Geographical application of the Water Footprint Methodology

Water Accounting and Efficiency Stocktaking Workshop
UNEP, 23-24 November, 2009

Water Footprint Network

Presentation

Introduction

Examples of geographical applications of the WF

Conclusions

Steps forward

Water footprint of a geography

- **two components:**

1. internal water footprint – WF inside the geography.
2. external water footprint – WF in other geographies

Indicators:

- total amount of water that is used by all the production processes in the geography (green, blue, grey)
- net amount of water that is imported (virtual water import for consumption and re-export)

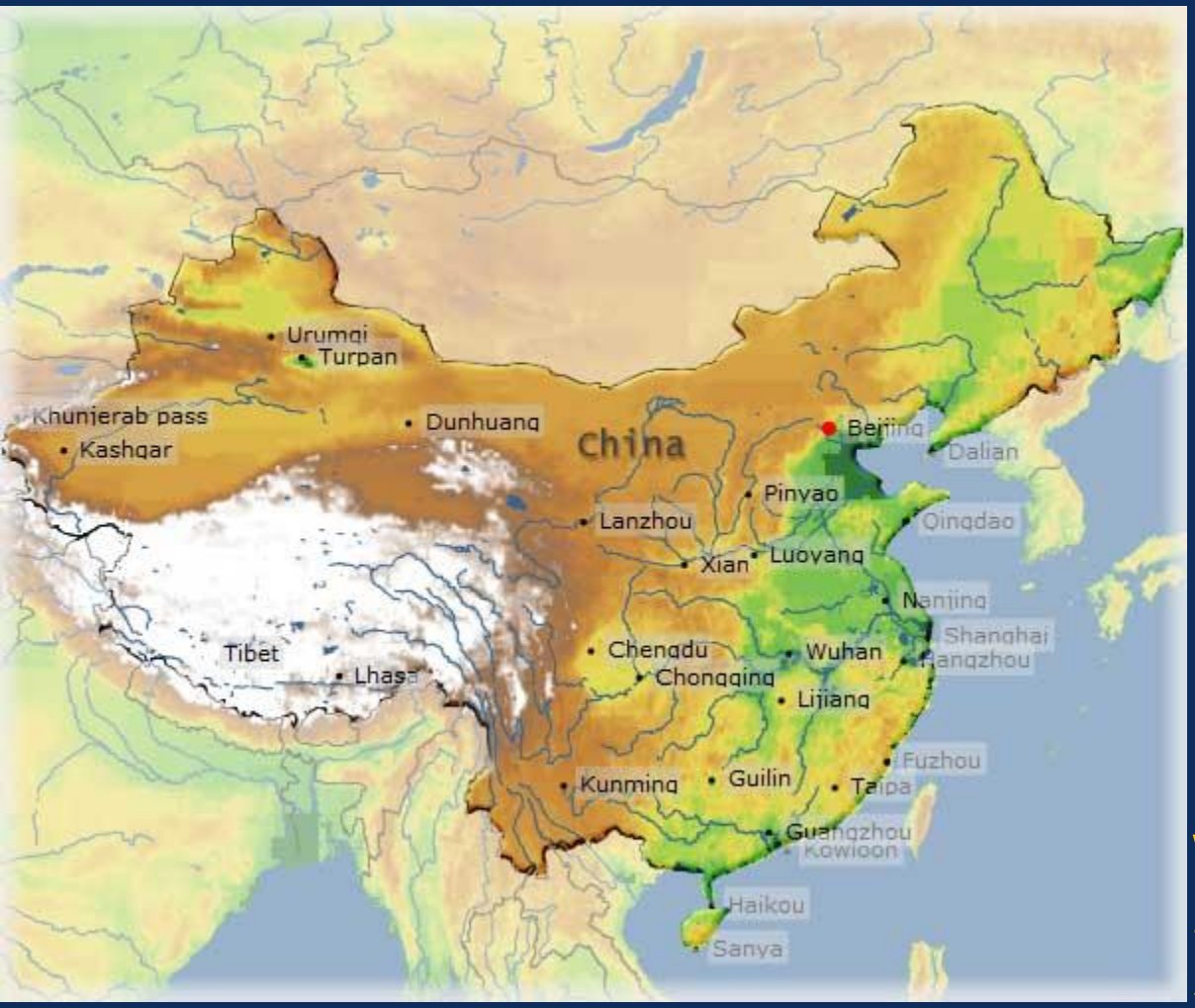
WF accounting Framework

Internal water footprint of consumption in the area	+	External water footprint of consumption in the area	=	Water footprint of consumption in the area	
+		+		+	
Virtual water export related to products made in the area	+	Virtual water re-export from the area	=	Virtual water export from the area	
=		=		=	
Water footprint within the area	+	Virtual water import into the area	=	Virtual water budget of the area	

Steps in a WF analysis

- Setting objectives and scope
- Water Footprint accounting
- Water Footprint impact assessment
- Water Footprint response formulation

CHINA



1

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, Liu et al., 2008.

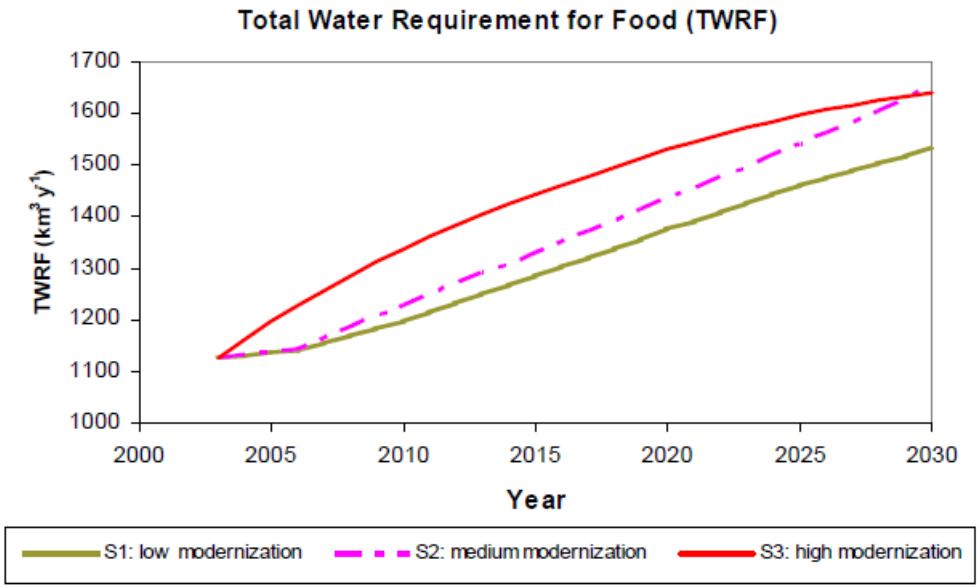
Context

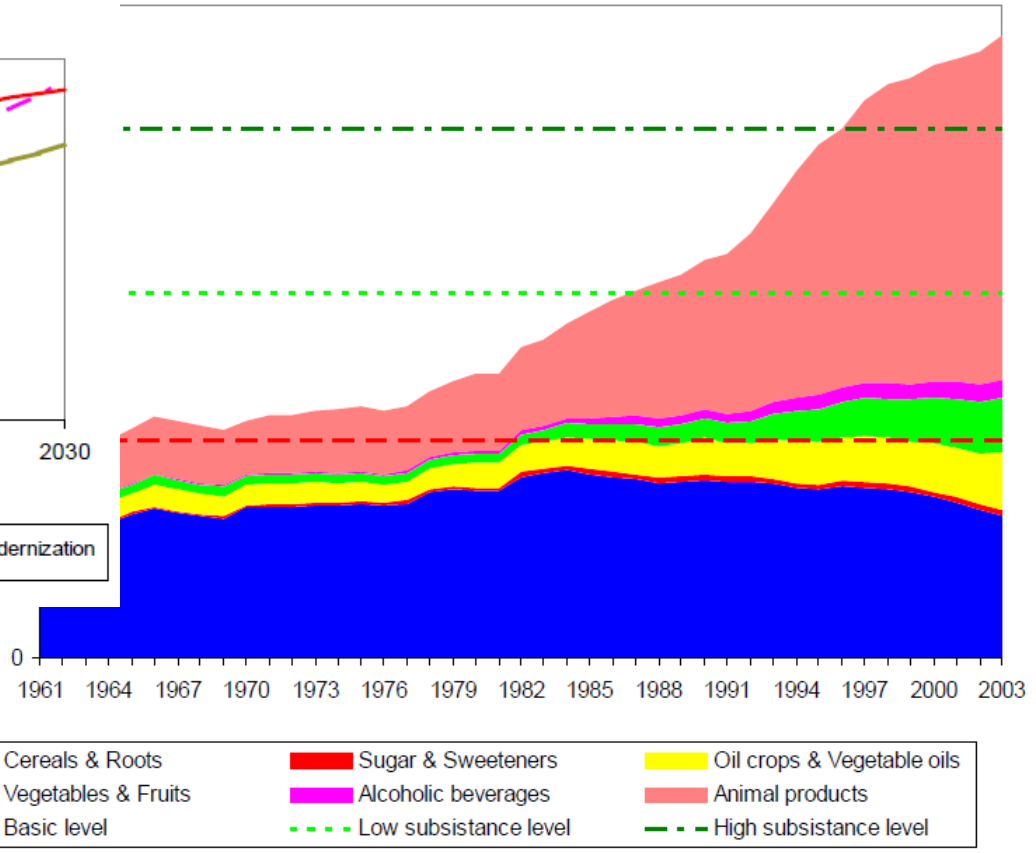
- Huge water availability differences within the country
- Rapidly growing consumption patterns

Main Question

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

China, Liu et al., 2008.



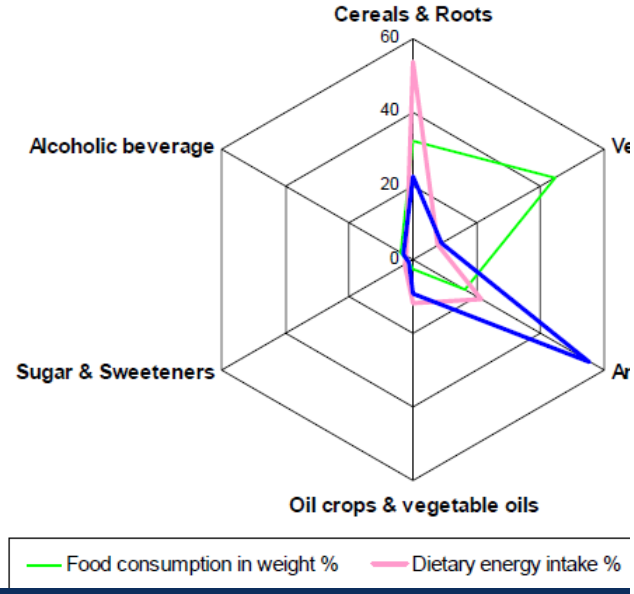


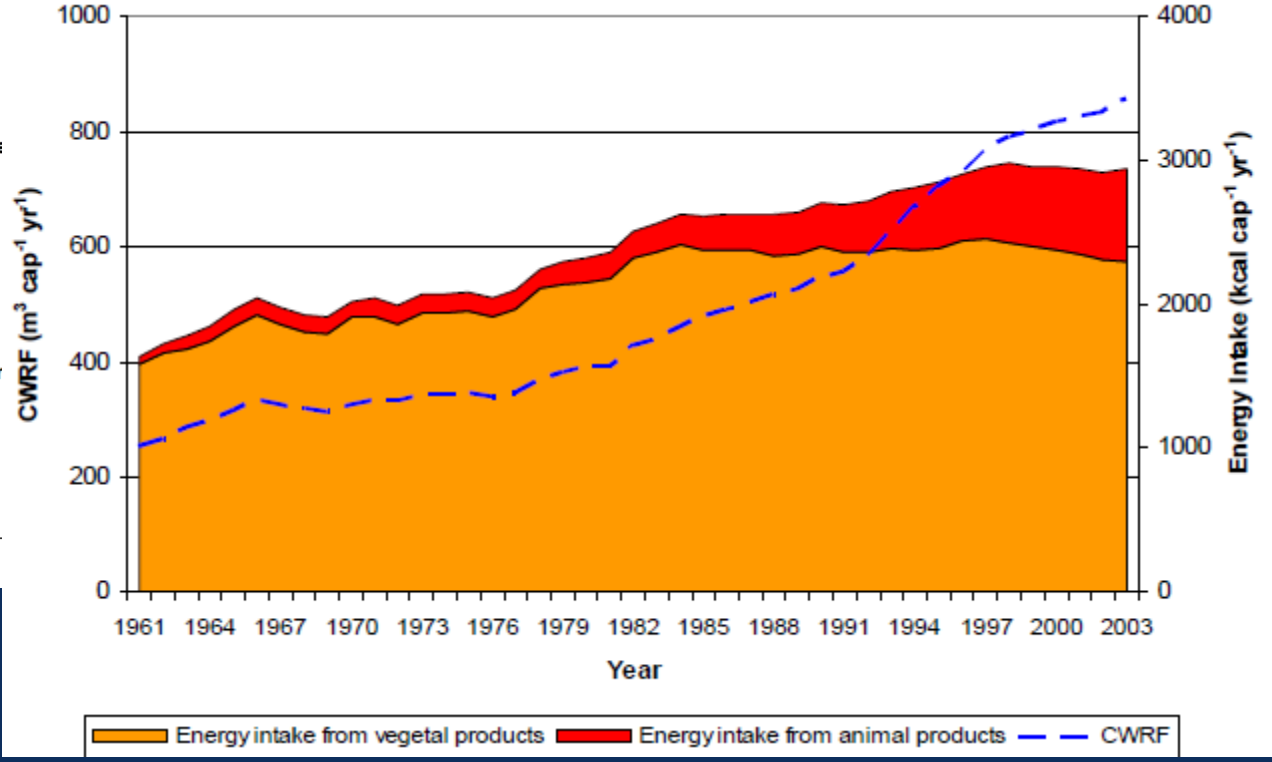
Indicators used

1. WF / VWC of crop and livestock products.

- Historical CWRF
- Scenario evaluation

China, Liu et al., 2008.





Indicators used

2. Energy water productivity

3. Energy intake

China, Liu et al., 2008.

Key findings

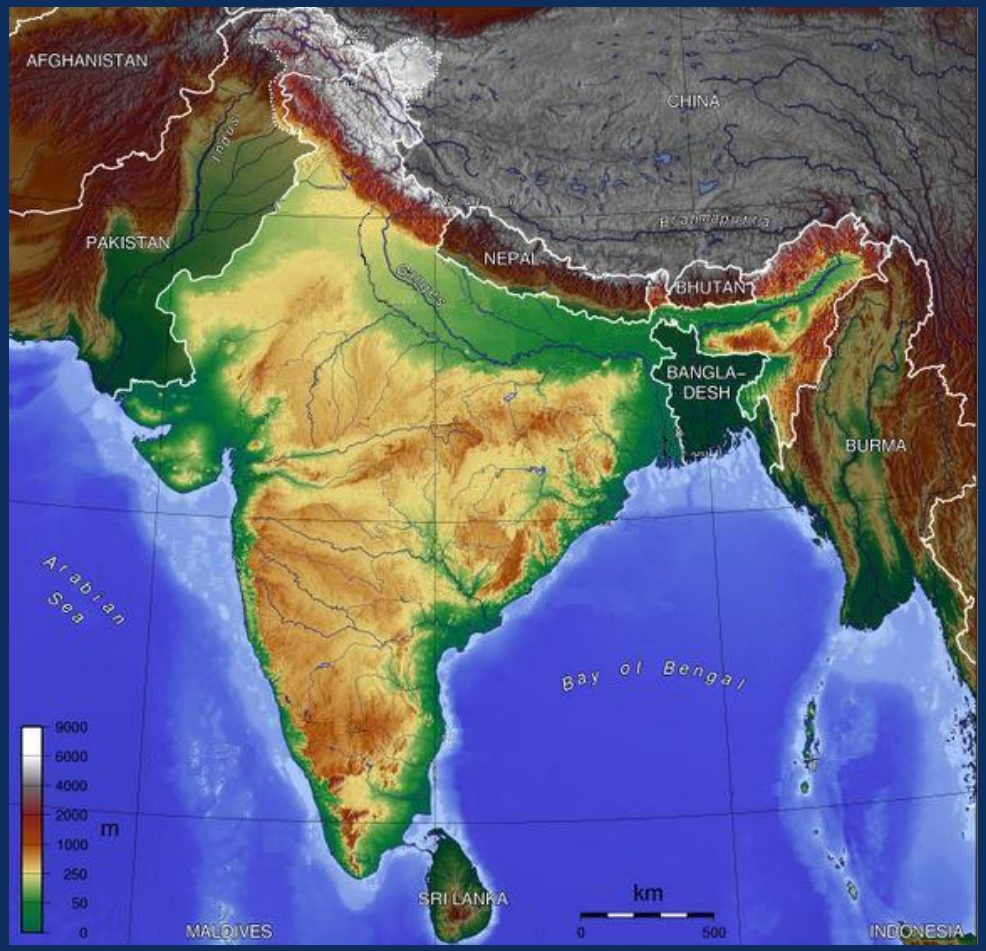
- CWRF has increased ~ 3.5 times between 1961 – 2003 -> increase in consumption of animal products. CWRF increased much faster than energy intake.

- Change in food consumption patterns

Affect the partitioning between green and blue water and influence VW trade worldwide.

The indicators shed light on the actual future water requirements for China and results are supportive information in policy making.

INDIA



[Kampman et al, 2007]

2

Verma, S., Kampman, D.A., Van der Zaag, P. and Hoekstra, A.Y. (2008) 'Going against the flow: A critical analysis of virtual water trade in the context of India's National River Linking Programme'.

India, Verma et al., 2008.

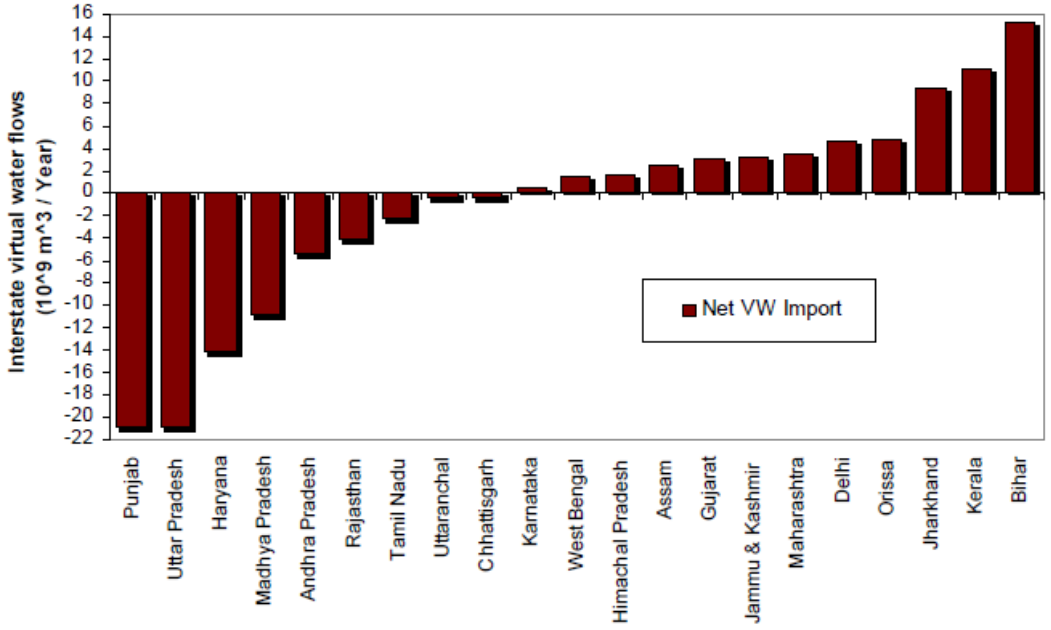
Context

- Huge water availability differences within the country
- National River Linking Programme

Main Questions

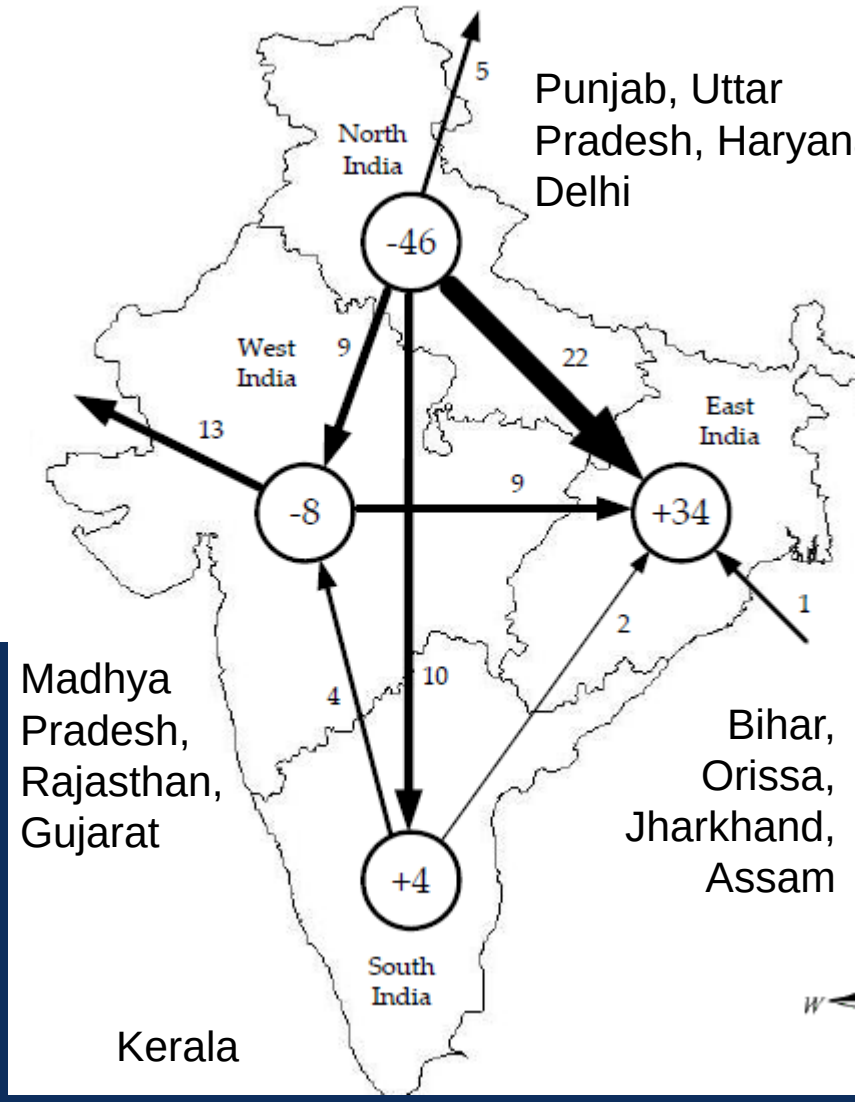
- Which factors influence inter-state virtual water trade?
- How does the National River Linking Programme look in light of virtual water trade trends?

India, Verma et al., 2008.

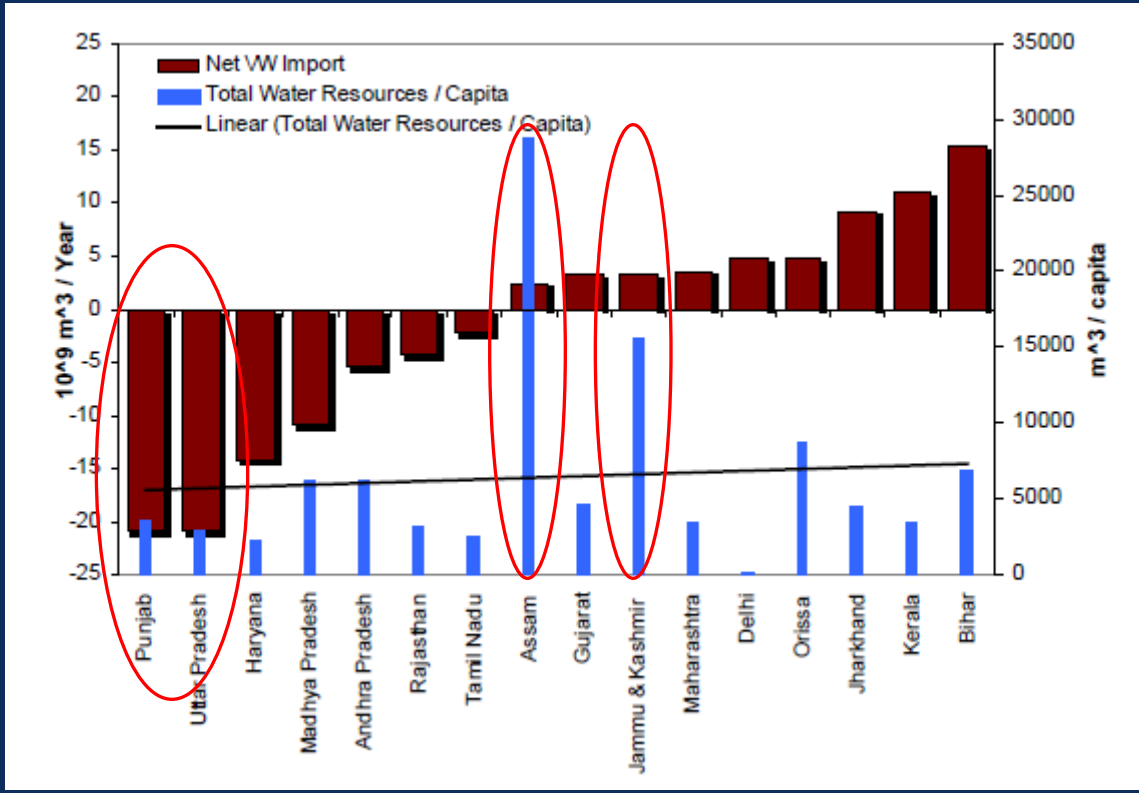


Indicators used

1. WF / VWC of 16 primary crops and VW flows.



India, Verma et al., 2008.



Indicators used

2. Per capita Water Availabity (green, blue internal, blue external, total) and comparison to VW trade patterns under the frame of current agricultural policies.

India, Verma et al., 2008.

Key findings

- The existing pattern of VW trade exacerbates scarcities in water scarce regions.

- Trade of agricultrual commodities

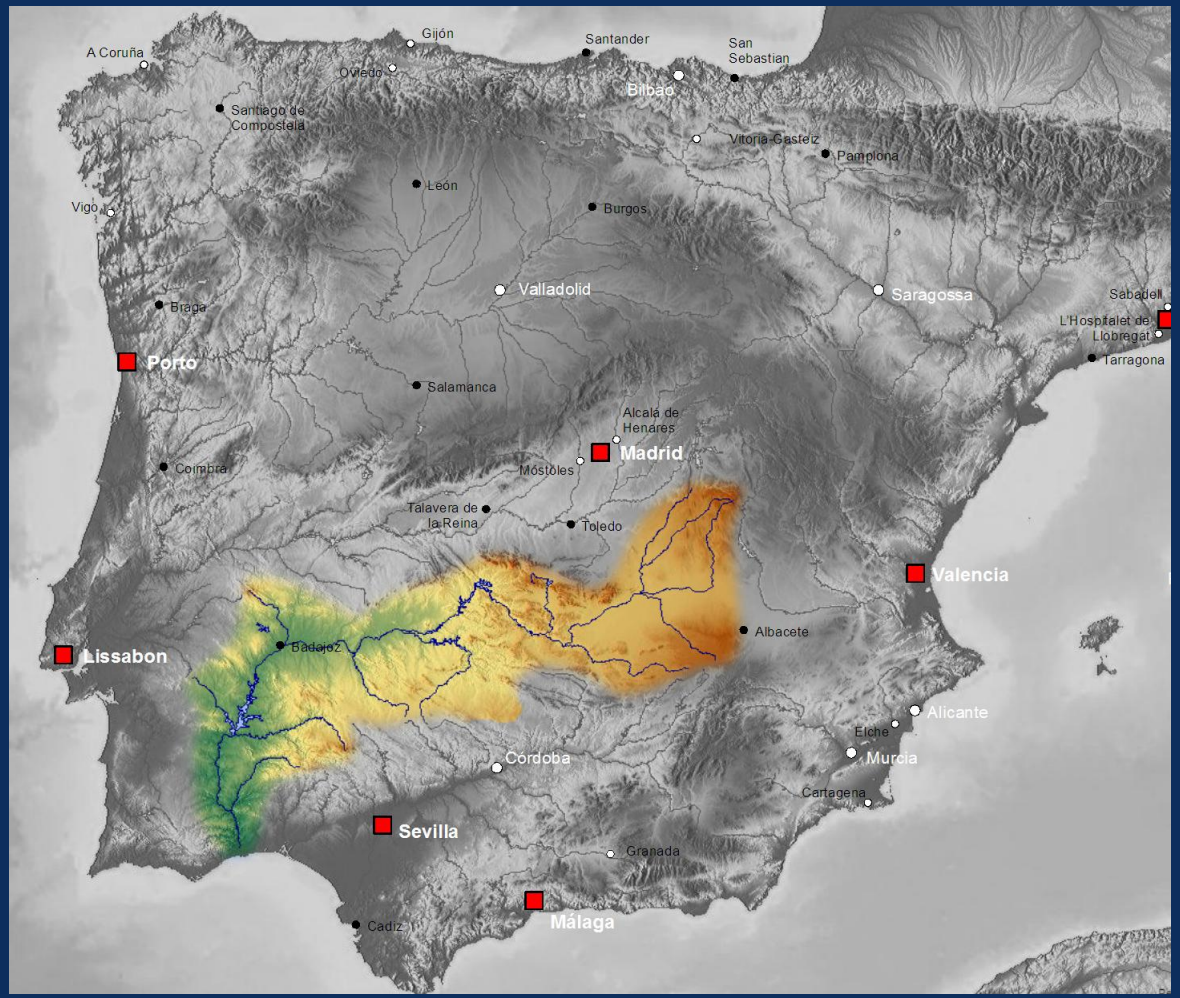
-Per capita availability of arable land.

- Food an agriculture policies i.e. Regional water pricing

Contradiction between virtual water trade arguments and the physical inter-basin water transfers .

In order to have a comprehensive understanding of virtual water trade, non-water factors of production need to be taken into consideration

SPAIN, GUADIANA RIVER BASIN



3

Aldaya, M.M. and Llamas, M.R. (2008). Water footprint analysis for the Guadiana river basin. Value of Water Research Report Series, UNESCO IHE.

Guadiana River Basin, Aldaya et al., 2008.

Context

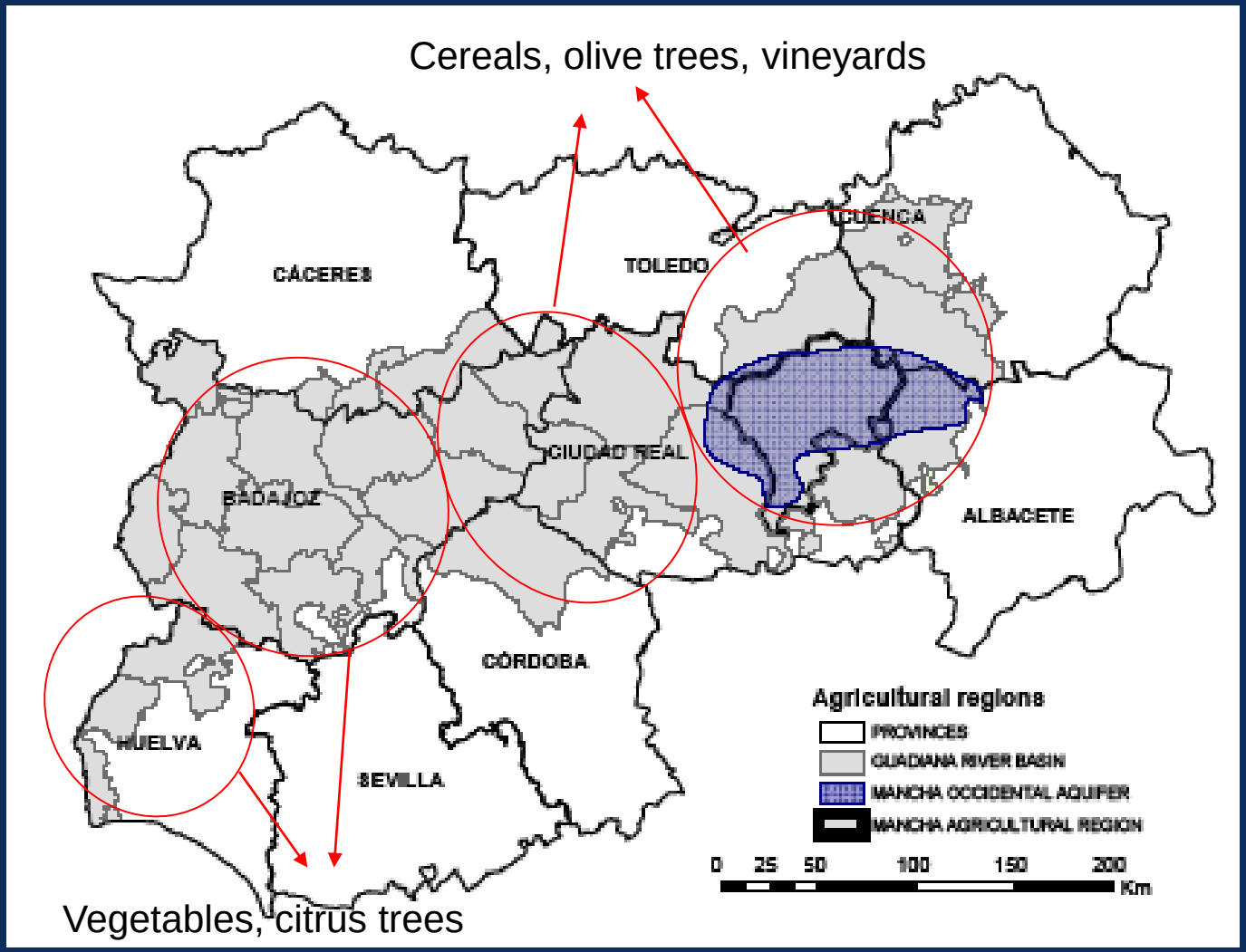
- Overexploitation of the aquifer -> protected UNESCO zone.
- Important agricultural area.
- Semi arid region

Main Questions

- Are trade strategies and agricultural patterns optimal from Water efficiency and economical points of view?
- How to provide more water for ecological services in the basin?

Guadiana River Basin, Aldaya et al., 2008.

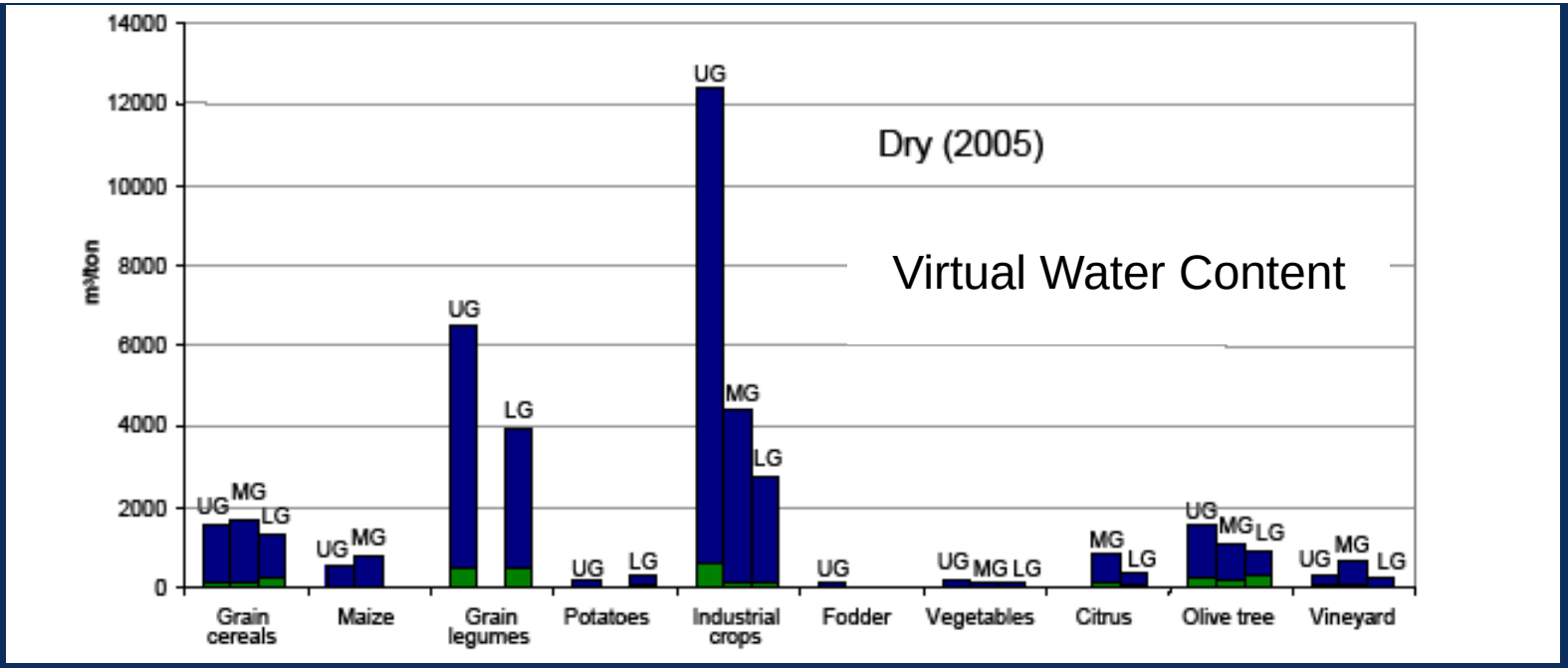
95 % Water use: Agriculture



67,000 km2 (47% for agriculture), semiarid climate

[Aldaya et al, 2009]

Guadiana River Basin, Aldaya et al., 2008.

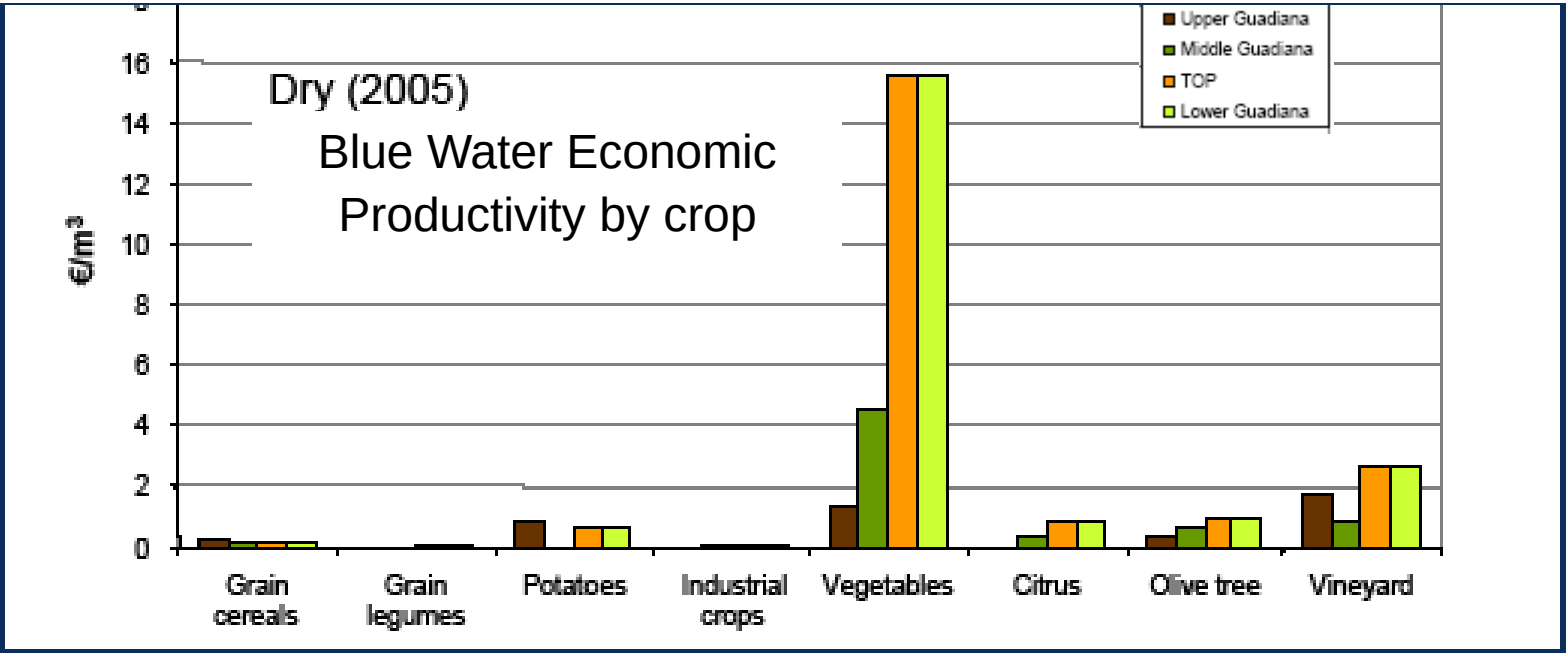


UG = upper Guadiana
MG = Medium
LG = Low

Indicators used

1. WF of the different activities and VWC of crops produced in the basin, per region.

Guadiana River Basin, Aldaya et al., 2008.



Indicators used

2. Agricultural economic productivity and economic productivity of blue water.

Guadiana River Basin, Aldaya et al., 2008.

Key findings

- Different regions in the same basin -> different trade strategies.

- Upper Guadiana → -Net exporter of high VW content, low blue water economic productivity crops.

- Lower Guadiana → -Imports low-value, hight VW content crops, exports high-value, low VW content crops.

The problem in the Guadiana River is not water scarcity but the use of water for low value crops

Not only hydrological but also ecological, economical, and other aspects should be taken into account in the analysis

Other geographical applications of the WF

Global	Per capita WF and comparison between countries
NL UK Germany	High external WF, use a water stress index to identify hotspots around the globe, awareness raising
Spain	Significant external WF, but also water scarcity problems, high exports – First country to include WF into policy

Preliminary conclusions

Different applications of WF: scenario, understanding result of multiple policies on water, understanding the econmic rationality behind water use, awareness raising

Different indicators depending on the goal and context of the study: WF, VWC, VW flows, economic water productivity, energy water productivity, agricultural water productivity

Water allocation and consumption is cannot be understood solely by looking at the water context, there are many other often seemingly irrational influences

Preliminary conclusions

Main focus in all studies is agriculture

WF and environmental or social requirements (impacts) not elaborated quantitatively

Studies do present valuable components for using water footprint at geographic level but not a comprehensive framework

Studies do not present detailed policy or response implications of the findings

Grey water footprints are not discussed in the studies

Next steps, Questions?

More cases will be brought in shedding light on:
- available water resources in geographies,
- environmental and social requirement indicators,
- response mechanisms (policy and practice),
- the potential of virtual water trade as policy measure,
- the influence of non water policy paradigms
- the indirect WF impacts
- other scales of geographic applications
- role of non-ag water consuming sectors
- grey water footprint application at geographic scales

Ideas on WF impact accounting

$$I_{environmental} = \frac{AW_{area} - WR_{area,social} - WF_{within\ area}}{WR_{area,environmental}}$$

$$I_{social} = \frac{AW_{area} - WR_{area,environmental} - WF_{within\ area}}{WR_{area,social}}$$

$$I_{economic} = \frac{P_{economic,actual}}{P_{economic,potential}}$$

$$I_{energy} = \frac{P_{energy,actual}}{P_{energy,potential}}$$