

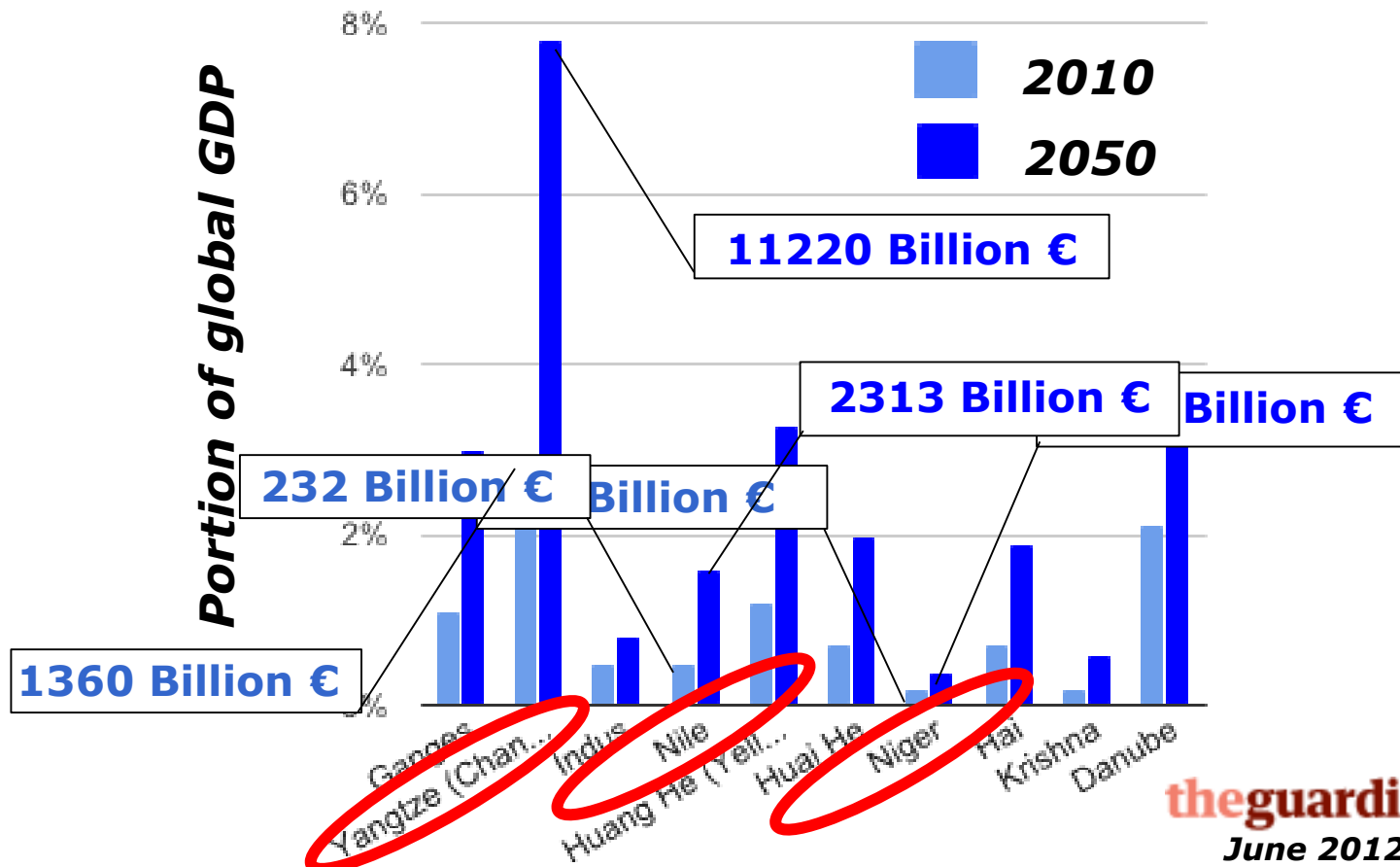
Addressing the knowledge base of the Water-Energy-Food Nexus as a support to policy decisions

Giovanni Bidoglio
Joint Research Centre

*EU Water Initiative Multi-Stakeholder Forum
Stockholm, 31st August 2014*

Water as opportunity for growth

Economic output of the world's ten most populous river basins will exceed that of the USA, Japanese and German economies combined but only if water scarcity is addressed



Sources:

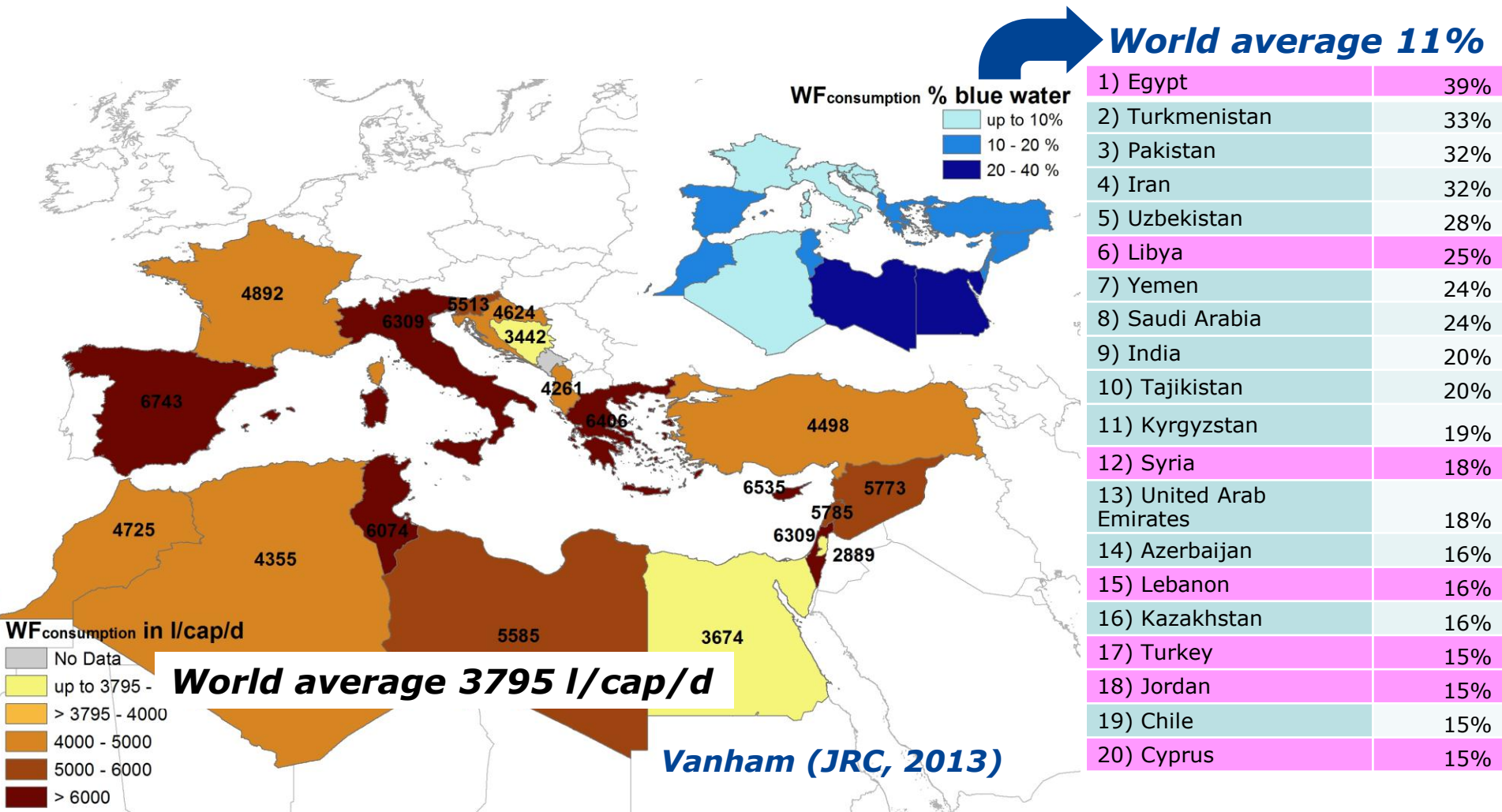
HSBC 

the guardian
June 2012

frontier
economics 

Living with water imbalance

The Water Footprint of Mediterranean countries



Building synergies within watersheds

- Address the water-intensity of our economies to close the gap between projected future water demand and current supply
- Match availability and demand of water in terms of competing objectives of the different sectors
- Look at the implications of water resources allocation and water security

Agriculture



Energy



Environment



Industry



Tourism



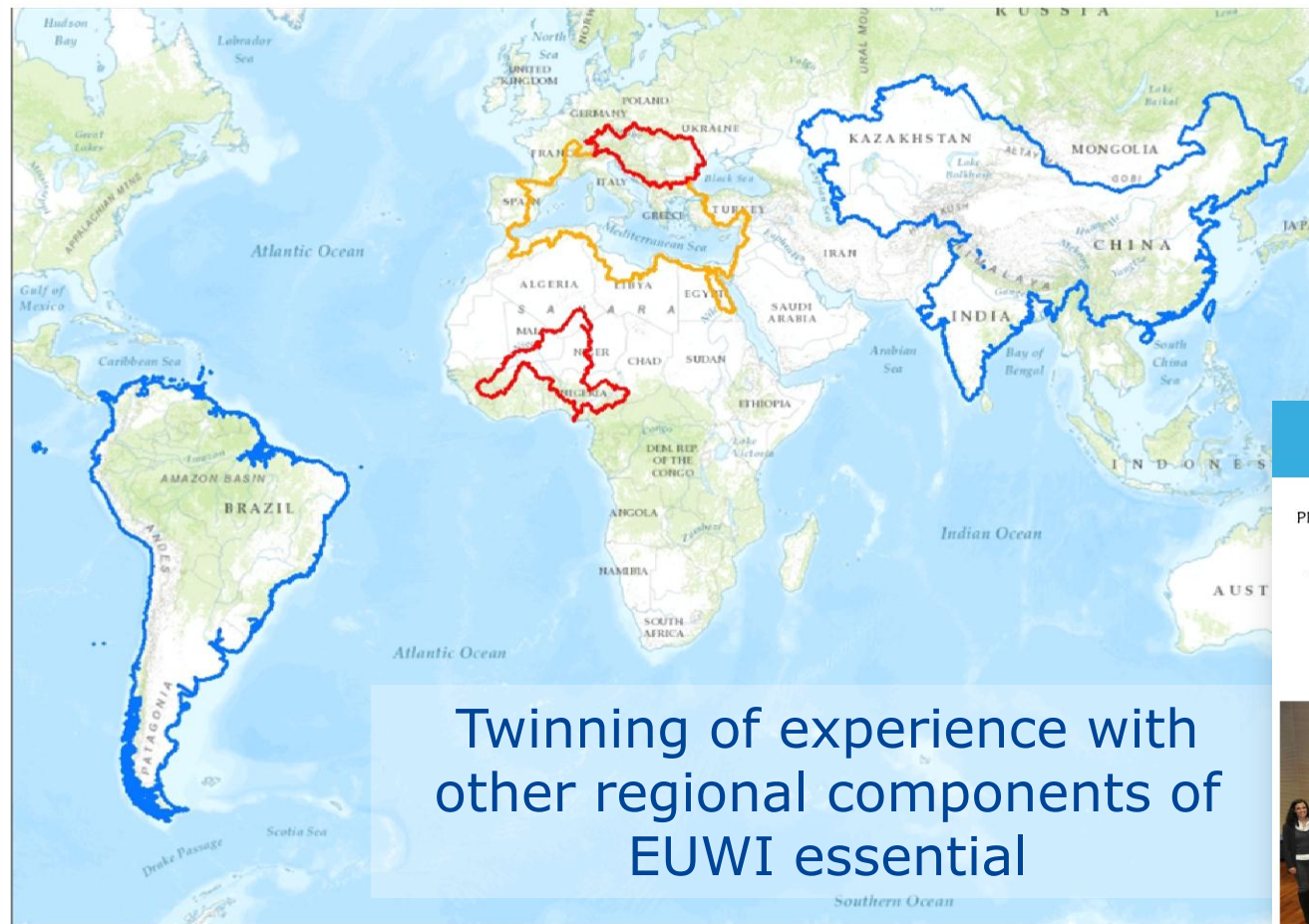
Drinking water





Investigating the evidence base of the Water-Agriculture-Energy-Ecosystems Nexus

- Deliberate assessment of the nexus to increase population resilience to climate change
- Current and future river management in the Mediterranean as a pilot

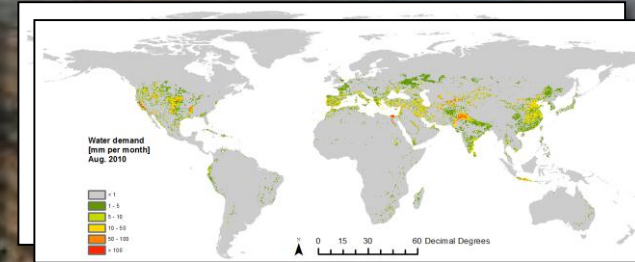
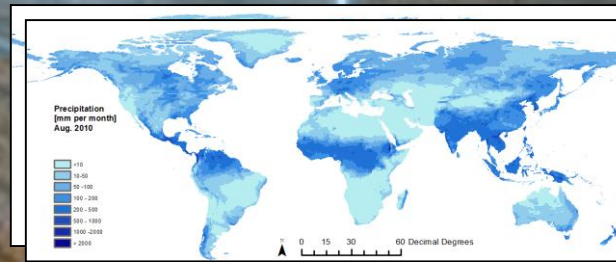
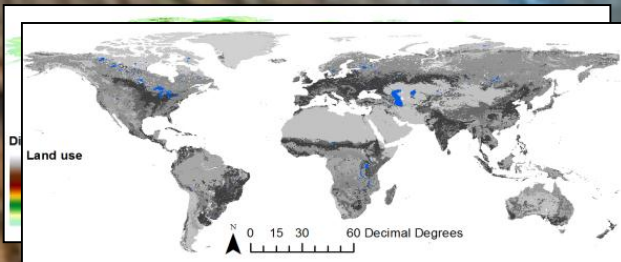


Understanding baseline conditions

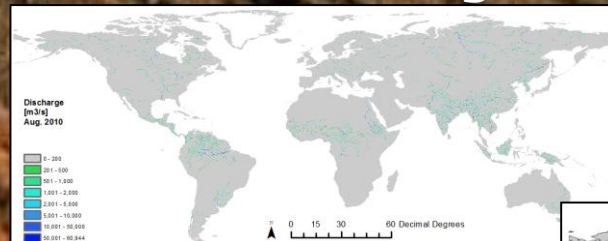
Global spatial data:
river network,
land cover,
elevation etc.

Daily data:
precipitation,
temperature,
wind speed etc.

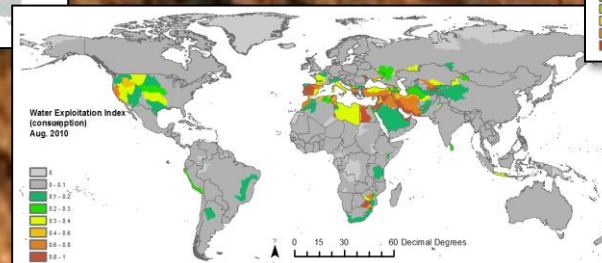
Water demand:
from industry,
livestock,
irrigation, energy, etc.



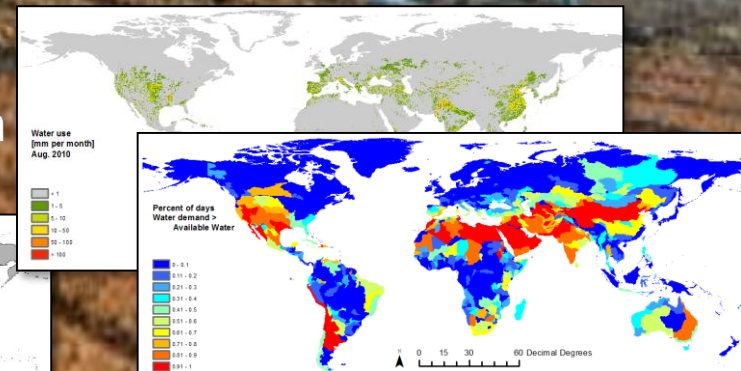
River discharges



Water Exploitation Index



Water availability

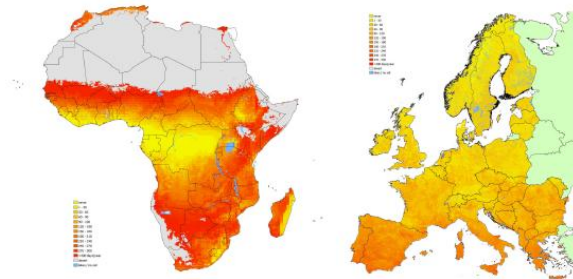


**Percentage of days
water demand >
water availability**

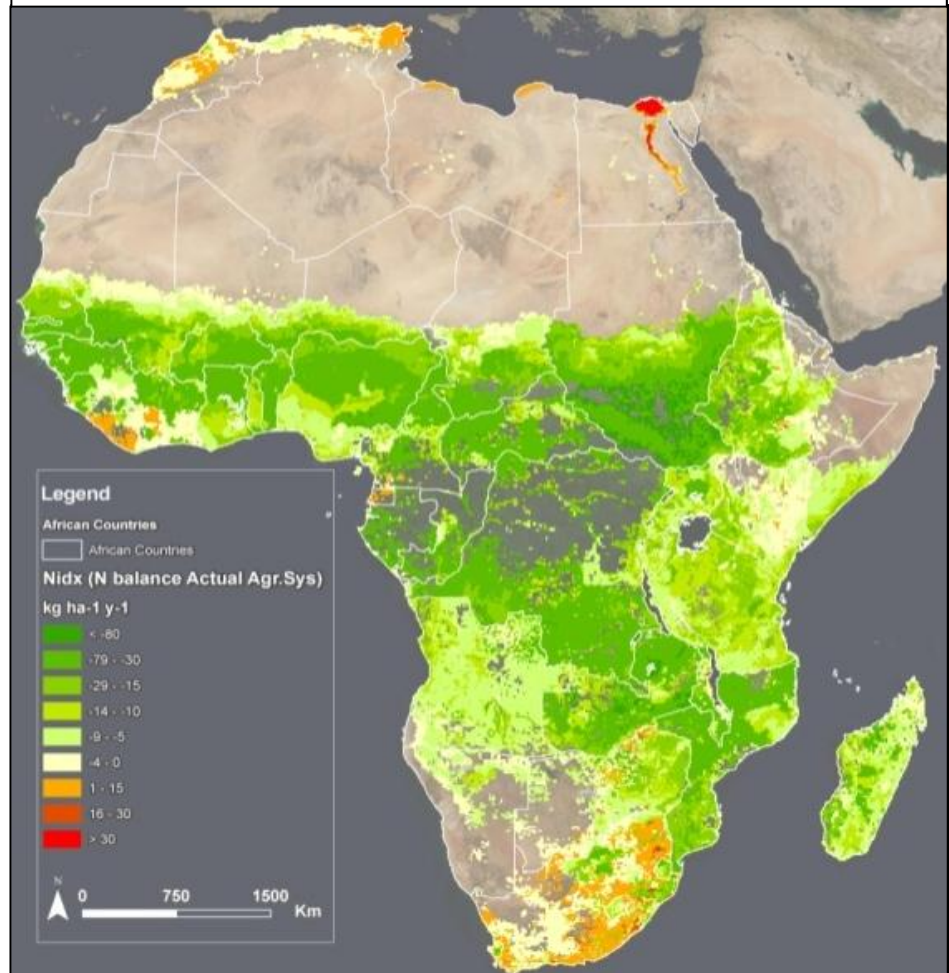
Current water resources in Europe and Africa

Matching water supply and water demand

Ad de Roo, Faycal Bouraoui, Peter Burek, Berny Bisselink, Ine Vandecasteele,
Sarah Mubareka, Peter Salamon, Marco Pastori, Mauricio Zambrano,
Vera Thiemeig, Alessandra Bianchi, Carlo Lavallo



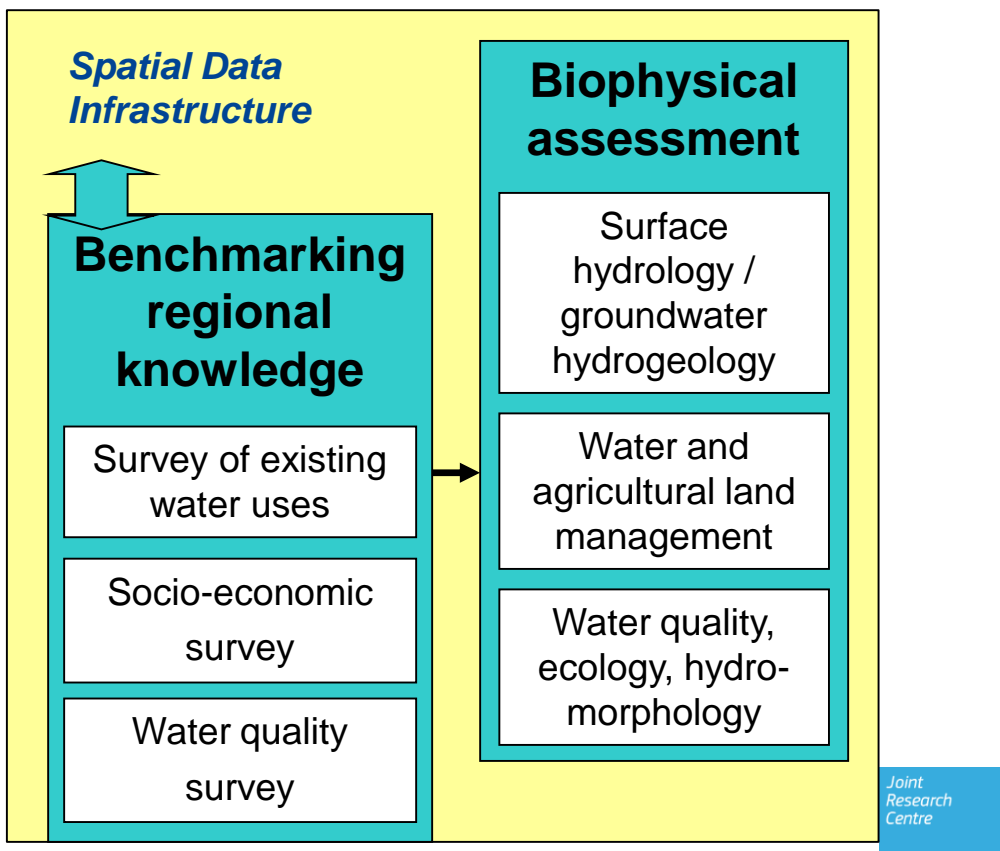
Nitrogen balance for 5 most diffuse crops





From baselines to solutions

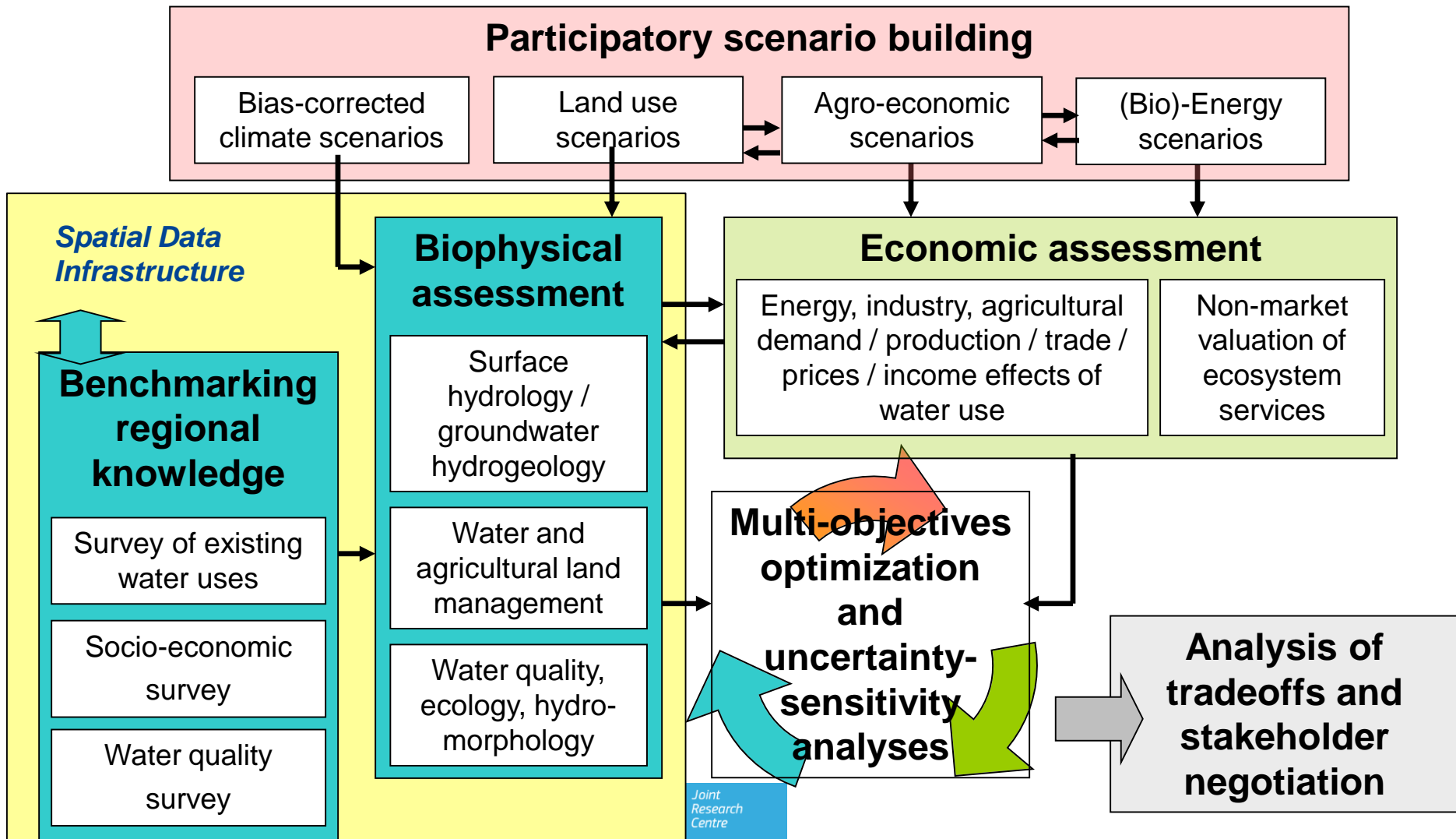
An hydro-economic assessment of impacts of scenarios for sectoral water use in 2030





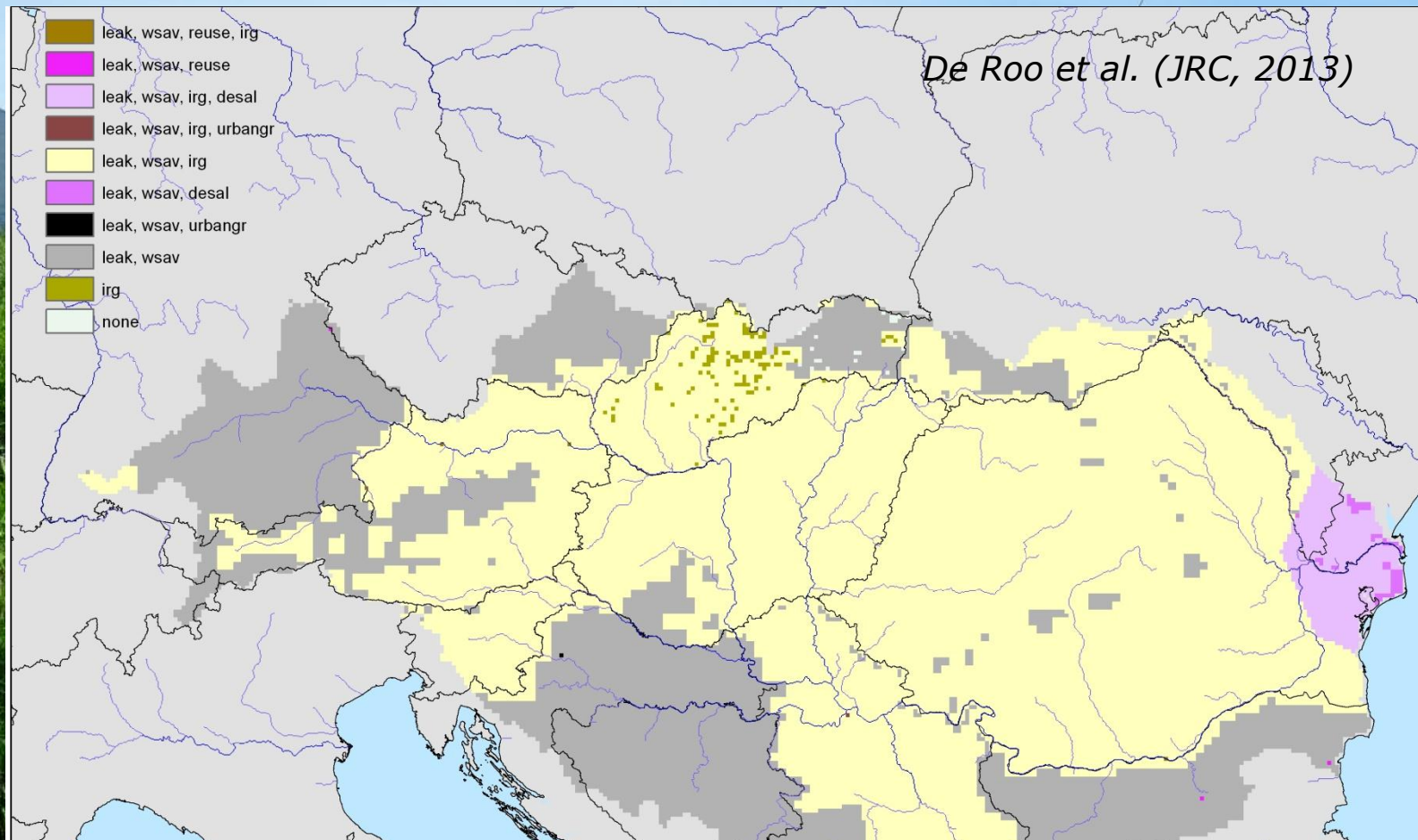
From baselines to solutions

An hydro-economic assessment of impacts of scenarios for sectoral water use in 2030



Testing scenarios for spatial planning of measures

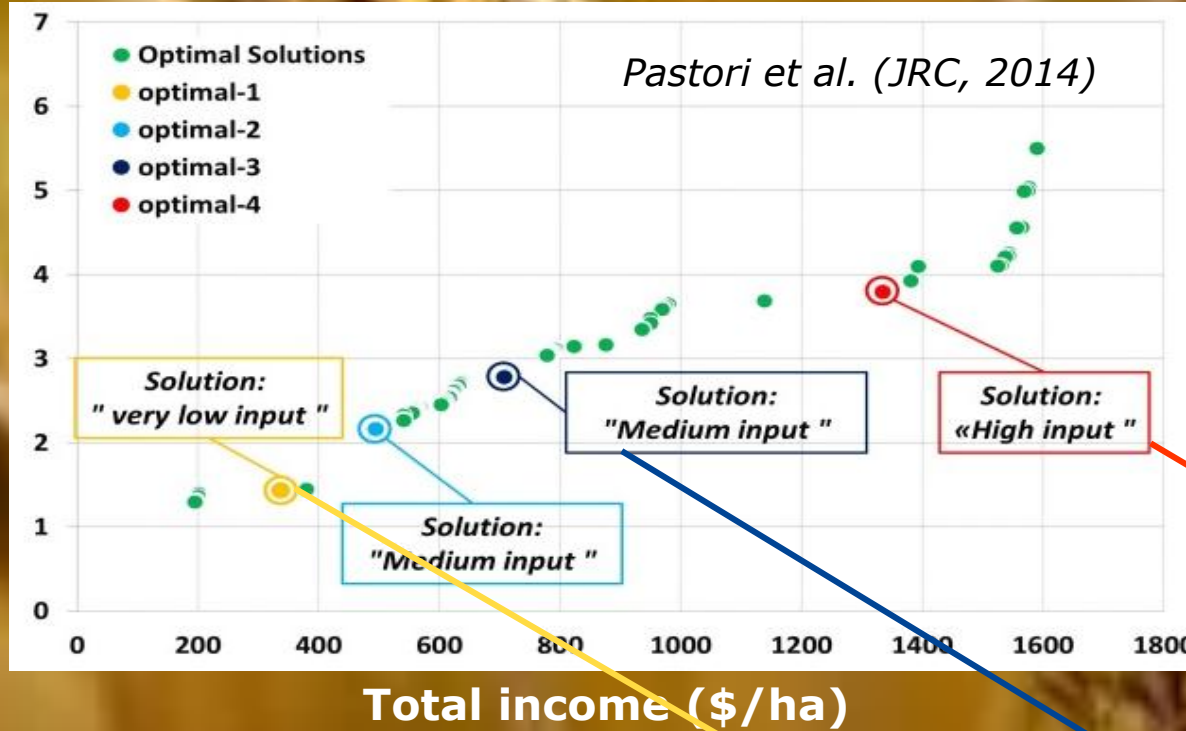
Maximizing water availability and minimizing impacts on ecological flow in the Danube river basin



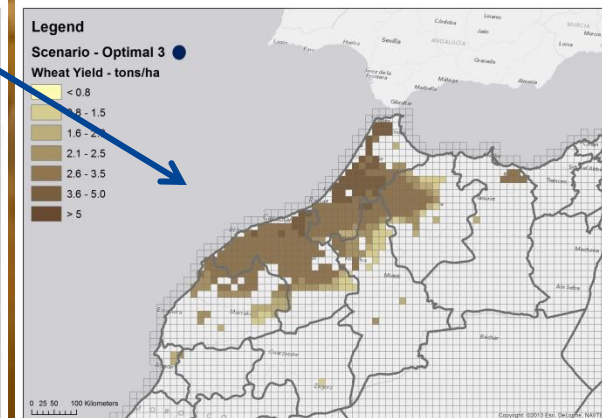
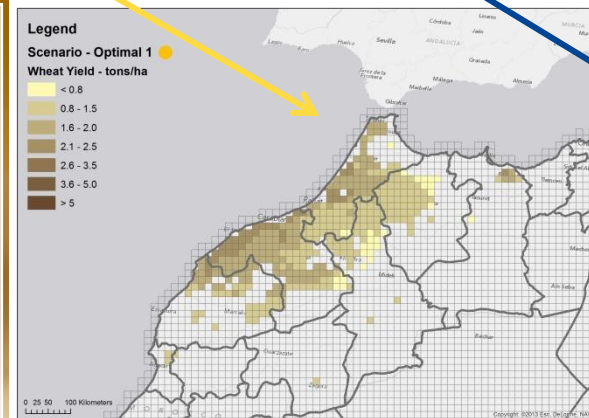
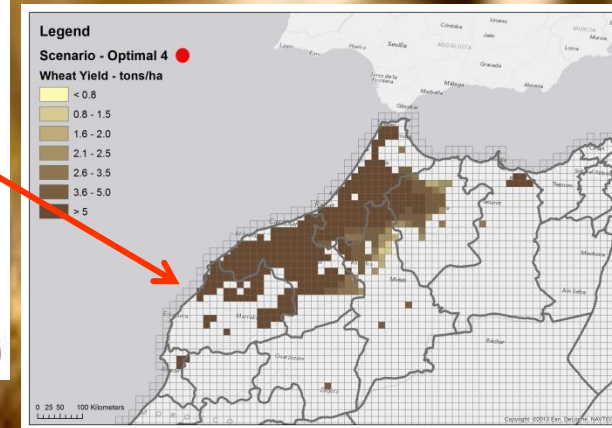
Irrigation water use efficiency - Leakage reduction - Urban Greening in Zagreb and Belgrade - Reuse of water in industry in Bulgaria - Desalination (Black Sea) - Water savings in households

Assessing trade-offs between economic and environmental objectives (nitrate leaching): optimization of irrigation and fertilisation practices

Nitrogen leaching (Kg/ha)



Wheat crop yield in Morocco



Total Income =
Crop yield * Crop selling
price – Water
consumption * Water
price –
Fertiliser consumption
*** Fertiliser price**

Assessing the Water Nexus in the Mekrou river basin

**Water
balance**

**Water management
and governance**

**Adaptation to climate
change**

**Water
security**



- Tools for assessment and data exchange across the three countries sharing the river basin (a tributary of the Niger)
- Participatory approach, bottom-up identification of priorities/needs
- Pilot project (2014-2017) methodology to be extended to other African river basins

The BASAL project in Cuba



- Tools to support local decision making:
 - ✓ Biophysical modeling of water management and crop production under climate change
 - ✓ Spatial database and GIS infrastructure
- Technology and knowledge exchange



Climate change &
climate variability

Average Daily Temperature Anomaly
A1B, HadCM3 2050 - baseline, summer

Water
management



Food
production

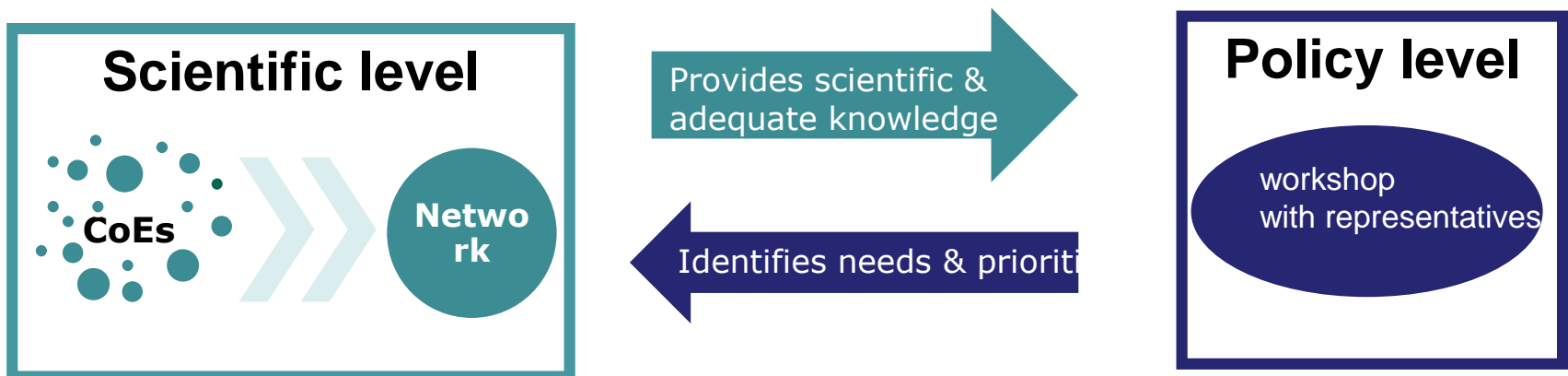


Regional Networks of Centres of Excellence in Water sciences

ACE-Water in the frame of the AU-NEPAD initiative on Networks of Centres of Excellence in Sciences and Technology



RALCEA - Red Latinoamericana de Centros de Conocimiento en gestión de Recursos Hídricos



The challenge of practical solutions

- Find the right combination of measures for the different sectors to fit specific context requirements at the river basin scale and **address interdependencies and trade-offs**
- **Innovative research and technologies** are essential to support the implementation of a nexus framework
- Facilitate joint building of assessment capacity and contribute to **harmonization across countries and trans-boundary watersheds** relying on knowledge deriving from national and international initiatives

A role for EUWI

Thank you for your attention

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