# The water footprint of bio-energy

**Winnie Gerbens-Leenes**
University of Twente, the Netherlands

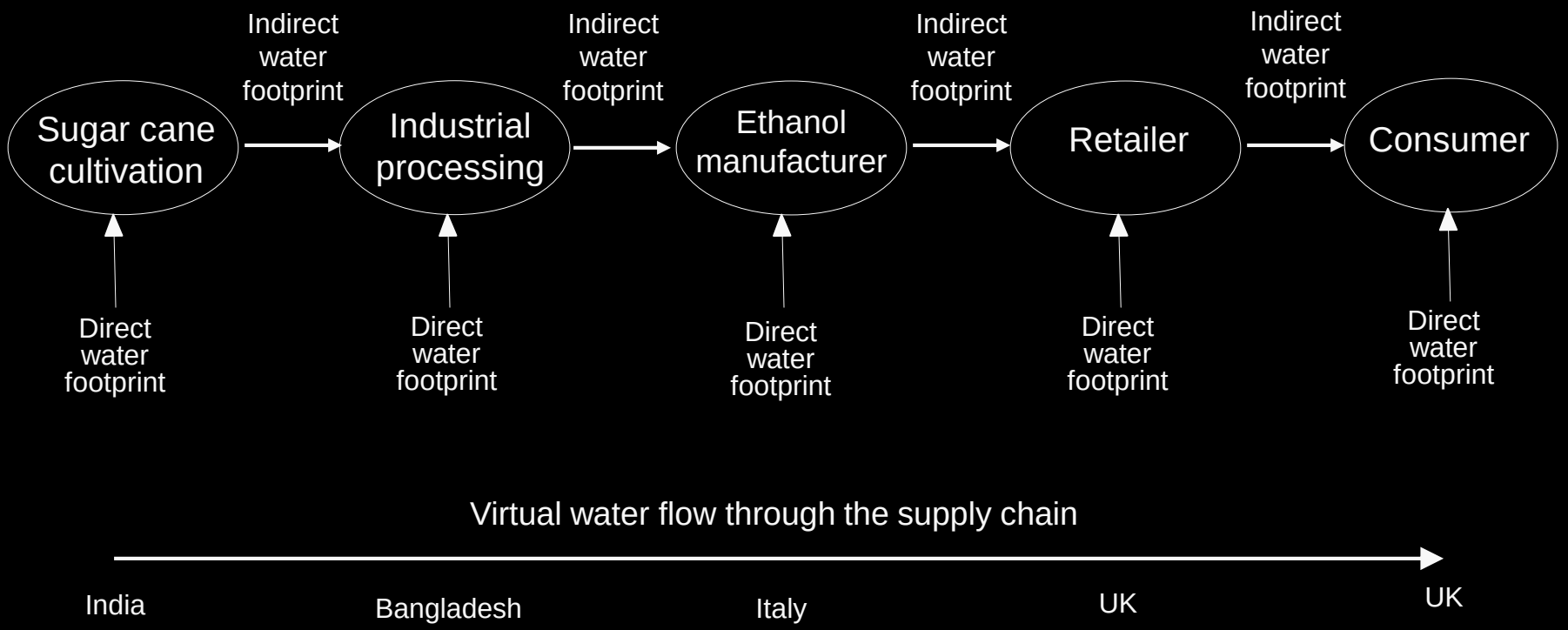
# The water footprint of bio-energy

3 steps:

- ❑ Quantification + mapping
- ❑ Sustainability limits per basin
- ❑ Response formulation

# Quantification + mapping

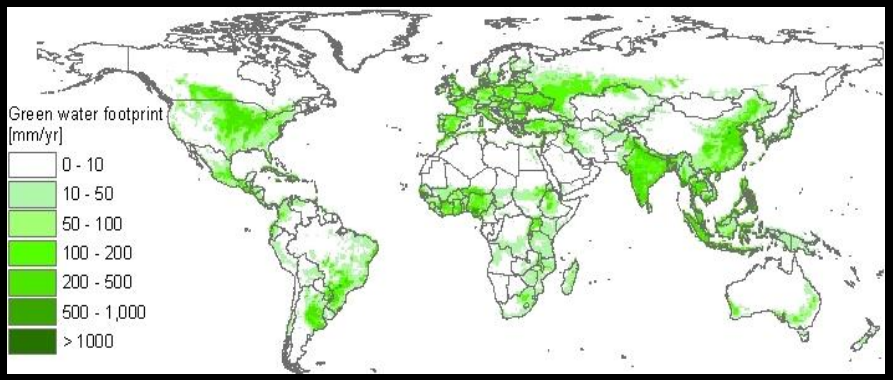
## Water footprints along a supply chain – example bio-ethanol

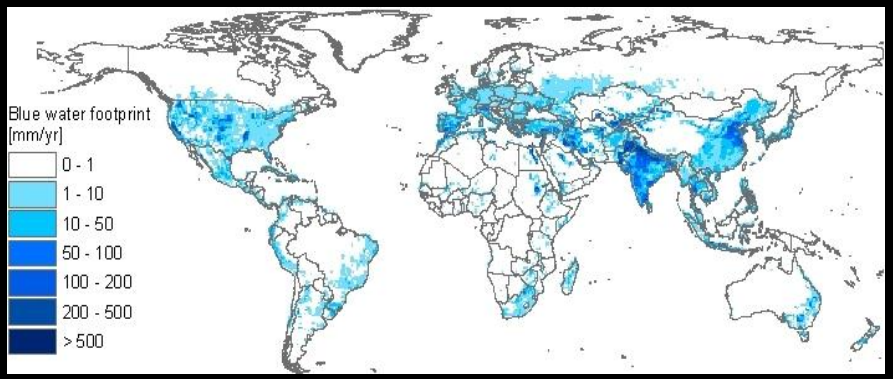


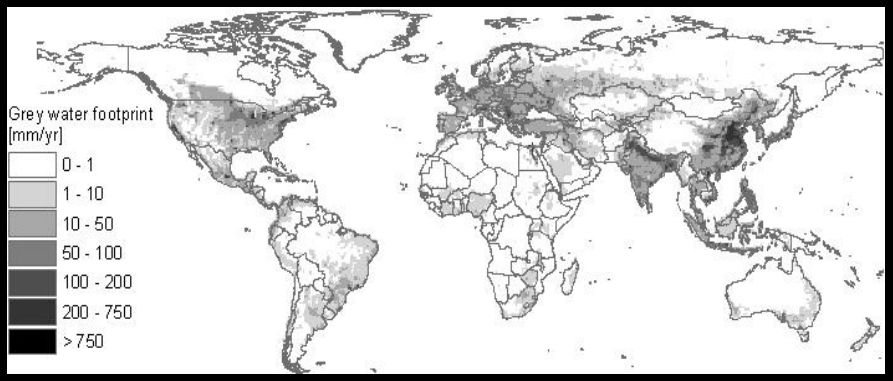



Source: Hoekstra et al. (2011) *The Water Footprint Assessment Manual*, Earthscan, London, UK

# The spatial distribution of the water footprint of humanity



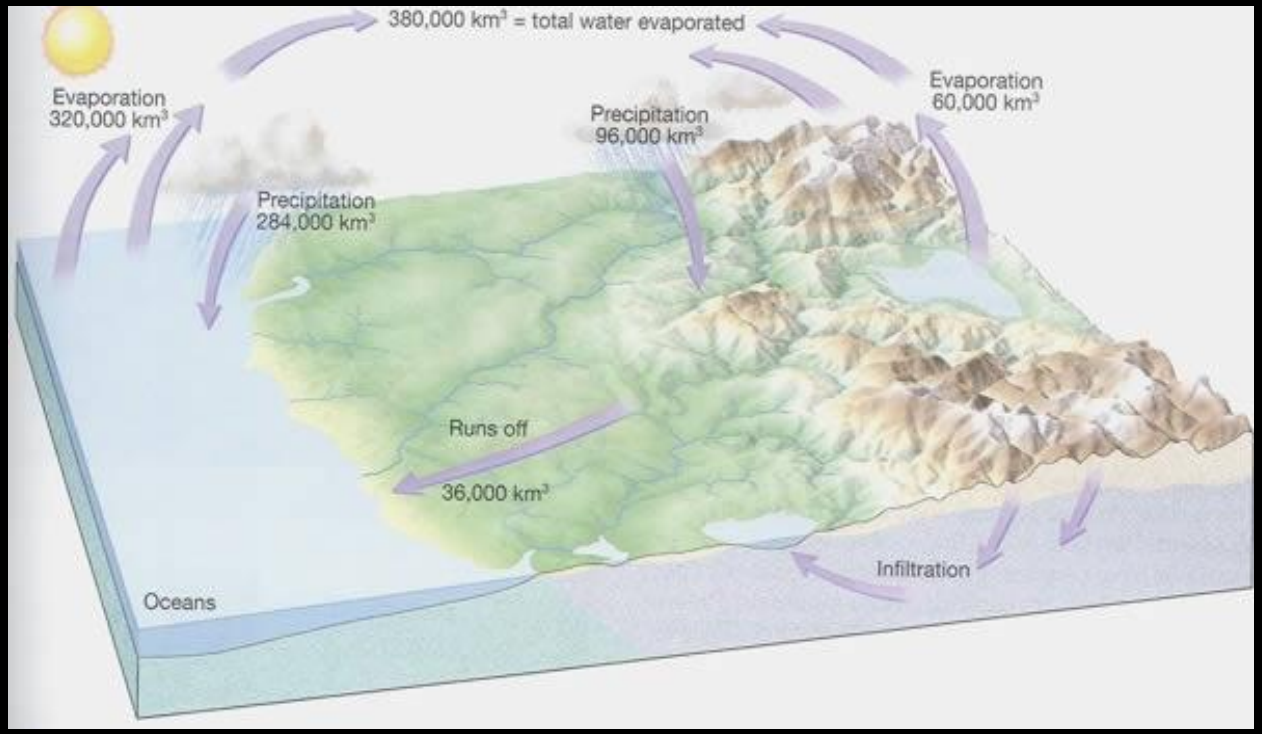




Source: Hoekstra & Mekonnen (2012)
The Water Footprint of Humanity, *PNAS*

# Sustainability limits per basin

## The green and blue water footprint in relation to the water balance of a catchment area




Water balance: P

ET (green water) → Partly left for natural vegetation; Partly used for production (green WF)

R (blue water) → Partly left as environmental flow; Partly consumed for production (blue WF)



Source: Hoekstra et al. (2011) *The Water Footprint Assessment Manual*, Earthscan, London, UK

# Sustainability limits per basin

## Blue water footprint vs. blue water availability

Share of natural runoff not consumed

**Blue water scarcity**

Severe

Significant

Moderate

Low

**Environmental flow requirements**

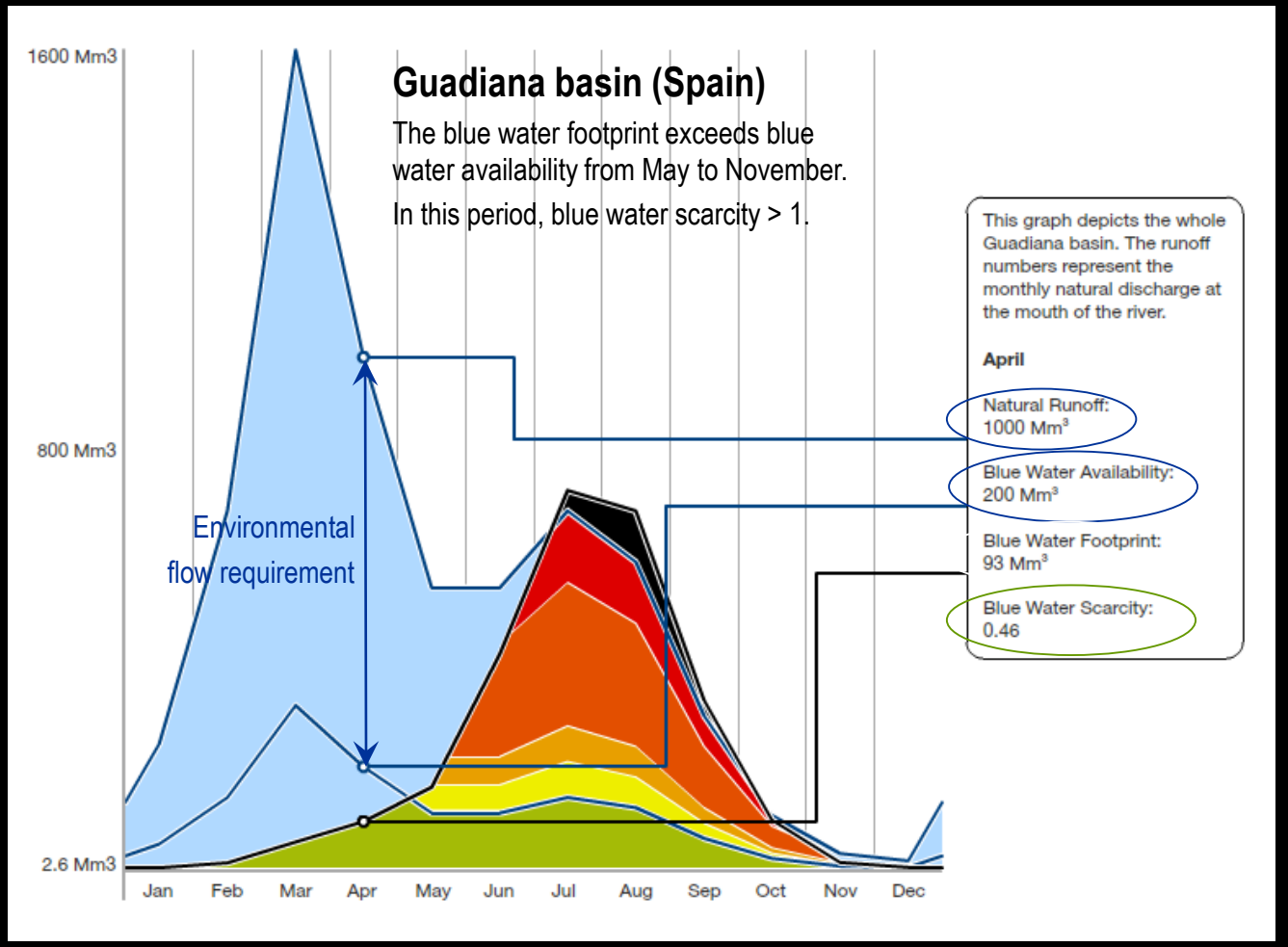
To be established at catchment level, on a monthly basis.

Presumptive standard:

EFR = 80% of natural runoff

(Richter et al., 2011)

Replace this estimate when better local estimates are available

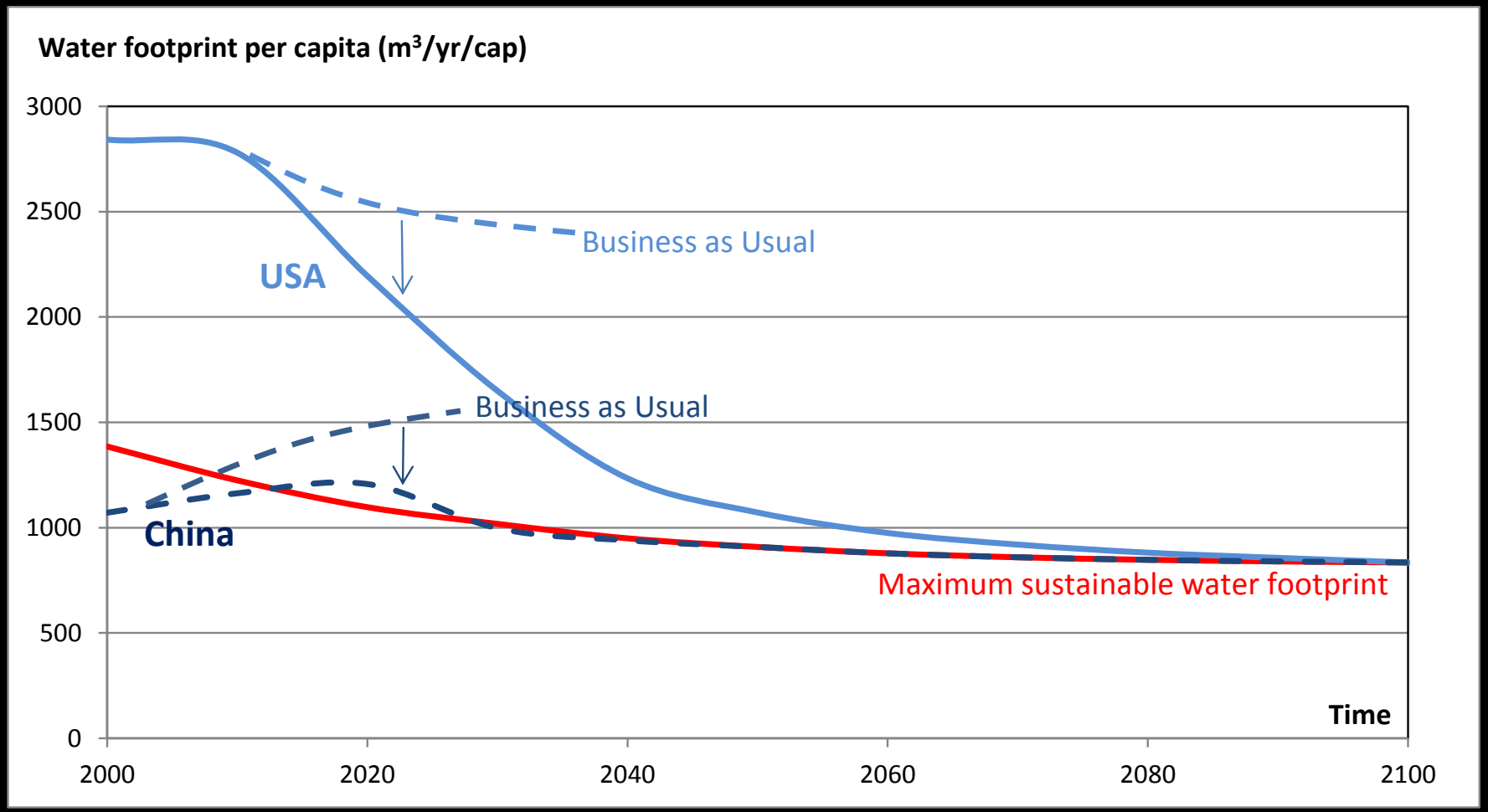



Blue water availability = Natural runoff – Environmental flow requirement

Blue water scarcity = Blue water footprint / Blue water availability

# Response formulation

## The need for contraction and convergence






Source: Hoekstra (2014) *Wise freshwater allocation*, UNESCO-IHE