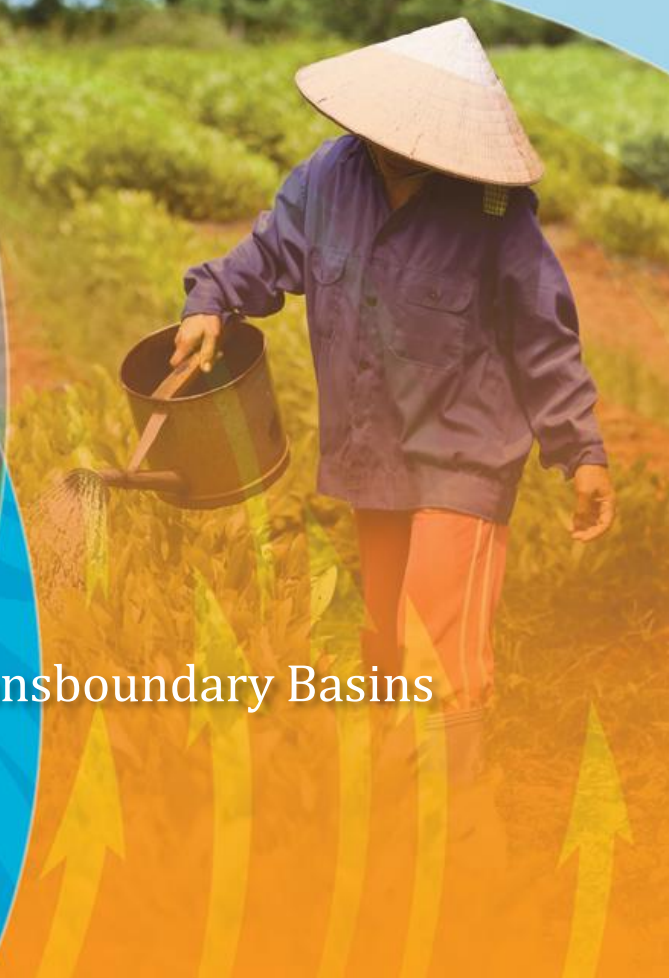
Indicators for Assessing the Water-Energy-Food Nexus



2nd Meeting of the Task Force on
the Water-Energy-Food-Ecosystem Nexus in Transboundary Basins

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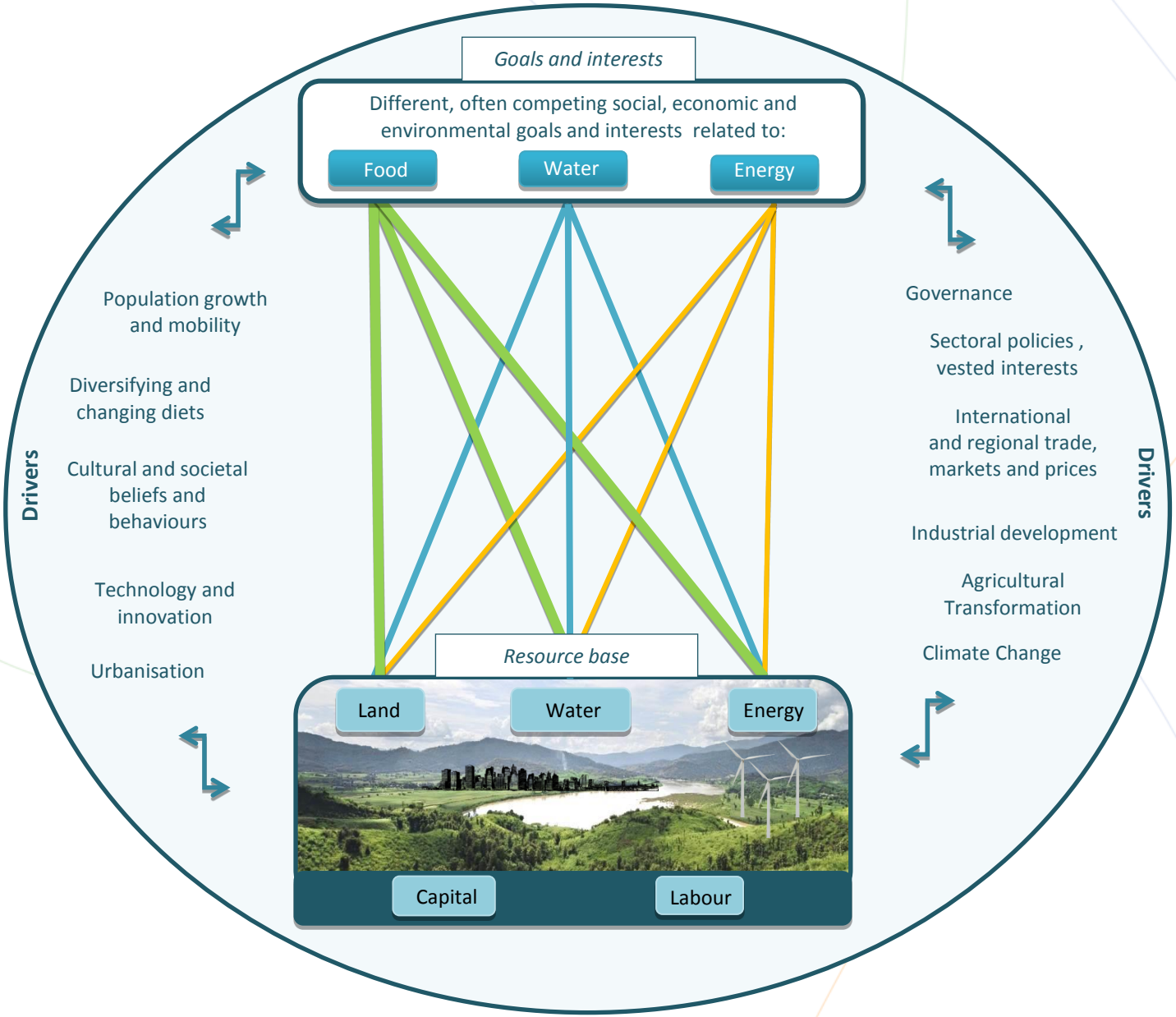
9th September 2014

The FAO approach to the Water-Energy-Food Nexus



Trends in the Water-Food Domain

	Water availability and access	Water use	Resilient societies and ecosystems
Food Availability	Availability of non-conventional sources for agriculture	Water use and impacts	Water stress due to agriculture

Water stress refers to the symptoms of water scarcity or shortage, e.g.

Improvements in water use efficiency and productivity may reduce water stress, and support agricultural development and economic growth.

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Food Availability

Food Access

Utilization (including nutrition)

Stability of supply and prices

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Access to modern energy

Renewable energy share

Energy efficiency

Dependency on food imports

Water scarcity and low productivity may cause dependency on food imports and vulnerability to volatile food prices.

Trends in the Water-Food Domain

	Water availability and access	Water use	Resilient societies and ecosystems
Food Availability	**Availability of non-conventional water resources for agriculture** **1) Wastewater resources** Particularly in water-scarce countries, investments in re-use of drainage water and (treated) municipal and industrial wastewater can offset scarcity. Wastewater has the advantage of being rich in nutrients, and is available close to the centers of population and markets, so it is ideal for peri-urban/ urban agriculture and aquaculture. However, contaminants in wastewater pose risks to human and environmental health and need to be closely regulated. **2) Desalinated water resources** Desalination is a technical option to increase the availability of freshwater both in coastal areas with limited resources and in areas where brackish waters – such as saline groundwater, drainage water and treated wastewater – are available. Desalination of salty groundwater and brackish drainage water for agriculture is generally less economic than the reuse of treated wastewater due to high energy costs and even where the capital costs of the desalination plants are subsidized.	**Water use and impacts** **1) Crop production** Improvements in water use efficiency and productivity have the potential to improve both food security and water sustainability in many parts of the world. Less water is required to produce more food. Irrigation will play an increasingly strategic role through water use efficiency, improved water services, yield growth and higher cropping intensity. Groundwater resources, in particular, provide a flexible, on-demand source of water for irrigation. Increasing demand for water can result in extra pressure on resources and ecosystems (overpumping of groundwater resources, sinking water tables, water shortages, and salinization) and in intra-sectoral trade-offs of water allocation. Where the technical and socio-economic conditions are not in place for sustainable land and water management, on-site risks arise, as well as risks to downstream water bodies and human health. Agricultural production may cause water pollution through the discharge of pollutants and sediment to surface and groundwater (eutrophication, spread of water-borne diseases, aquatic weeds,), through net loss of soil by poor agricultural practices,	**Water stress due to agriculture** Water stress refers to the symptoms of water scarcity or shortage, e.g. growing conflict between users and competition for water, declining standards of reliability and service, harvest failures and food insecurity. Improvements in water use efficiency and productivity may reduce water stress, and support agricultural development and economic growth. **Dependency on food imports** Water scarcity and low productivity may cause dependency on food imports and vulnerability to volatile food prices.

Indicators of the Water-Food Domain

	Availability of and access to water resources (SUPPLY)	Water use (DEMAND)	Resilient societies and ecosystems
Food Availability	**Availability of non-conventional water resources** **1) Wastewater resour** Treated municipal was discharged (m3/yr) Not treated wastewate (m3/yr) Direct use of untreated wastewater of irrigatio (m3/yr) Direct use of treated m wastewater of irrigatio (m3/yr) **2) Desalinated water r** Desalinated water proc	**Water use and impacts** **Water productivity:** Irrigated added value / agricultural water use ($/cap/m3) – this does not take into account rainfed systems, though. *Alternative*: Value of irrigated output as multiple of value of rain-fed output (USD, differentiated by crop) Currently, there is no data that differentiates between irrigated and rainfed production (except at the level of an individual irrigation scheme → MASSCOTE For values at national level, a proxy can be used on the value added from agriculture but only in countries where irrigation represents the main agricultural systems and it can be considered that the majority of water used goes to irrigation. In the future, it may be more relevant to monitor a sample of representative irrigation schemes around the world rather than using national data sets, except when irrigation production data are produced and water withdrawals data sets are robust. Use of agricultural pesticides and fertilizers Share of monitoring sites in agricultural areas that exceed recommend drinking	**Water stress due to agriculture** ultural water security index[f] roductivity of irrigated griculture ndependence from imported vater and goods esilience (percentage of enewable water resources tored in large dams) **ndency on food imports** r dependency ratio as total e of external water flows over volume of water produced/year l import dependency ratio

Thank you