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Living Lakes

Global Nature Fund

Water Footprint: Concepts, methodologies and policy actions

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Context

The material dimension of the economic system in a globalised world

Different approaches at different levels analysing the flows of materials, energy and waste generation in production and consumption processes.

- Products / processes
  - Ecobalance
  - Life cycle assessment
  - Footprints
- Firms / Societies
  - Industrial (social) metabolism
  - Footprints

Human footprint indicators

Ecological footprint (Rees & Wackernagel, 1996)

total use of bioproductive space [Surface/time]

Carbon footprint

total emission of greenhouse gases [CO_2 eq. mass/time]

Water footprint

total appropriation of freshwater [Water volume/time]

Basic Concepts

Water footprint (WF)

The water footprint is a measure of humanity's appropriation of fresh water in volumes of water consumed and/or polluted.

The water footprint is an indicator of freshwater use that looks not only at direct water use of a consumer or producer, but also at the indirect water use.

It is *not* a measure of the severity of the local environmental impact of water consumption and pollution. (The idea of the grey water footprint was introduced in order to express water pollution in terms of a volume polluted)

Hoekstra et al. 2011

Virtual water (VW)

Water in the global trading system is known a 'virtual water'. It is the water embedded in key water-intensive commodities such as wheat.

(Allan, 1997)

Virtual water is the water needed to produce agricultural commodities. The concept could be expanded to include the water needed to produce non-agricultural commodities.

(Allan, 2003)

Virtual water accounts for direct and indirect water use in production and is thus an element of the water footprint.

VW/WF components
1. Water consumption

Blue water

is fresh water running off on the surface or flowing in aquifers.

The blue water footprint measures the amount of water available in a certain period that is consumed (in other words, not immediately returned within the same catchment)

Green water

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

The green water footprint is the volume of rainwater consumed during the production process

VW/WF components
2. Water pollution

Grey water

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

The grey water footprint is the volume of water that is required to dilute pollutants such that they become harmless.

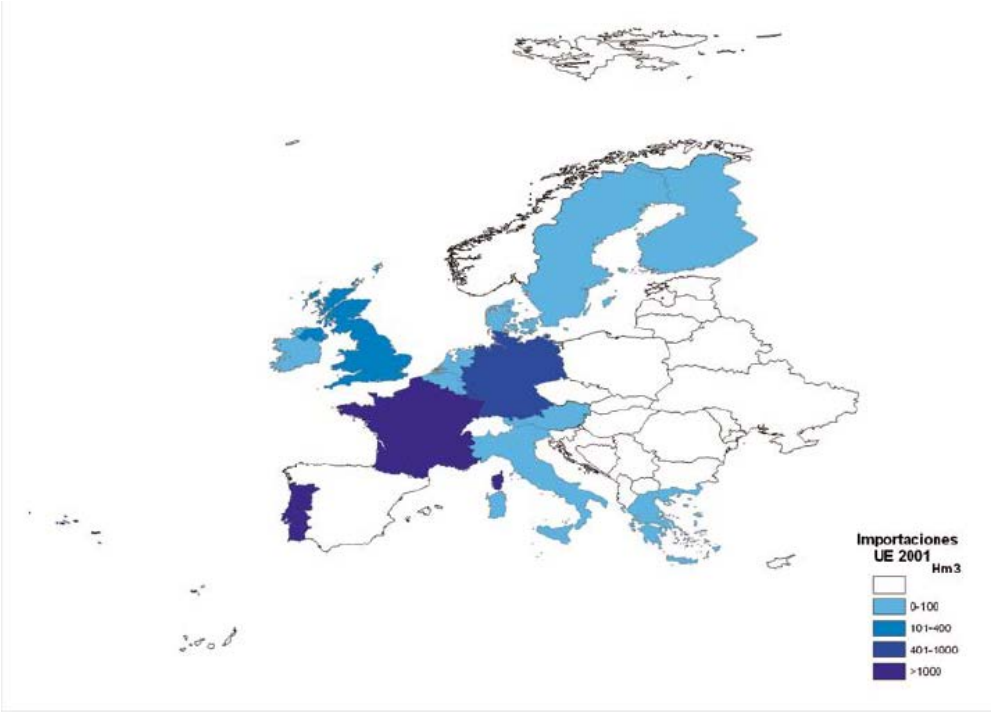
Applications

Hoekstra (2009)

Hoekstra (2009)

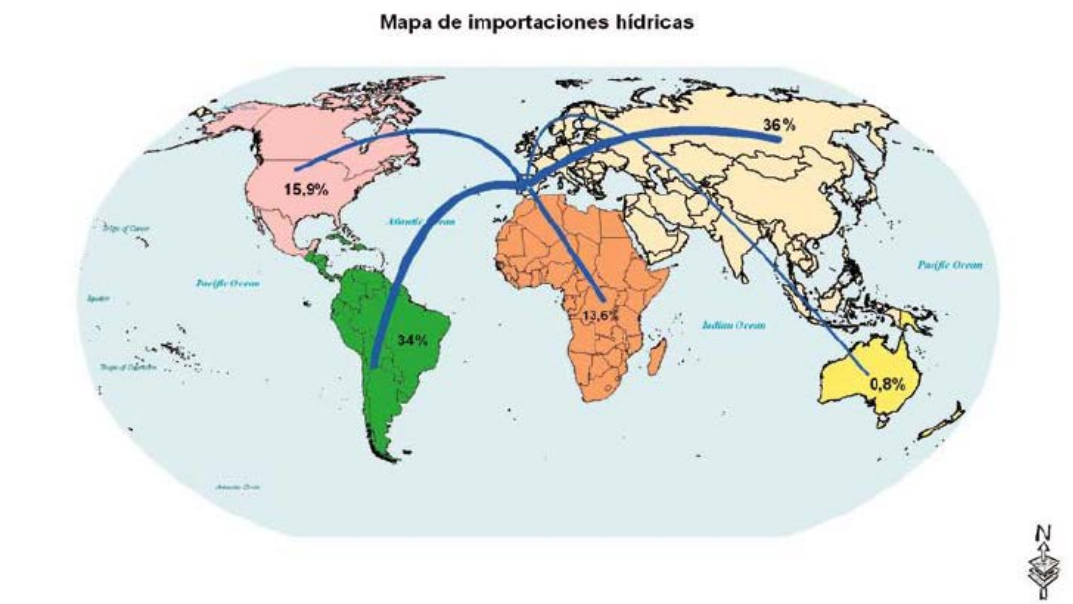
Hoekstra (2009)

Virtual Water (VW) imports to Spain



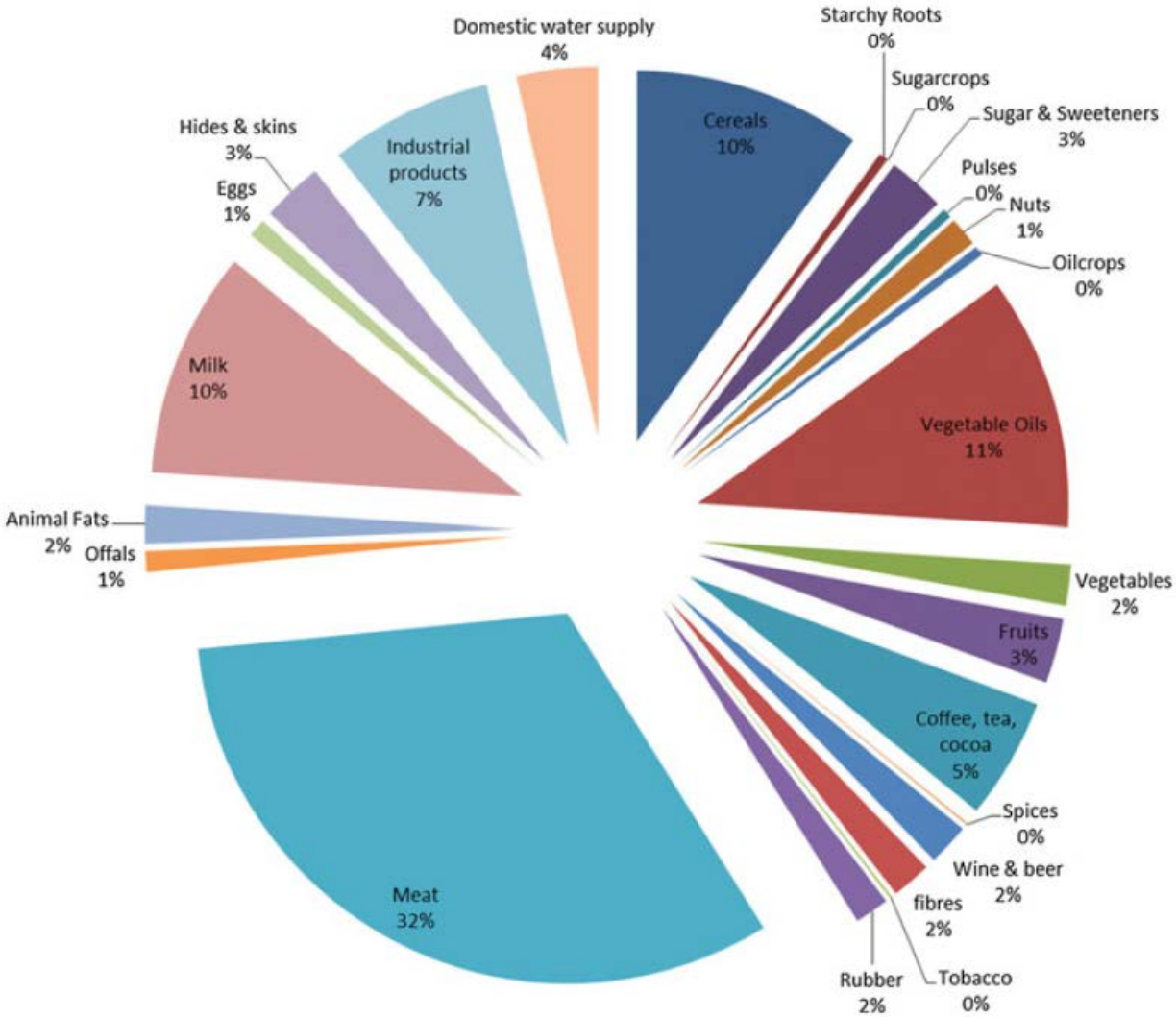
↑ VW volume (Hm^3) imported by Spain from EU countries. Year 2001

➔ Share of Spanish VW Imports from different continents. Year 2001



MARM (2011)

The composition of the water footprint of the average Italian consumer. Period 1996–2005



Hoekstra 2015

Policy Actions

The political dimension in Allan's View

The author thereafter used the term [VW] to draw attention to the notion that serious local water shortages could be very effectively ameliorated by global economic processes.

Awareness of a dependence on water and staple food coming from outside there own sovereign territories can be very destabilising. Because virtual water is economically invisible and politically silent it has the wondrous virtue of making it possible for water policy-makers and managers to cultivate a policy discourse where it can be assumed that there is no national water or food deficit. The strategic water deficit is invisibly and silently solved by importing commodities…

Water embedded in food commodities can be mobilized very quickly and flexibly to remedy the ever-changing demands of those enduring water and staple food deficits.

Allan (2003)

Actions at consumer and business level

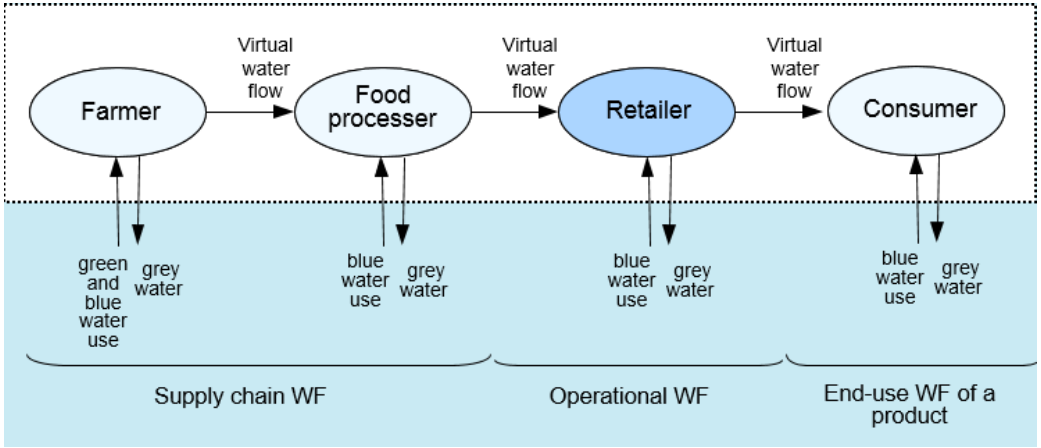
Goal: Reducing and offsetting the WF impacts

Consumer

- Good water use practices
- Change of diet / consuming patterns

Business

- Reduction of own operational WF
- Reduction of the supply-chain WF



Hoekstra (2009)

Some criticisms

WF assessment is a partial tool

- and thus, an insufficient guide for decision making by itself

Some relevant limitations

- Energy: Allan's "water, food, trade" vs "water, food energy" nexus
- Carbon footprint as a complementary indicator (Hoekstra, 2009)
- Poor indication of qualitative aspects

The local dimension

- Local access to clean freshwater is not represented by WF
- Increased VW trade leads to local loss of control and shift to global governance schemes (Vos & Hinojosa, 2016)

Risk of perverse use

- Strategies for reducing the domestic WF in some countries by VW trade increase water grabbing in poor countries
- Use of business WF as a green-washing tool

Conclusion

WF and VW have proved to be useful tools in arising awareness among consumers, firms and policy makers.

WF as a uni-dimensional [Volume] indicator needs to be complemented with other information to get a complete picture of water related problems.

Policy, management or consumption decisions cannot be derived straightaway from WF calculations, but they help to broaden the view.

Thank you!

Bauer Alex / Fotolia.com https://www.umweltbundesamt.de/themen/wasser/wasser-bewirtschaften/wasserfussabdruck#textpart-1

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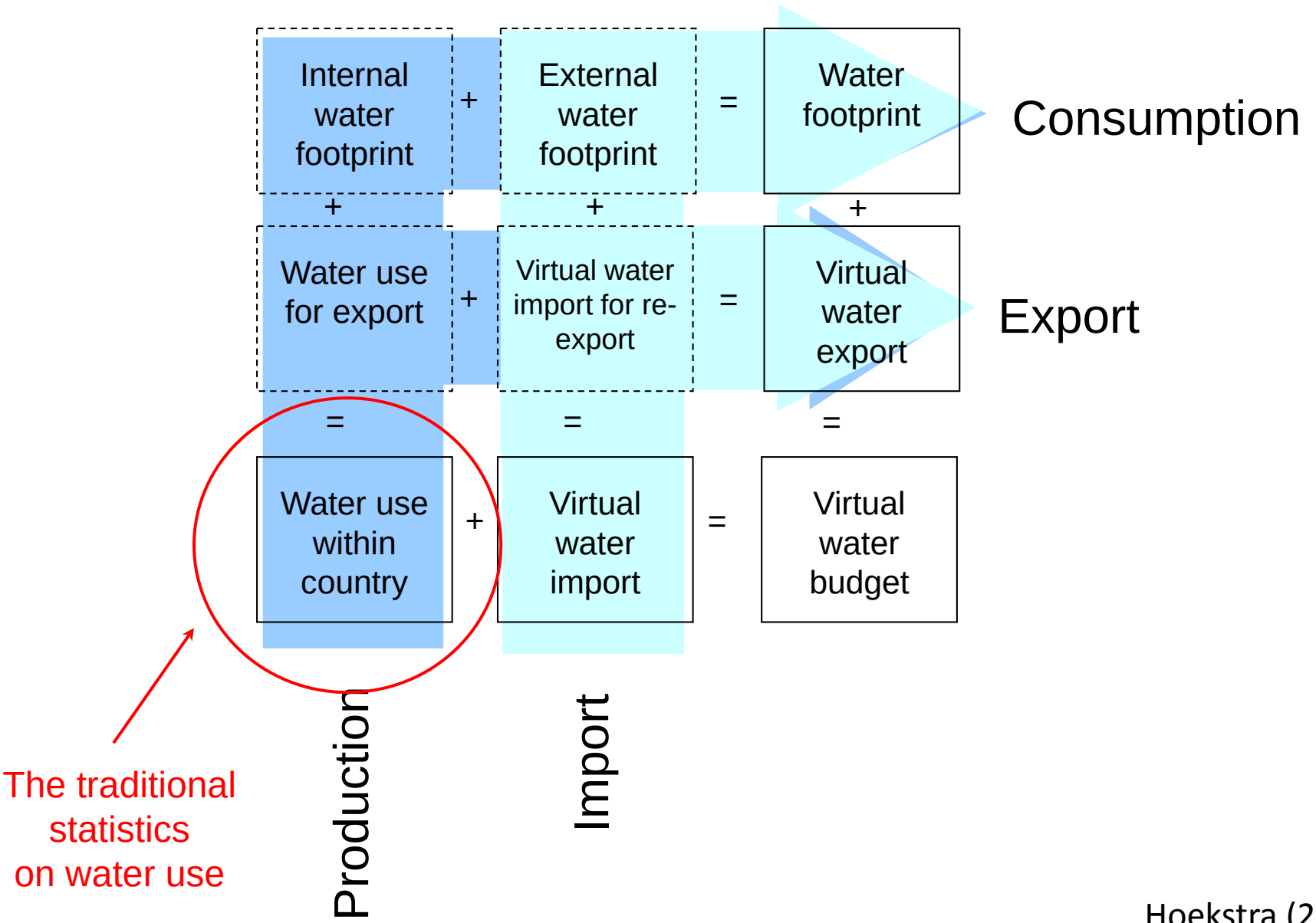
National water accounting framework



Hoekstra (2009)

IPH

3.1.1.1. ACTIVIDADES SOCIOECONÓMICAS

El plan hidrológico recogerá un resumen de los análisis efectuados sobre las distintas actividades económicas que afectan al uso del agua, suministrando información agregada para la demarcación hidrográfica y, cuando proceda, a escala regional. Incluirá información sobre las actividades económicas actuales y su evolución hasta la actualidad. Asimismo se realizará un análisis de la huella hidrológica de los distintos sectores socioeconómicos entendida como la suma total del agua utilizada de origen interno y del saldo neto de agua importada y exportada, en cada demarcación.

15340 ORDEN ARM/2656/2008, de 10 de septiembre, por la que se aprueba la instrucción de planificación hidrológica.

Underestimation of grey water

The share of the grey water footprint is relatively small as well (10 %), but this is a conservative estimate, because we have analysed the required assimilation volume for leached nitrogen fertilizers only, leaving out relevant pollutants such as phosphorus and pesticides.

Mekonnen & Hoekstra 2011; 1596

Green washing: *net green* vs *green*

With one move, adopting "net green" water use rather than fully "green" water use could have wiped out 43 percent of Dutch Coke's water footprint. A water footprint using "net green" would subtract the amount of water natural vegetation might need if, say, a sugar plantation hadn't replaced it. In cases where pre-existing natural vegetation absorbed more water than the crop that replaced it, "net green" held out the possibility of reducing a company's overall water footprint despite industrial-scale farming's links to water pollution and other water sustainability issues. The Verge asked Coca-Cola about requesting that calculations be based on "net green" for water usage, but the company did not respond.

Coke claims to give back as much water as it uses. An investigation shows it isn't even close
By Christine MacDonald May 31, 2018
https://www.theverge.com/2018/5/31/17377964/coca-cola-water-sustainability-recycling-controversy-investigation