



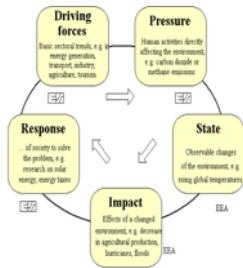
LA METODOLOGIA DELLE FOOTPRINT NELLA STIMA DELLA DEFORESTAZIONE



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COME QUANTIFICARE LE RELAZIONI SOCIETA'-AMBIENTE?



INDICATORI PSR
Pressioni-Stato-Risposta
OCSE



VALUTAZIONI MONETARIE
Valore economico
(Costanza et al., 1996)



INDICATORI DI FOOTPRINT/IMPRONTA
Ecological Footprint (Rees, Wackernagel, 1996),
Water Footprint (Hoekstra, 2002),
Carbon Footprint....

INDICATORI BASATI SUI FLUSSI DI MATERIA
Material Flow Analysis
Wuppertal Institut, IFF, 2000



INDICATORI BASATI SULL'ENERGIA
LCA, eMergy (Odum, 1996);
exergy (Jorgensen, 1998);
Energy Flow Analysis (IFF)



WATER FOOTPRINT

- Pochi anni dopo viene proposta anche la water footprint: idea iniziale di Allan (1993), poi sviluppata da Hoekstra (2002) e Champagain



COMMENTARY: Water scarcity challenges to business

Arjen Y. Hoekstra

The growing scarcity of freshwater due to rising water demands and a changing climate is increasingly seen as a major risk for the global economy. Consumer awareness, private sector initiatives, government regulation and targeted investments are urgently needed to move towards sustainable water use.

Recently the World Economic Forum listed water scarcity as one of the three global systemic risks of highest concern, an assessment based on a broad global survey on risk perception among representatives from business, academia, civil society, government and international organizations. Freshwater scarcity manifests itself in the form of declining groundwater tables, reduced river flows, shrinking lakes and heavily polluted waters, but also in the increasing costs of supply and treatment, intermittent supplies and conflicts over water. Future water scarcity will grow as a result of various drivers: population and economic growth, increased demands for animal products and biofuels, and climate change¹. Water efficiency improvements may slow down growth in water demand but, particularly in irrigated agriculture, such improvements are unlikely to be offset by increased productivity. Similarly, water storage and transfer infrastructure improve availability, but do not reduce demand. In addition, water

change will probably increase the magnitude and frequency of droughts and floods. The expected increase in climate variability will compound the problem of water scarcity in dry seasons by reducing water availability and increasing demand, the latter owing to higher temperatures and the need to make up for lost precipitation². The private sector is becoming aware of the problem of freshwater scarcity but is facing the challenge of formulating effective responses.

Water risk
Water shortage and pollution pose a physical risk to companies, affecting operations and supply chains³. They also face the risk of stricter regulations, what firms face if water is scarce. For example, higher water prices, reduced quotas, stricter emission permits or obligatory water-saving technology remain unclear. Furthermore, brands face a reputational risk because the public and media are becoming increasingly aware that many companies contribute to unsustainable water use⁴. Even companies operating in water abundant regions can be vulnerable to water scarcity because the supply chains of most companies stretch across the globe. An estimated 22% of global water consumption and pollution relates to the production of export commodities⁵. Countries such as the USA, Brazil, Argentina, Australia, India and China are big virtual water exporters, which means that they intensively use domestic water resources for producing export commodities (Fig. 1). In contrast, countries in Europe, North Africa and the Middle East as well as Mexico and Japan are dominated by virtual water import, which means that they rely on imported goods produced with water



Figure 1 | Virtual water balance per country and target virtual water flows related to international trade. The countries colored green, water use for producing export commodities exceeds the water use for the virtual water import. The countries colored yellow to red, the opposite is true (net virtual water export). The thickness of the arrows represents the comparative quantity of water being traded. Figure reproduced with permission from ref. 6. © 2012 WRI.

remain imported. Water use is suboptimized in many countries, either through direct governmental investments in water supply infrastructure or indirectly by agricultural subsidies, promotion of crops for bioenergy or food energy subsidies to pump water.

Water stewardship
Managing water risk is generally confused with good water stewardship. The former can contribute to the latter, but water stewardship entails more than managing water risk. Water stewardship includes the reduction of the sustainability of water use across the entire value chain, the formulation of water consumption and pollution reduction targets for both the company's operations and supply chains, the implementation of a plan

SPECIAL SECTION RETHINKING THE GLOBAL SUPPLY CHAIN

REVIEW

Humanity's unsustainable environmental footprint

Arjen Y. Hoekstra¹ and Thomas O. Whitham^{2*}

Within the context of Earth's limited natural resources and assimilation capacity, the current environmental footprint of humankind is not sustainable. Assessing land, water, energy, material, and other footprints along supply chains is paramount in understanding the sustainability, efficiency, and equity of resource use from the perspective of producers, consumers, and government. We review current footprints and relate these to maximum sustainable levels, highlighting the need for future work on combining footprints, assessing trade-offs between them, improving capital-use techniques, estimating maximum sustainable footprint levels, and benchmarking efficiency of resource use. Ultimately, major transformative changes in the global economy are necessary to reduce humanity's environmental footprint to sustainable levels.

Since the latter part of the 19th century, humans have been shifting the Earth to an unprecedented and increasingly unwise and wasteful by radically transforming the landscape, increasing natural resource use, and rapidly generating waste. One way of quantifying the total human presence on the natural environment is to calculate humanity's "environmental footprint"—an umbrella term for the different footprint concepts that have been developed during the past few decades.

Common to all environmental footprints is that they quantify the human appropriation of natural capital as a source or a sink (14). The basic building block of footprint amounts is the footprint of a single human activity (Fig. 1). Each specific footprint includes factors on-site, particular environmental context (e.g., forest land, livestock, fresh water, and so forth) and measures either resource appropriation or waste generation, or both. The ecological footprint (EF) measures both the appropriation of land as a resource and the land needed for waste assimilation (CO₂ equivalent) (15). The first component is separately described as the land footprint (LF) (16). The second component, as the energy footprint (EF) (16). The water footprint (WF) measures both the consumption of fresh water as a resource and the use of fresh water to assimilate waste (16). The material and phosphorus footprints (MF and PF) focus on the resource appropriation (16, 17). The carbon and land footprint (CLF) measures carbon of greenhouse gases to the atmosphere (18). The nitrogen footprint (NF) measures the loss of reactive nitrogen to the environment (19). The biodiversity footprint (BF) measures the threat of human activity to biodiversity (20).

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The Water Footprint Assessment Manual
Setting the Global Standard

Arjen Y. Hoekstra, Ashok K. Chapagain, Maile M. Aldaya and Meslin M. Mekonnen

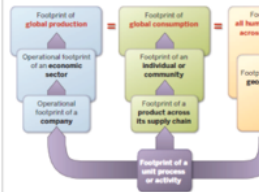


Fig. 1. The relation between footprints of different entities. At the base of any activity are individual and community footprints. A "unit footprint" is the footprint of a single activity and forms the basic building block for the footprint of a product, a service, or the footprint of an economic sector. The footprint of global production is the footprint of global consumption, both equal the sum of the footprints of all activities across the globe.



LA FAMIGLIA DELLE FOOTPRINT

In questi ultimi anni sono state proposte molte footprint:

- Ecological
- Water
- Carbon
- Land
- Material
- Nitrogen
- Human Appropriation of Net primary production;
- Biodiversity
- Deforestation

La letteratura scientifica su questi temi è recente ma si sta diffondendo rapidamente. Su ecological, water e carbon footprint è ormai molto vasta



LA CONTABILITA' FOOTPRINT: QUANTIFICARE GLI USI VIRTUALI

- La grande innovazione delle footprint è che considera non solo gli usi reali ma anche quelli virtuali
- Di solito si parla di **virtual** o **embodied water, carbon, land**, ecc.
- Nel caso della deforestation si parla di **embedded deforestation**



1 MELA:

- **Contenuto fisico di acqua = 0,2 litri**
- **Contenuto virtuale di acqua = 70 litri**



1 tazzina di caffè
= **140** litri di acqua



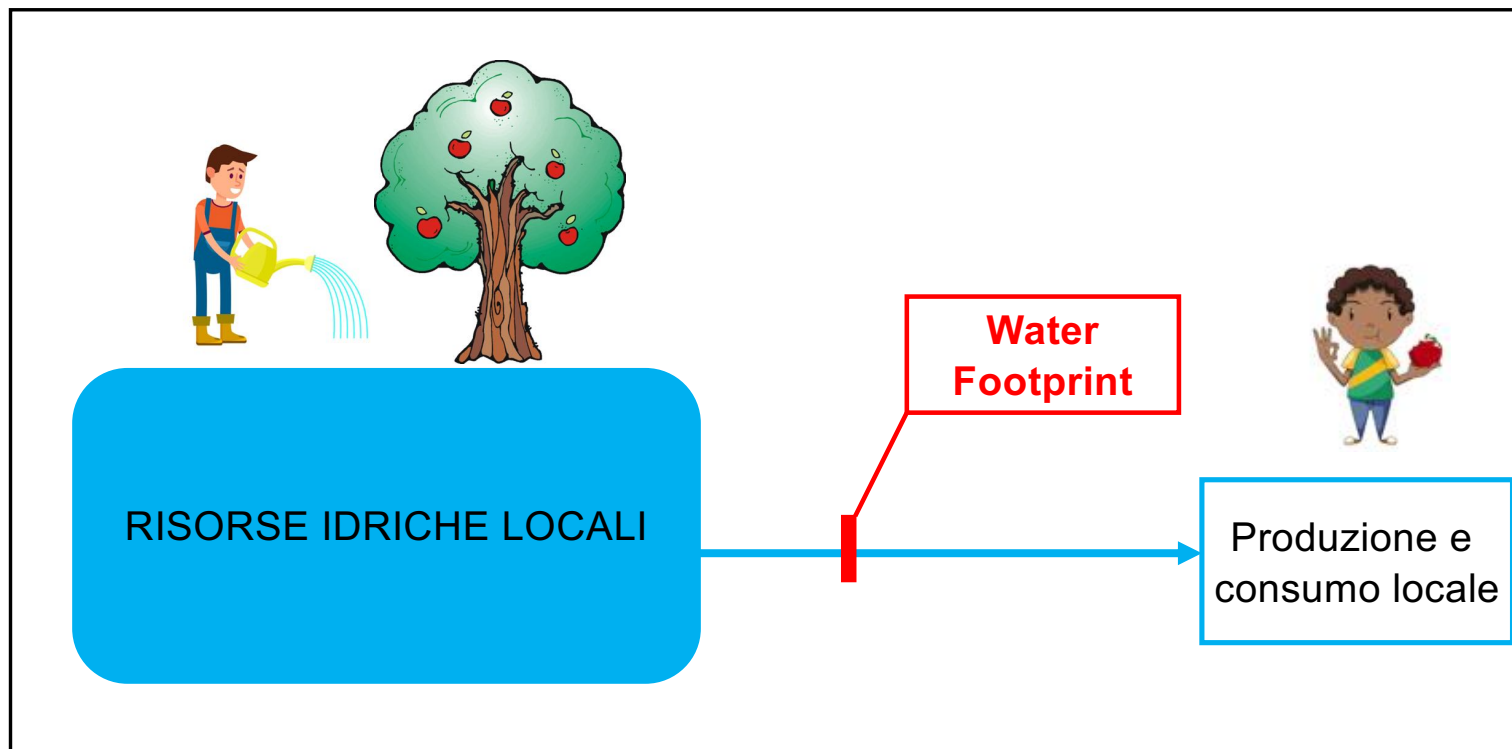
1 kg di carne di vitello
= **15500** litri di acqua



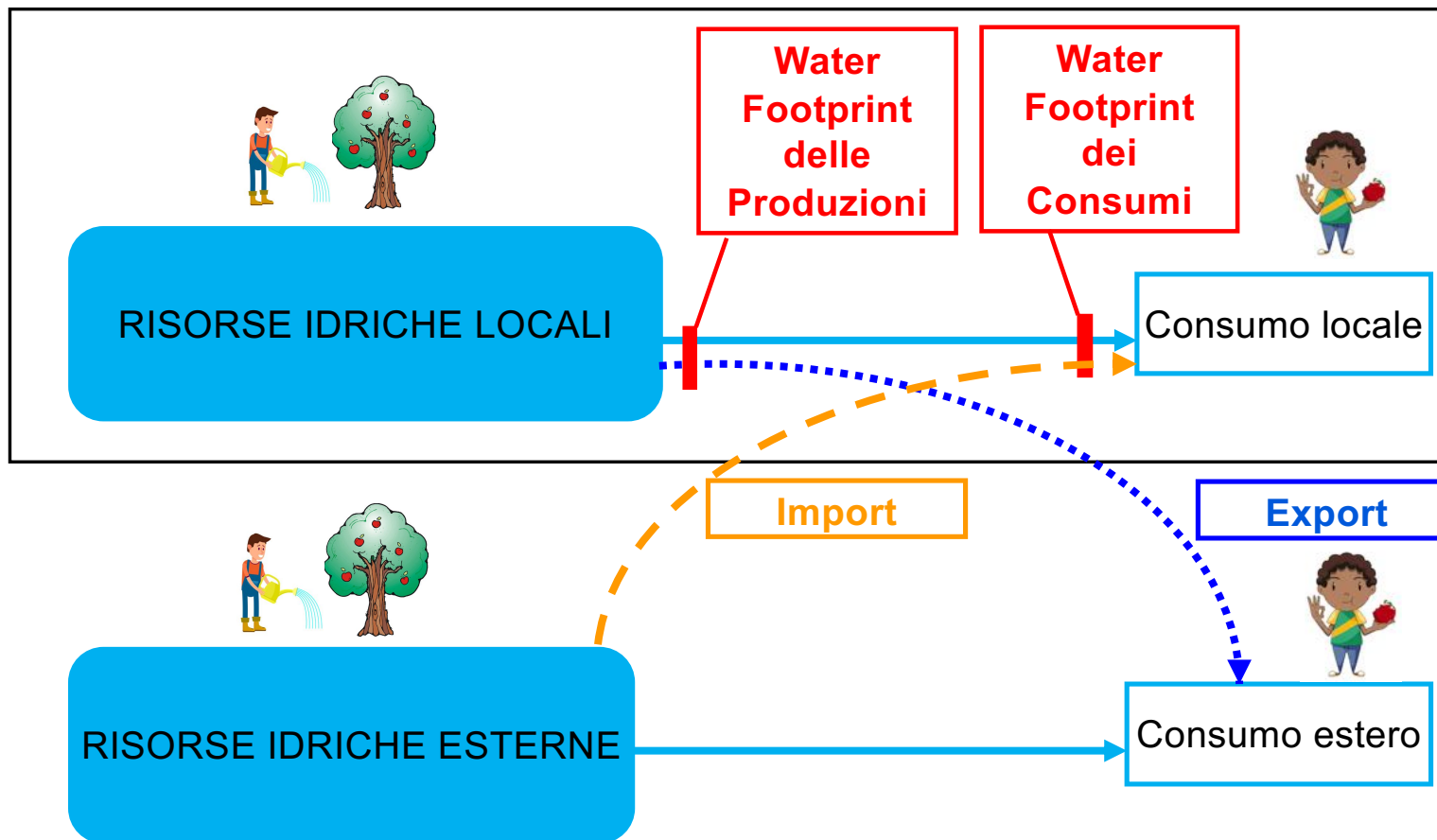
1 maglia di cotone
= **2700** litri di acqua



IL SISTEMA DI CONTABILITA' DELLE FOOTPRINT: L'ESEMPIO DELLA WATER FOOTPRINT



WATER FOOTPRINT DELLE PRODUZIONI E DEI CONSUMI



$$\text{WFConsumi} = \text{WFProduzioni} + \text{IMPORT netta}$$

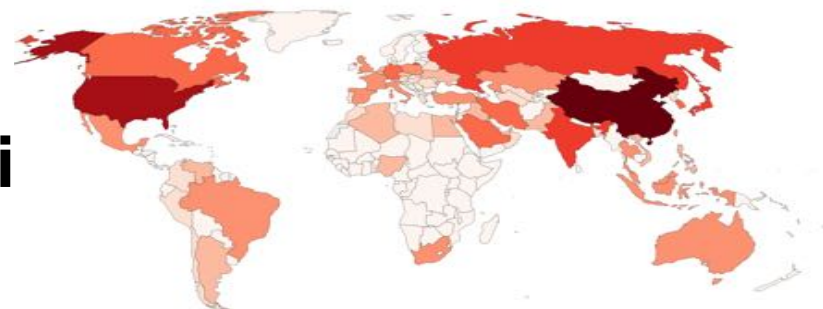
IL BILANCIO DELLE FOOTPRINT

WFConsumi



=

WFProduzioni



+

IMPORT netta

