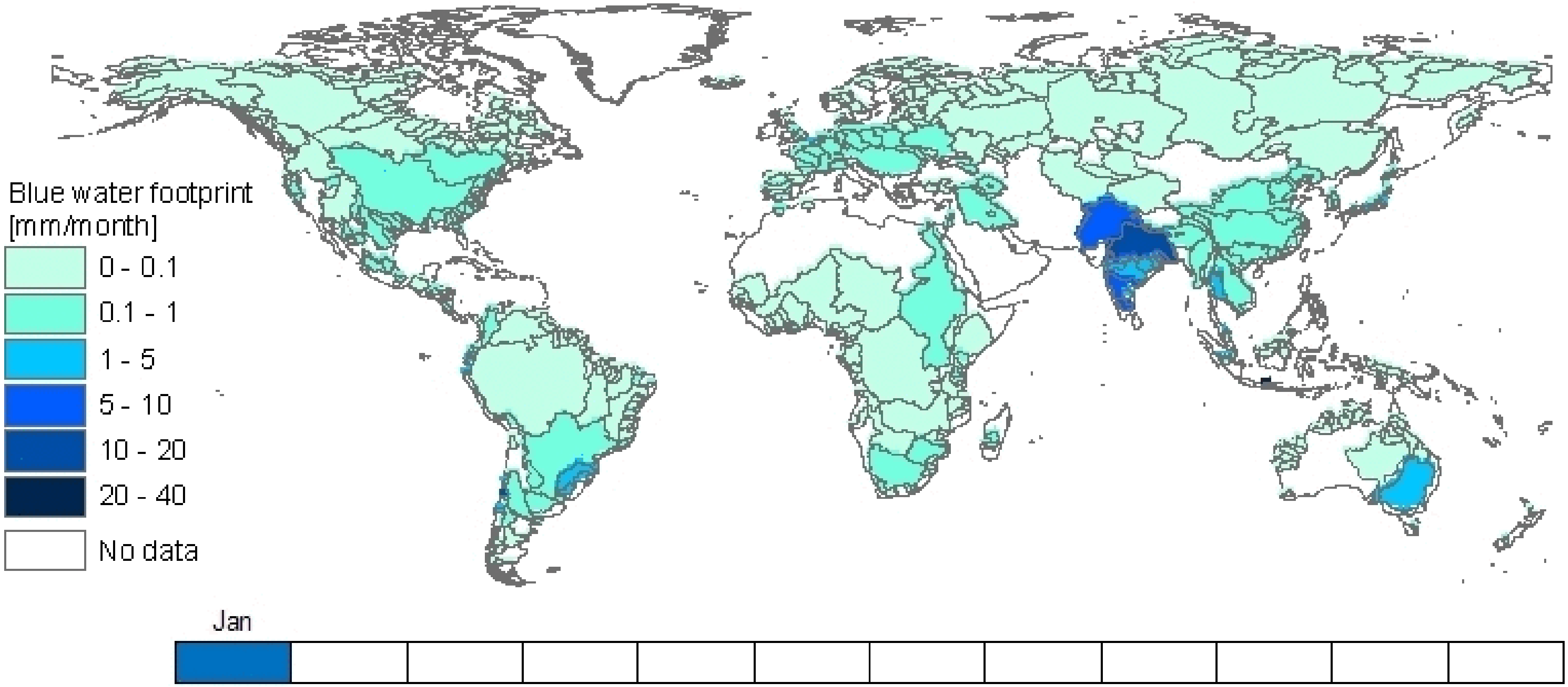
[Mekonnen & Hoekstra, 2011]





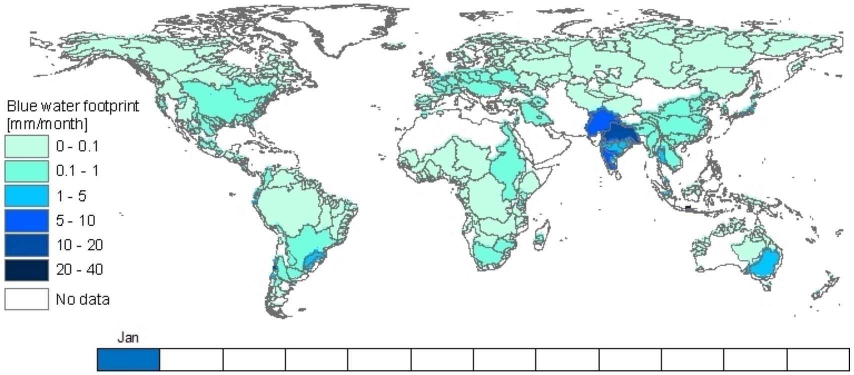
[Hoekstra & Mekonnen, 2011]

Monthly blue water footprint per river basin

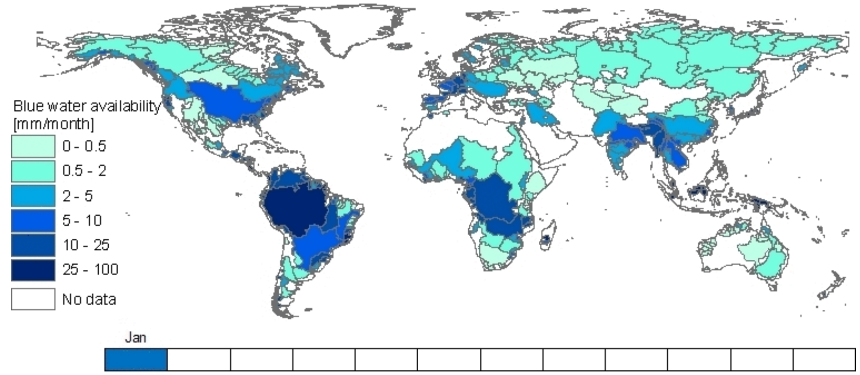


[Hoekstra & Mekonnen, 2011]

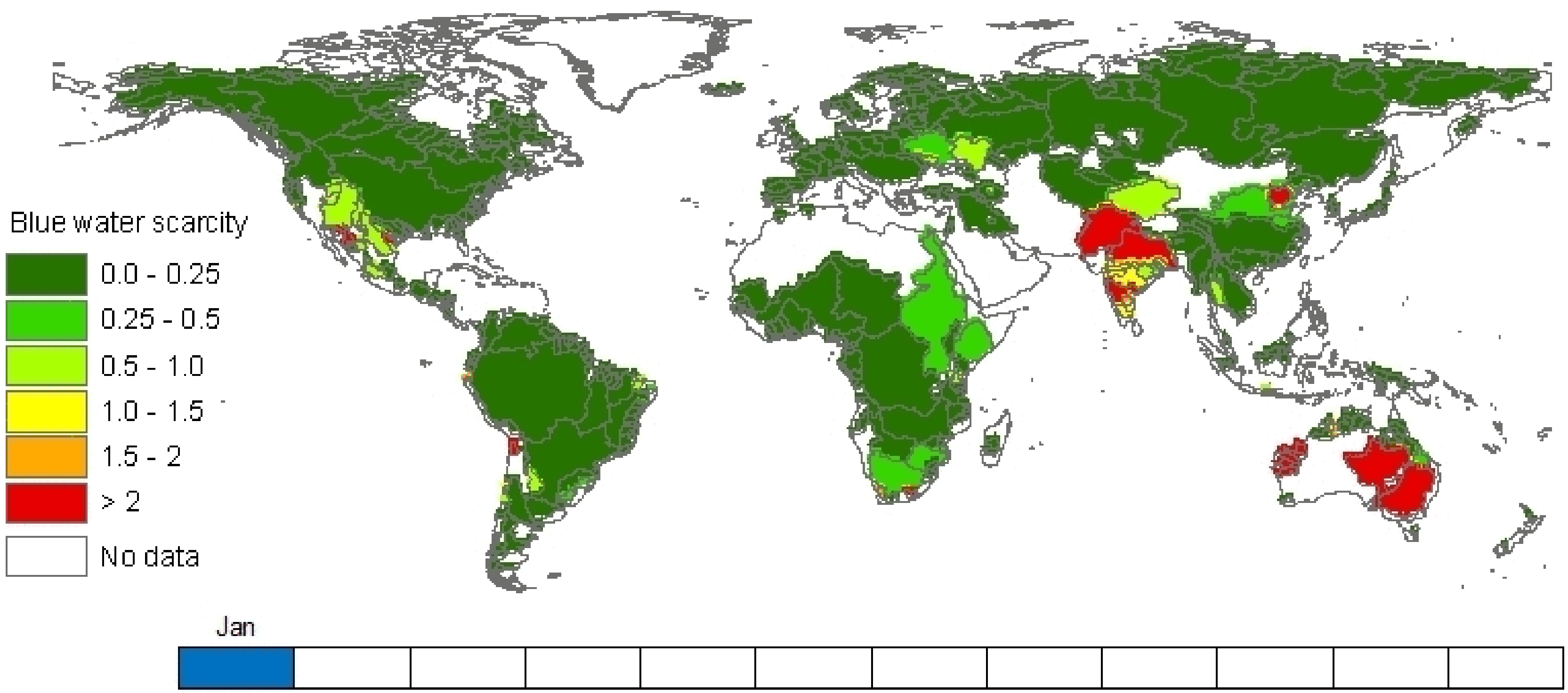
Blue water footprint



Blue water availability

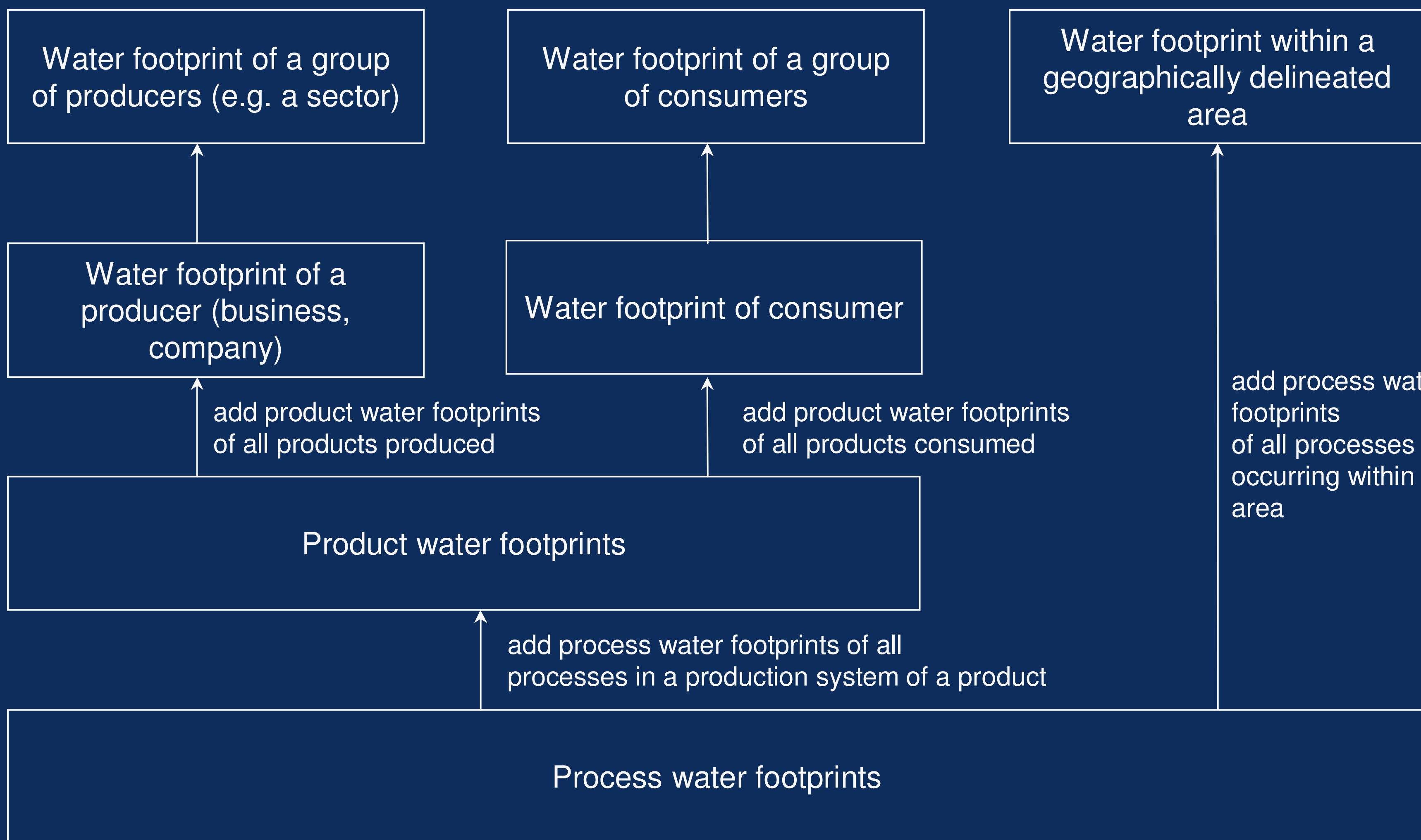


Blue water scarcity



[Hoekstra & Mekonnen, 2011]

Coherence in water footprint accounts



[Hoekstra et al., 2011]

Thank you very much for your attention