



# A comparison of approaches to assess impact of water use in consumer products

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Water Footprint  
**NETW****ORK**



# Goals



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- Compare two main approaches (WFN, LCA) to assess water use across the life cycle, illustrating via two pilot studies
- Identify similarities and differences between the methods and potential synergies

# Unilever WF-LCA Pilots



25 LYL tea bags  
Brussels factory

**Ingredients:** Tea

**Packaging:** Paper, string, cardboard, LDPE film, corrugated board

**Grown:** Kenya, Indonesia, India

**Blended:** Trafford Park, UK

**Packed:** Brussels, Belgium



500 g Rama margarine  
Pratau factory (Germany)

**Ingredients:** Sunflower oil  
Palm oil  
Rapeseed oil  
Maize oil

**Packaging:** PP tub + lid, corrugated board, LDPE film

**Grown:** Argentina, Ukraine, Malaysia, Germany, Poland, Czech Republic, Hungary, France

**Blended and packed:** Pratau, Germany

# Water Footprint Network

- The Water Footprint concept was introduced by Hoekstra in 2002
- The Water Footprint Network, established in 2008, now has 122 partners
- Wide applicability – individual, community, business, nation, product

The Water Footprint of a product is the total volume of freshwater used to produce the product, summed over the various stages of the production chain



## **Green water**

The volume of rainwater that evaporates from a crop field during the growing period



## **Blue water**

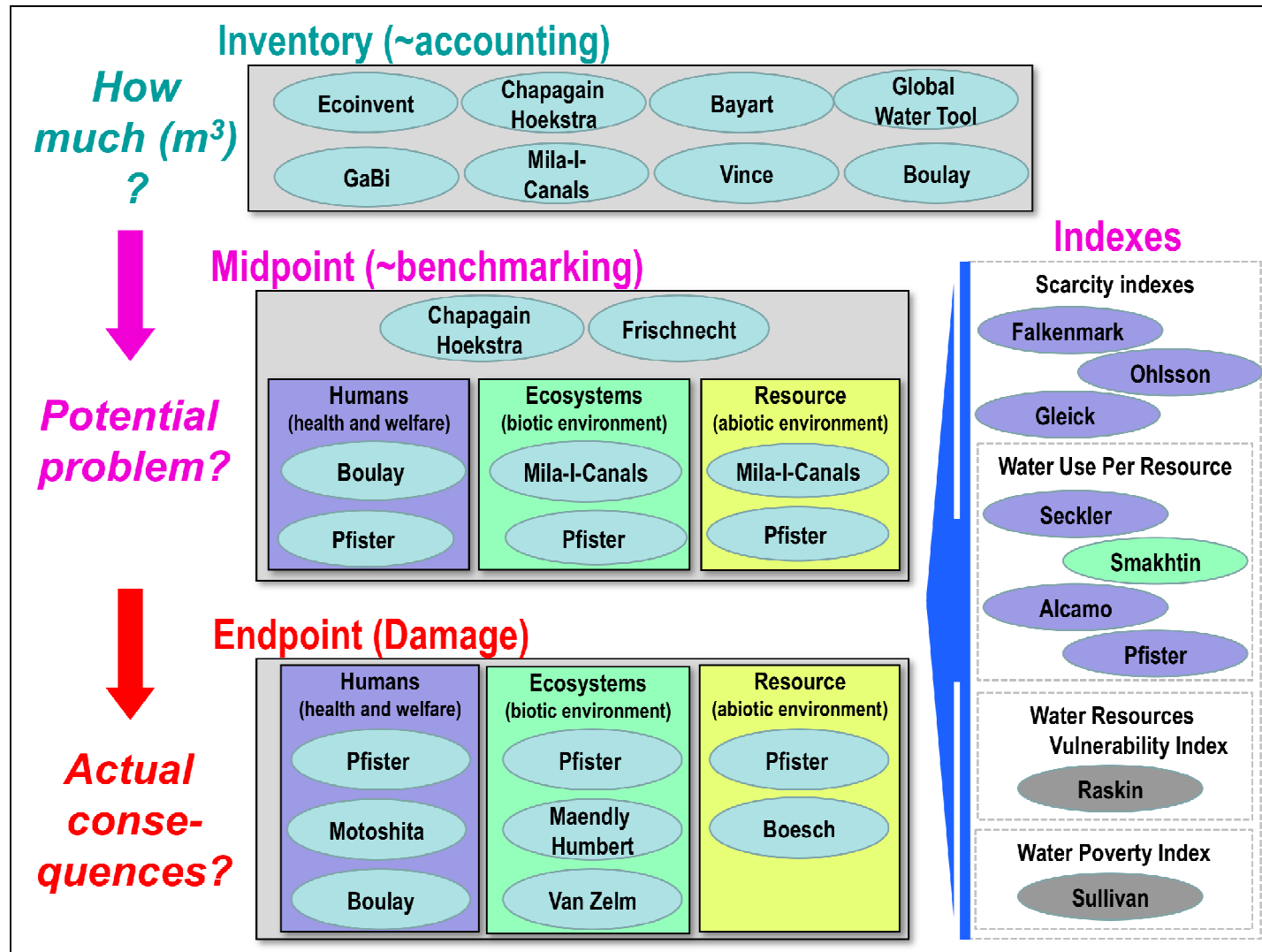
The volume of irrigation water (withdrawn from surface or ground water) that evaporates from a crop field during the growing period.



## **Grey water**

The volume of water that is required to dilute pollutants to such an extent that the quality of the water remains above agreed water quality standards

# Water in LCA - Overview



# Four stages of a Water Footprint study

## 1) Goal and scope

For WFN, the Water Footprint is a volume (litres). Sustainability (impact) assessment is performed as a subsequent step

## 2) Accounting / Inventory

## 3) Sustainability/ Impact Assessment

In LCA, the Water Footprint incorporates characterisation factors, and is expressed in litres-eq.

## 4) Response strategies

# Water Footprinting vs LCA

$$\text{Water Impact} = \sum_i C_i \times \text{Eq. Fact}$$

**Water Consumption**  
(~WFN Methodology)

**Needs for Impacts  
characterization  
factors**

UNEP/SETAC Life Cycle Initiative  
Working Group on:  
Assessment of Freshwater use in  
Life Cycle Assessment (WULCA)



- Within *conceptual framework* of WFN, possible for accounting stage to be same in both methods.
- Agreement to use consumptive (rather than abstracted) use
- In practice there are slight differences in boundaries and scope.

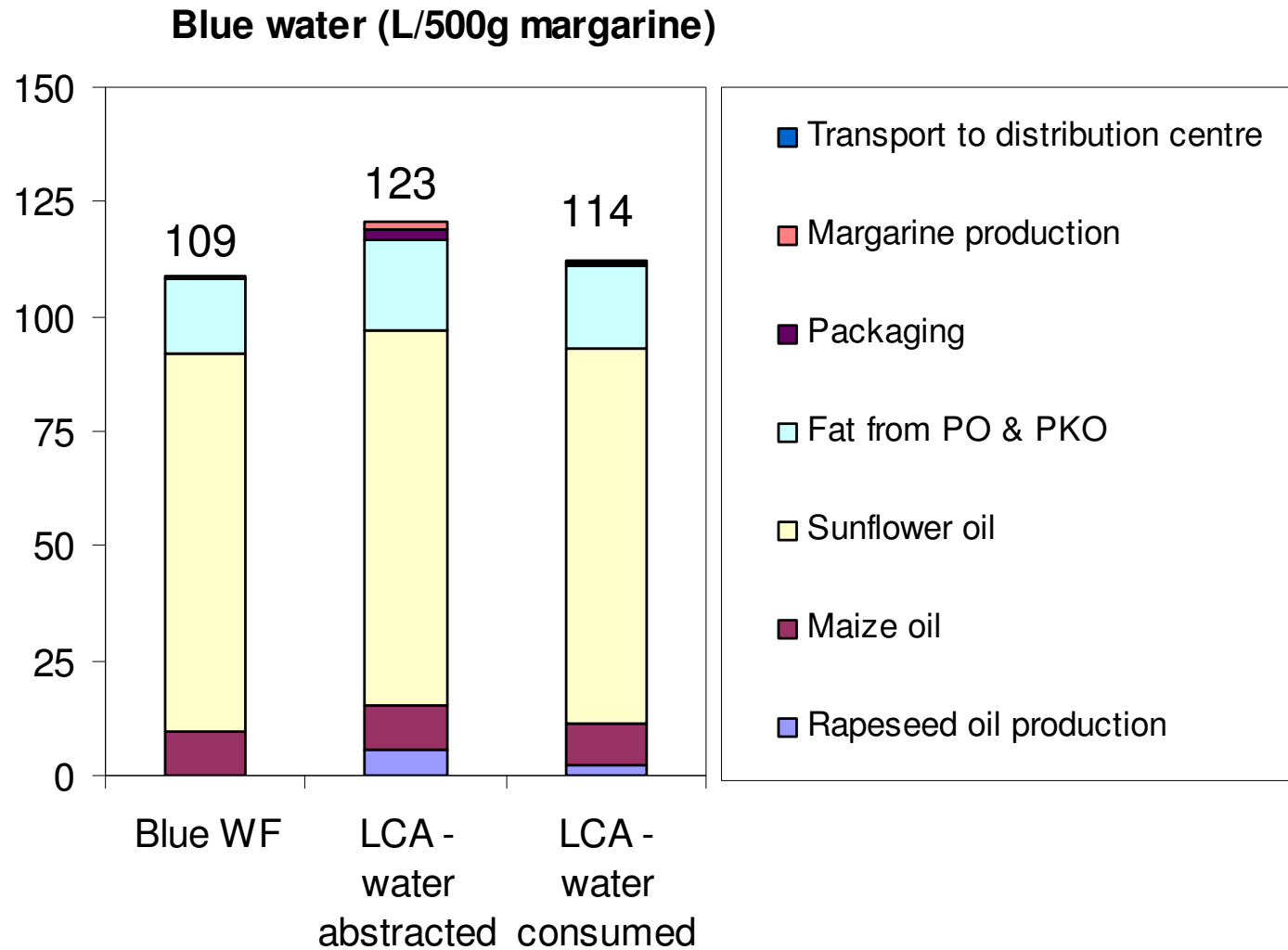
# Methods



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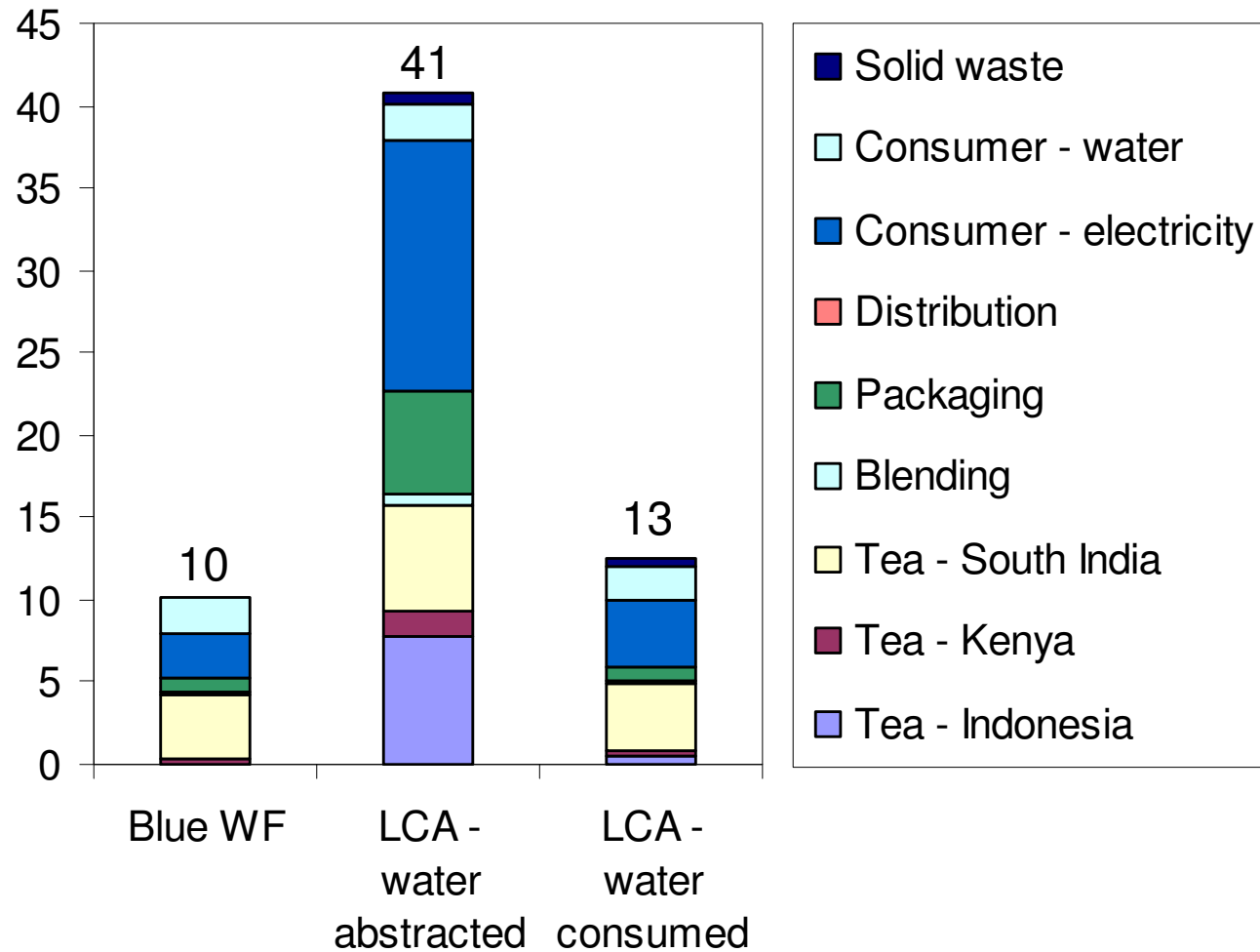
- LCA analyses performed in Gabi, WF calculation performed in Excel following Ercin *et al.*, 2009.
- Water footprints associated with agricultural ingredients calculated as in WF manual, with specific grower information used where possible. (blue water also used in LCA).
- Primary data used where possible (mainly agriculture and manufacturing) with background processes estimated using Ecoinvent.
- Ecoinvent data used directly and also modified to estimate consumed water
  - Turbine water and 95% cooling water (Gleick, 1994) assumed non-consumptive
  - All other freshwater flows assumed consumptive (likely to be an over-estimate)

# Results - margarine

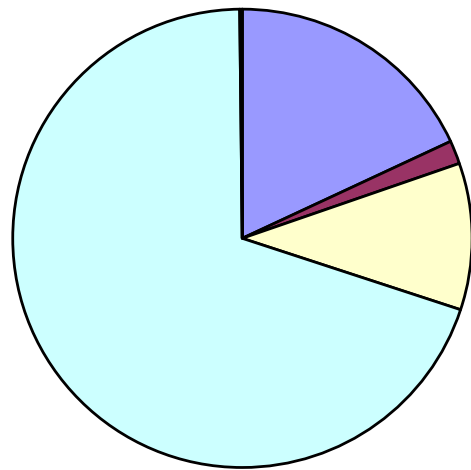


## Results - tea

Blue water (L/50g tea)

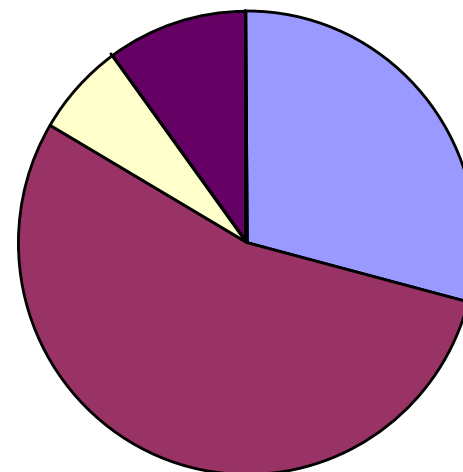


# Green WF



- Rapeseed oil production
- Maize oil
- Sunflower oil
- Fat from PO & PKO
- Packaging
- Margarine production

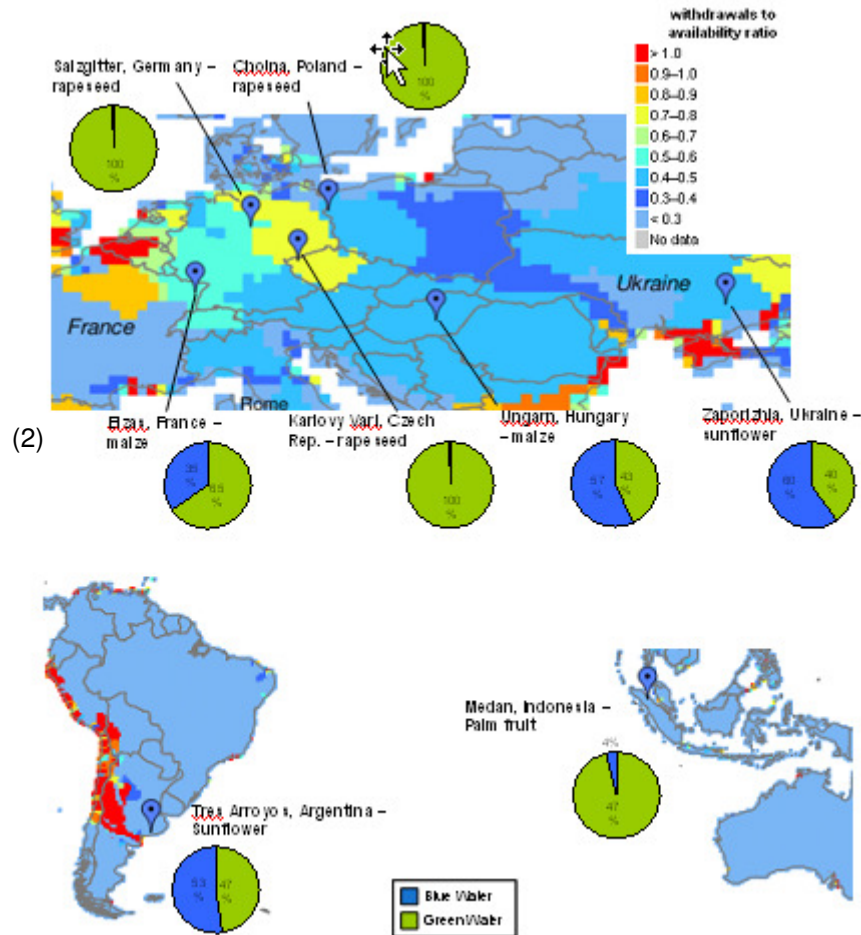
Green WF = 553 litres



- Tea - Indonesia
- Tea - Kenya
- Tea - South India
- Blending
- Packaging
- Distribution
- Consumer - electricity
- Consumer - water

Green WF = 294 litres

# Impact assessment

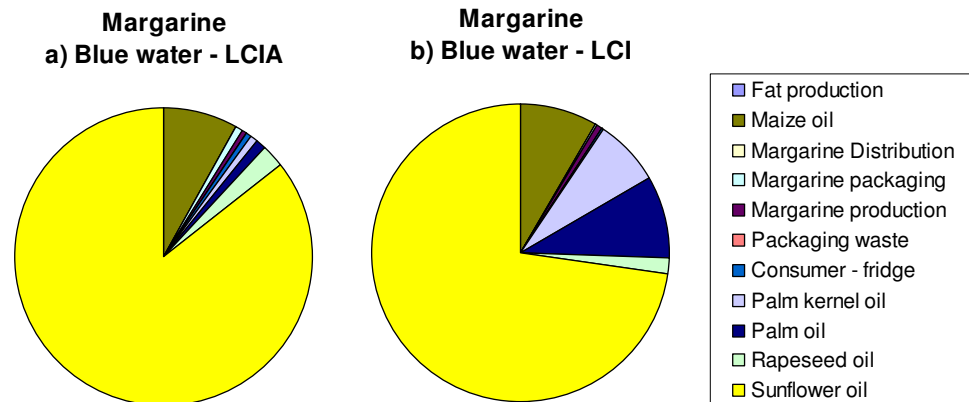


Characterisation model is WSI (Smakhtin), implemented via WATERGAP

$$WSI_i = \frac{WU_i}{WR_i - EWR_i}$$

$$FEI = \sum_{i=1}^n CWU_i \times WSI_i$$

Country-specific WSI values calculated.



# Conclusions

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- The Water Footprint and LCA approaches gave similar results when applied to margarine and tea
  - In most food and beverage products, the majority of the WF is from growing the agricultural ingredients and this is calculated the same way for both approaches in the present study.
  - Bigger differences could be expected where irrigation is quantified differently, or when assessing industrial products.

# WFN / LCA: How do we see them fitting together?



- WFN and LCA are not distinct competing methods - common underlying conceptual framework at accounting/inventory
- Differences in this study are attributable to the definition of boundaries/scope.
- WFN and LCA approaches bring unique and complementary perspectives.
  - WF developed from a watershed resource management perspective and is strong in addressing the local and temporal nature of water-related impacts at a localised level. Well-established methodology to estimate blue and green water to grow crop in a location.
  - Aggregated results, as produced in LCA are useful for some purposes (e.g. hotspots). LCA considers water alongside other impacts, providing holistic impact assessment. Tools such as LCA software and data are well-established, particularly for industrial processes.

# WF ↔ LCA



## What WF can learn from LCA

- Robust systems analysis framework established over many years
- Extend to cradle-to-grave analysis
- Consider use of specialised software e.g. Gabi, Simapro
- Blue and grey water for industrial materials and processes can be approximated using commercial databases e.g. Ecoinvent

## What LCA can learn from WF

- Consumed, instead of abstracted, water
- Calculation of blue and green water to grow crops

# Business needs

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Harmonisation of inventory/accounting methodology

Common databases

Impact assessment

- Continuing development
- Application specific



# THANK YOU!

## Questions?

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