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Virtual Water Trade Assessment: From global to local

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Virtual Water Assessment



Global → National → Regional → Municipal

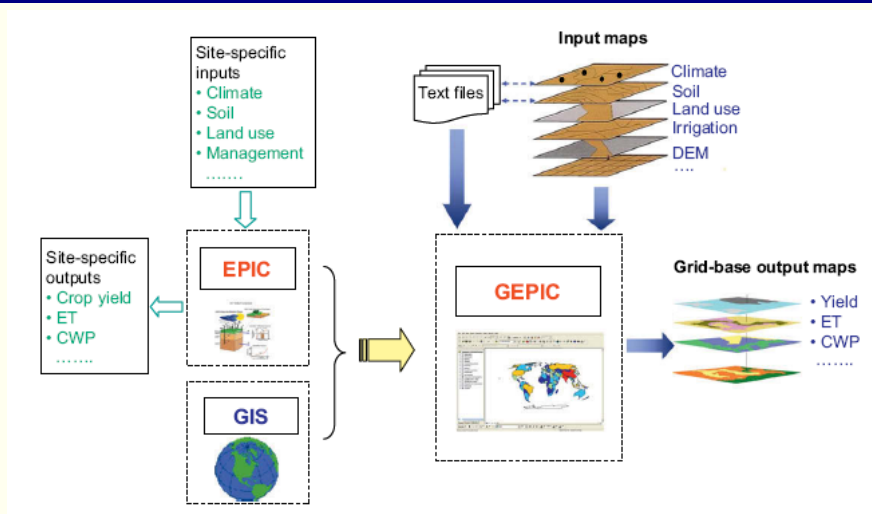
All countries
22 crops

China

South-North China

Beijing

Assessment Tool: GEPIC



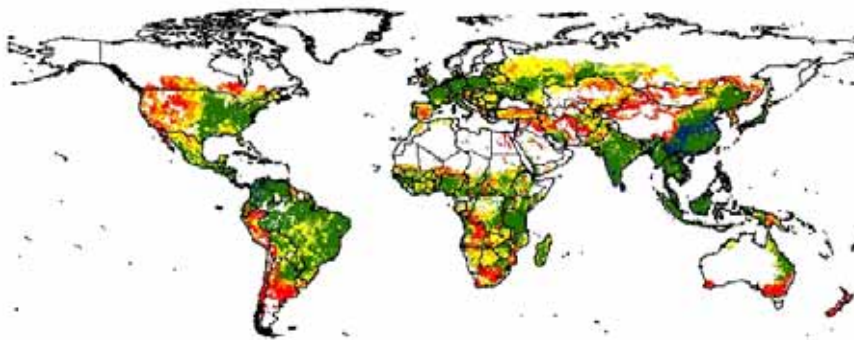
Tool

- **Flexible scale**
- **High resolution**

Liu *et al.*, 2007 *Agr Syst*
Liu, 2009 *Environ Modell Softw*

Virtual water content: Global

Rainfed Maize

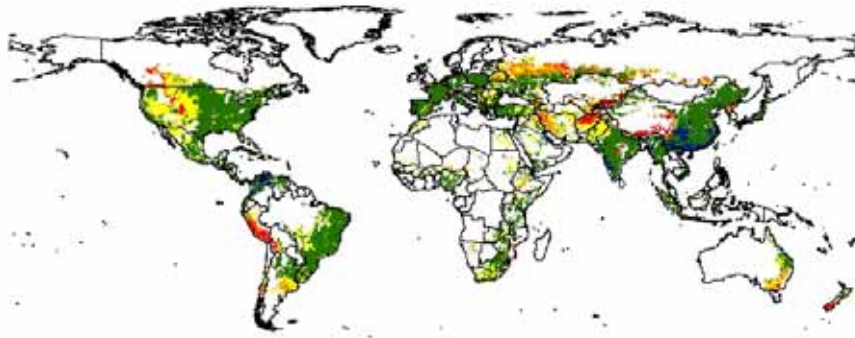


Global

Liu, 2009 *Environ Modell Softw*

Virtual water content: Global

Irrigated Maize



Water footprint (m³/kg)



Global

Liu, 2009 *Environ Modell Softw*

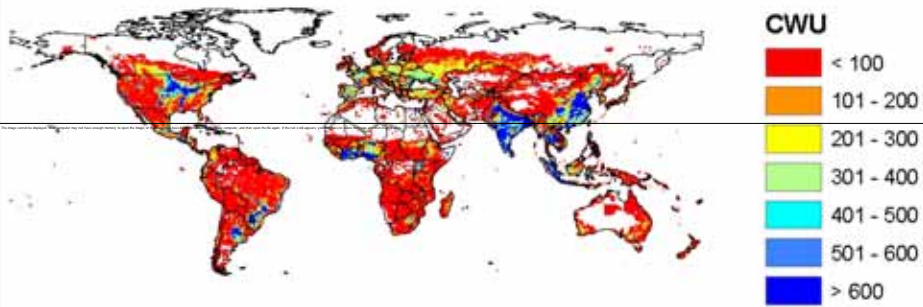
Assessment of virtual water content: Global



Twenty-two major crops: wheat, maize, rice, barley, rye, millet, sorghum, soybean, sunflower, potatoes, cassava, sugar cane, sugar beets, oil palm, rapeseed, groundnuts, cotton, pulses, coffee, fruits, vege, grassland

Assessment of consumptive water use

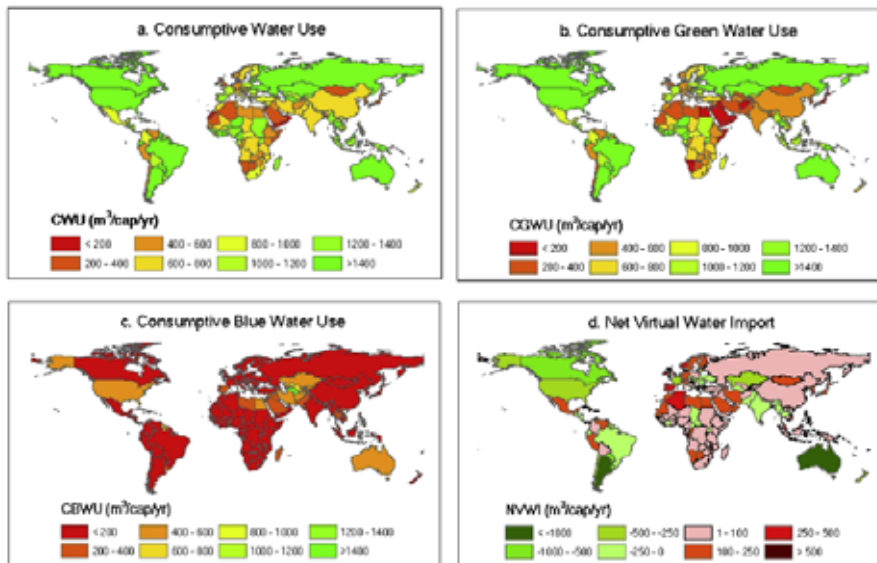
Consumptive Water Use (Unit: million m³/yr)



Global

Liu and Yang, 2010 *Journal of Hydrology*

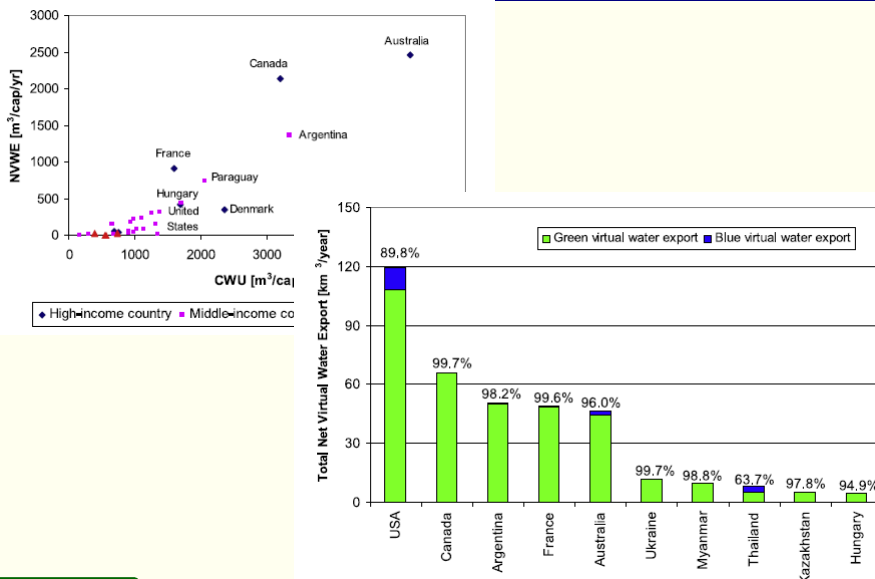
Consumptive water use vs. Virtual water trade



Global

Liu and Yang, 2010 *Journal of Hydrology*

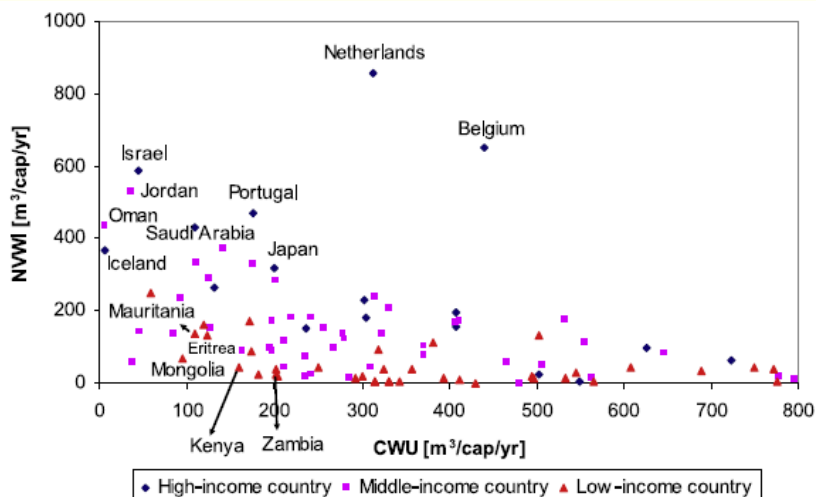
Consumptive water use vs. Virtual water trade



Global

Liu et al., 2009 *Water Resources Research*

Consumptive water use vs. Virtual water trade



Global

Liu et al., 2009 *Water Resources Research*

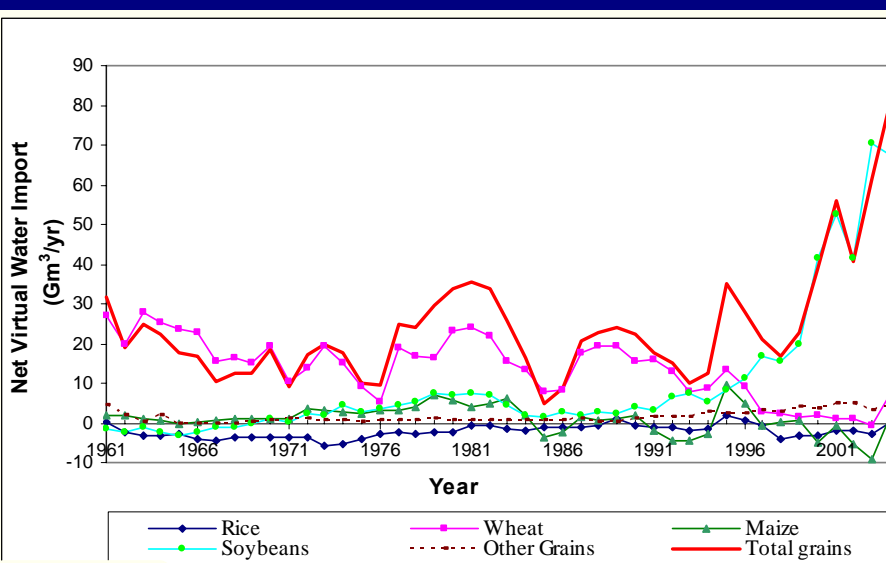
Virtual water assessment: national (China)



- **Huang-Huai-Hai River Basins**
 - 1/3 of China's population; 35% of industrial output
 - 40% of cultivated land; 50% of national grain production
 - but only **7.6%** of the nation's water resources

National

Virtual water flow in China



National

Source: Liu et al., 2007. Water Int.

Virtual water flow in China

Nature 453, 587 (29 May 2008) | doi:10.1038/453587c; Published online 28 May 2008

Time to break the silence around virtual-water imports

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Sir

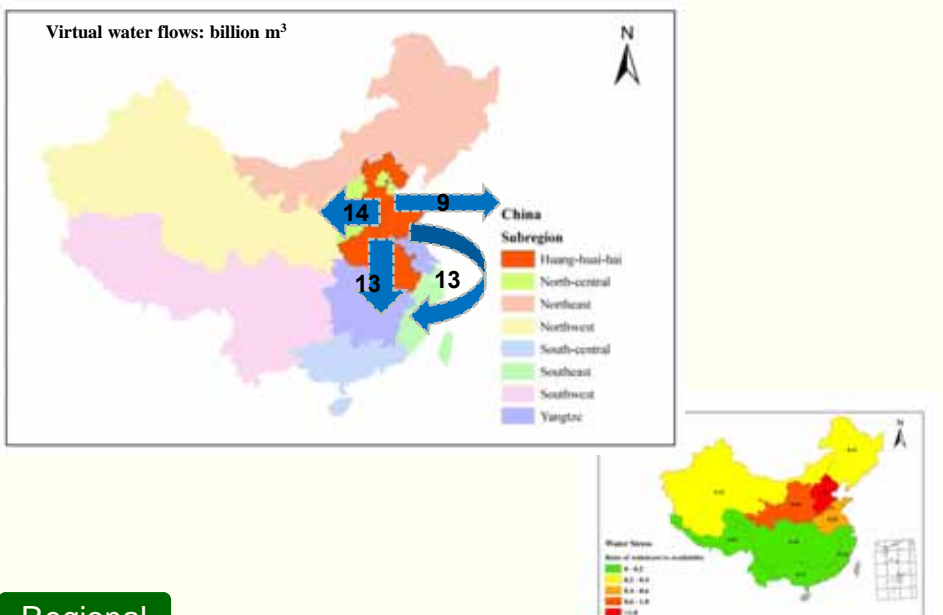
Your News Feature 'More crop per drop' (*Nature* 452, 273–277; 2008) mentions that China has "unconsciously" turned to 'virtual-water' imports by importing food that requires large amounts of water to produce. Officially, however, the Chinese government continues to advocate self-sufficiency in food because it regards reliance on international food import as a threat to domestic security.

National

Source: Liu et al., 2008. Nature

Virtual water assessment: regional (China)

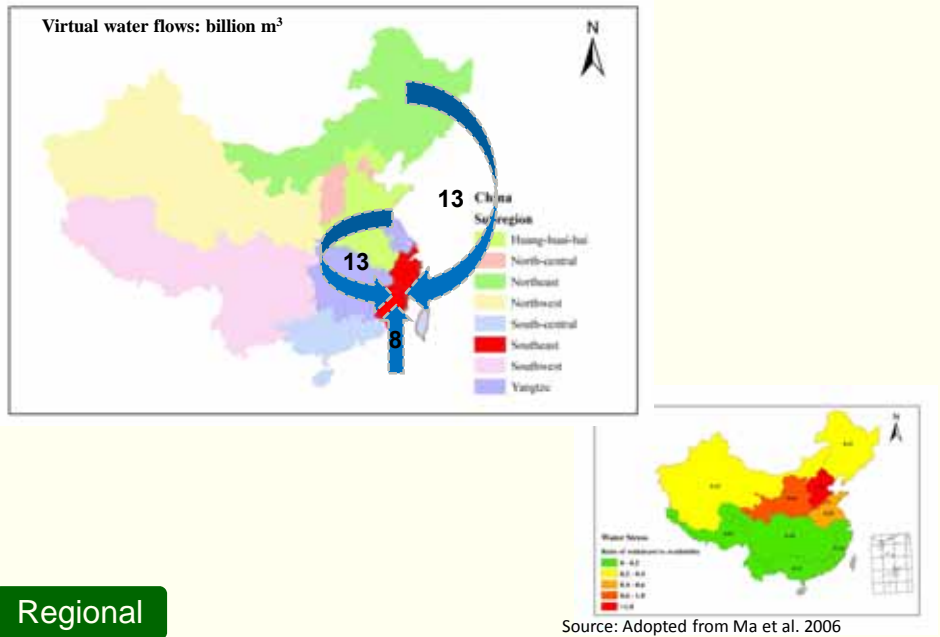
Virtual water flows: billion m³



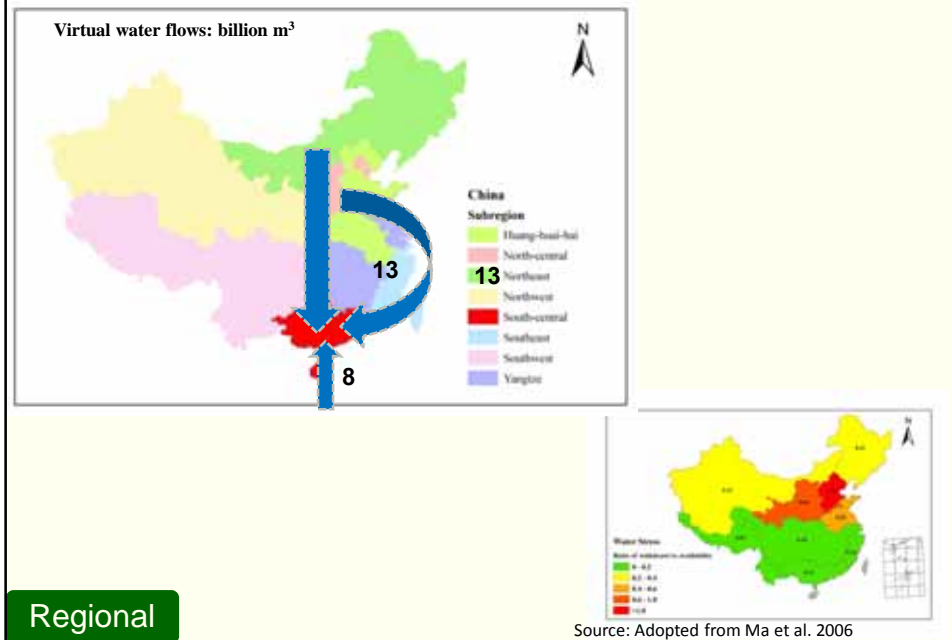
Regional

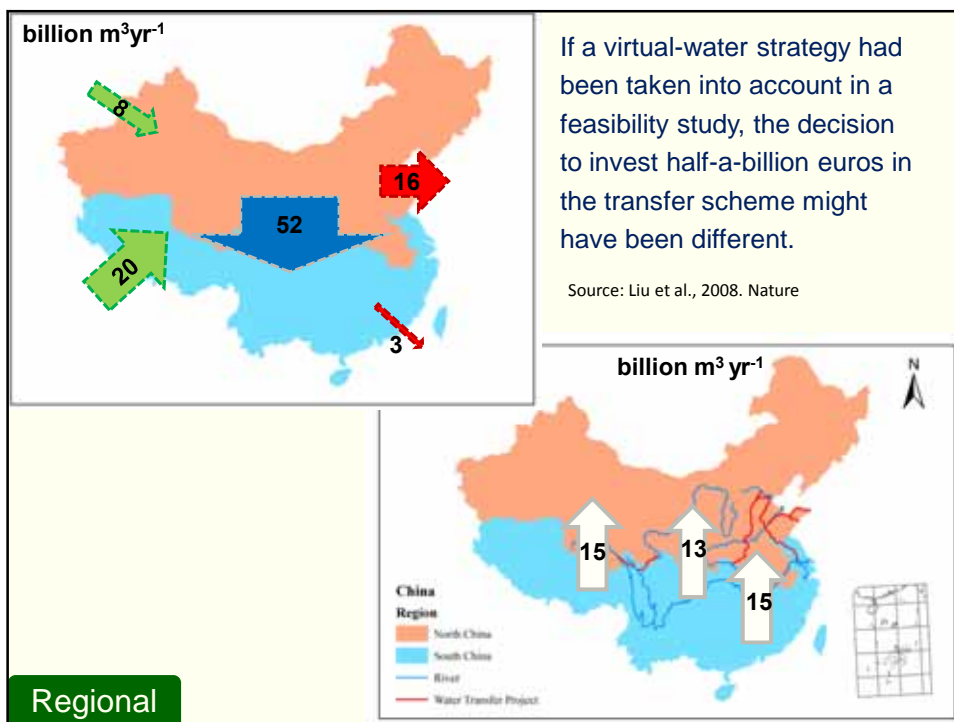
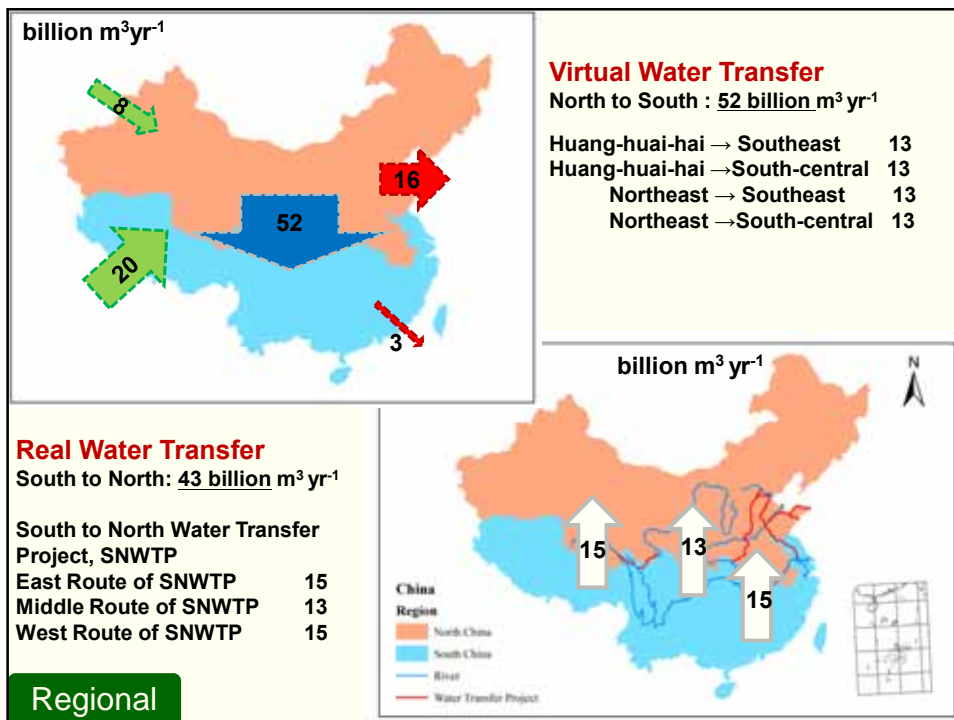
Source: Adopted from Ma et al. 2006

Virtual water assessment: regional (China)



Virtual water assessment: regional (China)





Virtual Water Assessment: Municipal (Beijing)



Beijing

- Capital of China
- Political, educational, and culture center
- Population: 17.55 million (2009)
- Urban population: 14.92 million
- Population density: 1069 persons/km²
- GDP: 1187 billion Yuan (175 billion US\$)

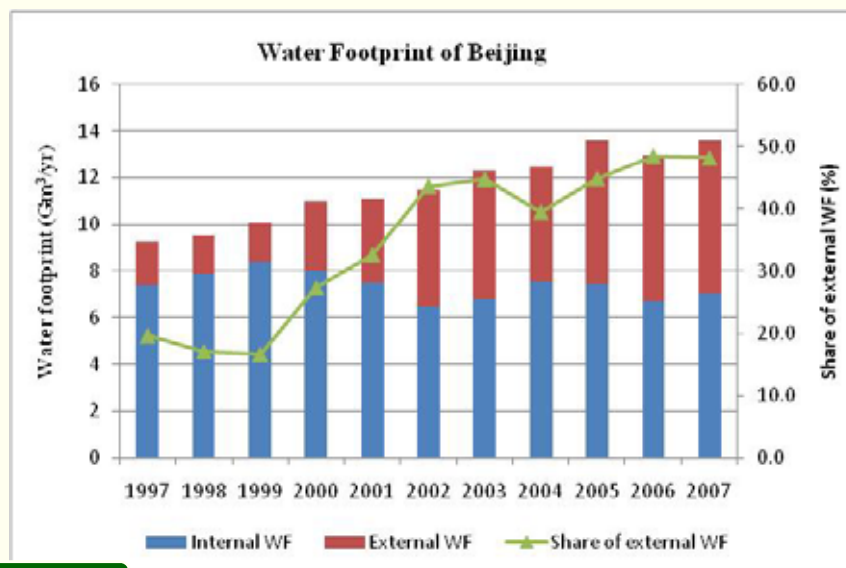


A city short of water

- Per capita water resources:
~ 150 m³/cap/yr (1999-2007)
- Absolute water scarcity: <<< 1000 m³/cap/yr

Municipal

Water Footprint and Virtual Water: Beijing



Municipal

Concluding Remarks

- ❑ A **GEPIC** model has been developed and it enables virtual water assessments at different levels;
- ❑ **Global:** virtual water import/export is influenced not only by consumptive water use, but also by income levels
- ❑ **National:** China has unconsciously using virtual water strategy to alleviate water scarcity problems
- ❑ **Regional:** Virtual water flows move from water-poor regions to water-rich regions, indicating that it is necessary to re-consider China's future water management
- ❑ **Municipal:** Beijing is relying more heavily on virtual water imports to alleviate local water scarcity. Policies should be explicitly formulated to emphasize the important role of virtual water



Welcome to China!

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Virtual water assessment: national (China)

