



The Water-Food-Energy Nexus

Concept & Potential for Nexus-based Development Solutions

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Achieving WEF Security goals in a dynamic world

Present

Unmet demands!

- 0.9 billion people have no access to clean water
- 1.1 billion people have no access to electricity
- 1 billion people have insufficient food supply

Future

Increasing demands!

- Due to population growth, economic development and changing consumption patterns
- The uncertainties of global change exacerbate the difficulty in achieving these goals

by **2035**
GLOBAL ENERGY
consumption will
INCREASE 50%



... increasing
WATER
CONSUMPTION
by **85%**

To meet global food demand by 2050, agricultural production must
INCREASE BY 60%

NOW



2050



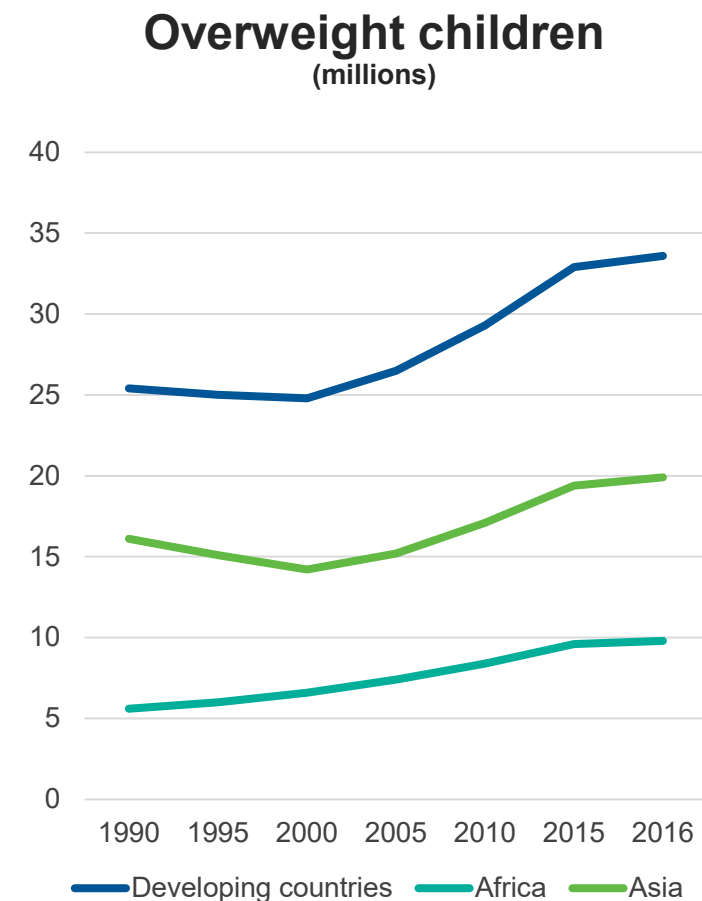
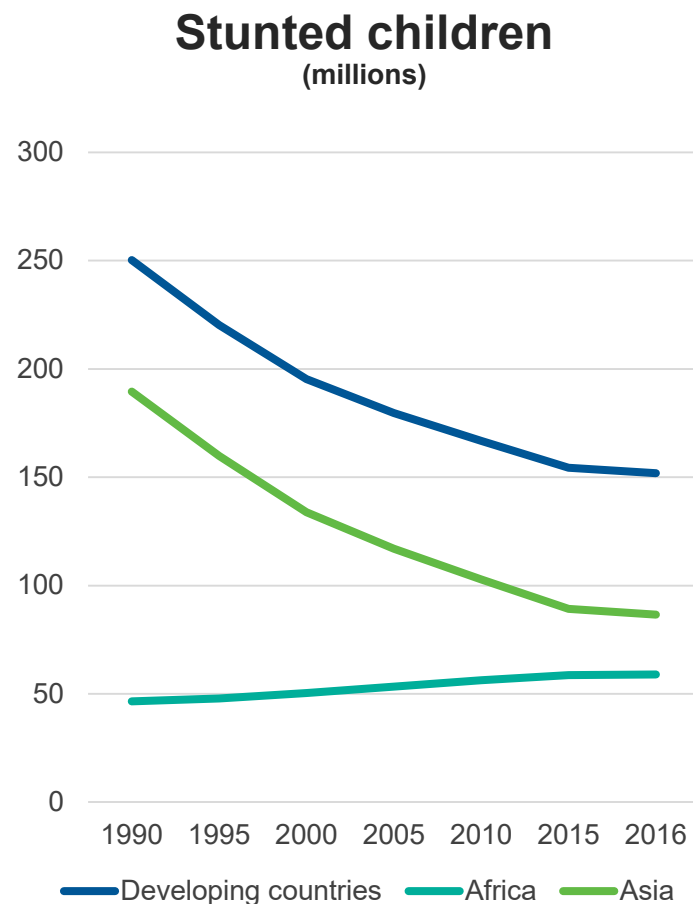
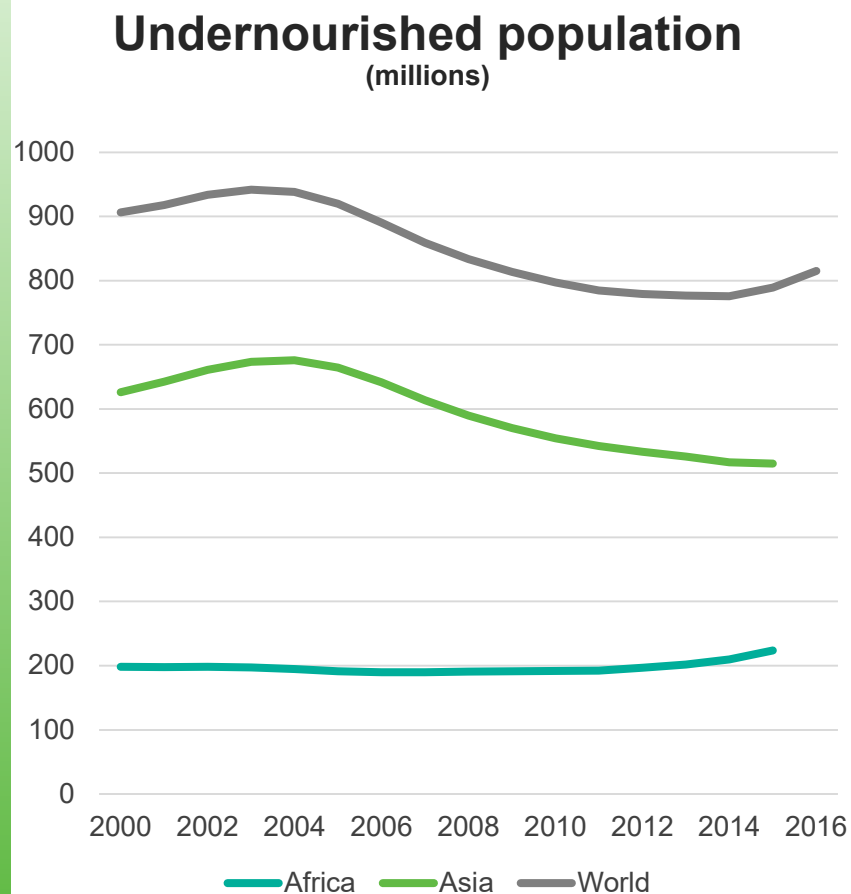
UNDESA, 2014; CCAFS, n.d.

WEF in the context of the Sustainable Development Goals



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Example SDG 2: Hunger and undernutrition persist AND alarming rise in overnutrition



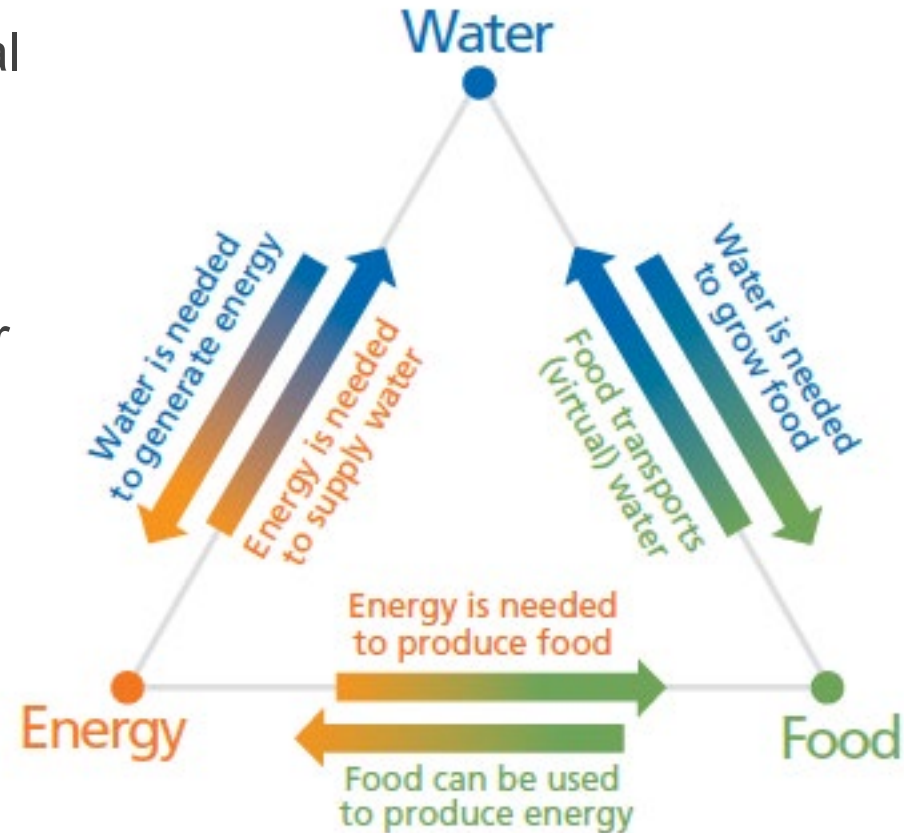
Source: FAO 2017, UNICEF/WHO/WB 2017

Ringler et al 2019

The WEF sectors are closely related

Examples of interconnections:

- Agriculture accounts for 70% of total global freshwater withdrawals
- 90% of energy produced today is water-intensive
- Agriculture & food chain account for 33% of global energy demand



Adapted from: Water - A Global Innovation Outlook Report, IBM, 2009

UNU, 2013

Single-mindedly pursuing individual goals may interfere with other goals

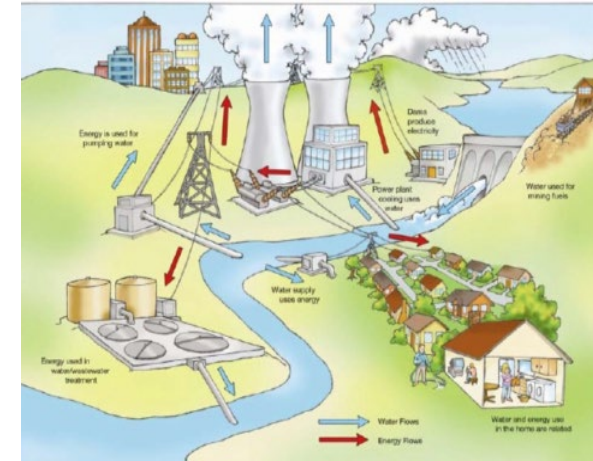
Example: Increasing electricity production

- Higher energy security
- More abstraction of water for cooling
- Less water for other sectors and the environment
- Less water security

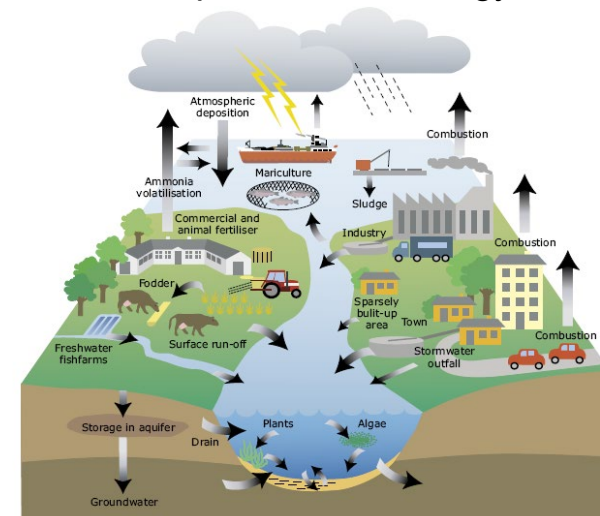
Example: Intensifying agricultural production

- Higher food security
- Competition for land resources (eg. biofuels vs. crops as food)
- More use of fertilisers
- Contamination of water resources
- Less water security downstream

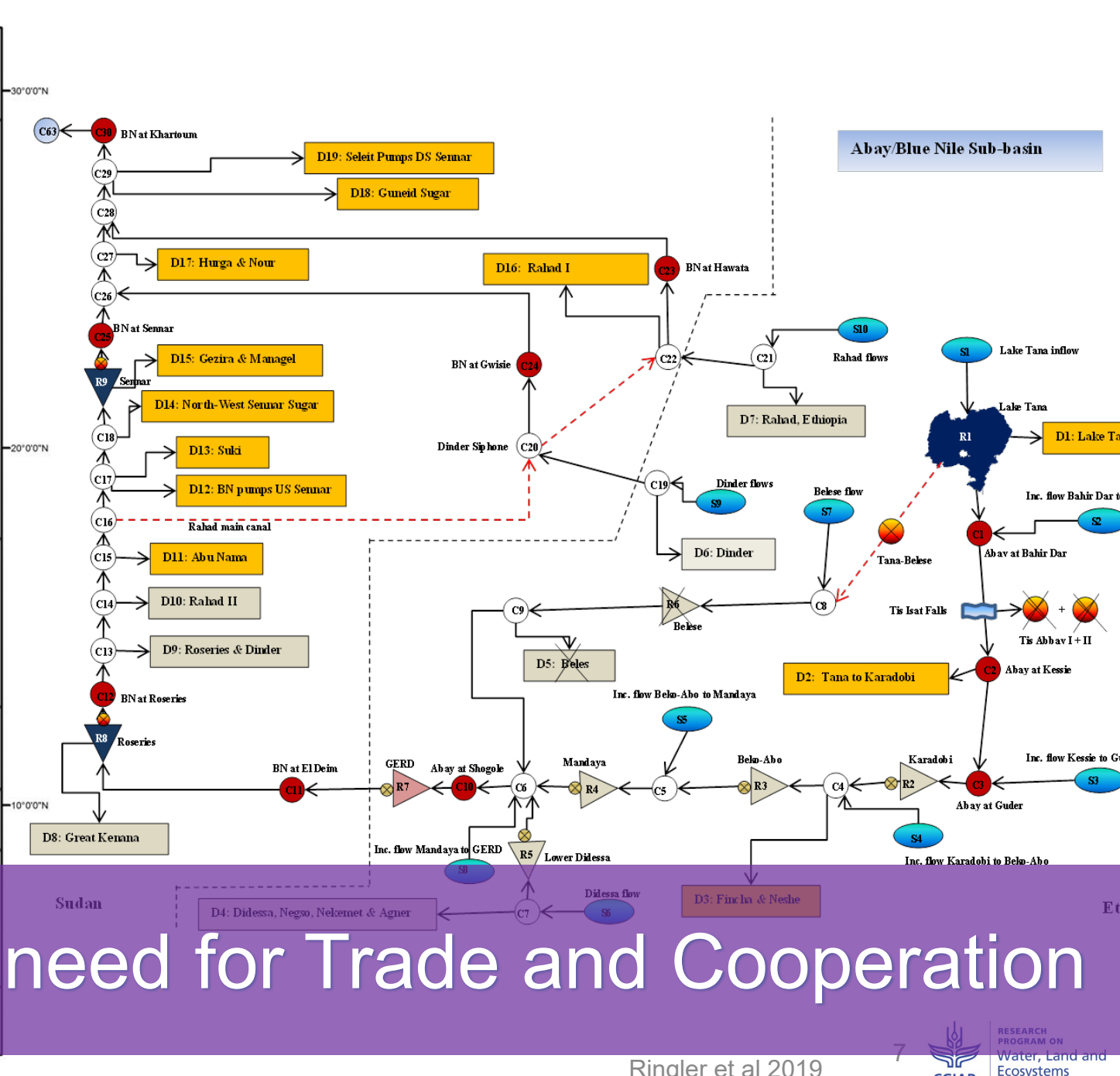
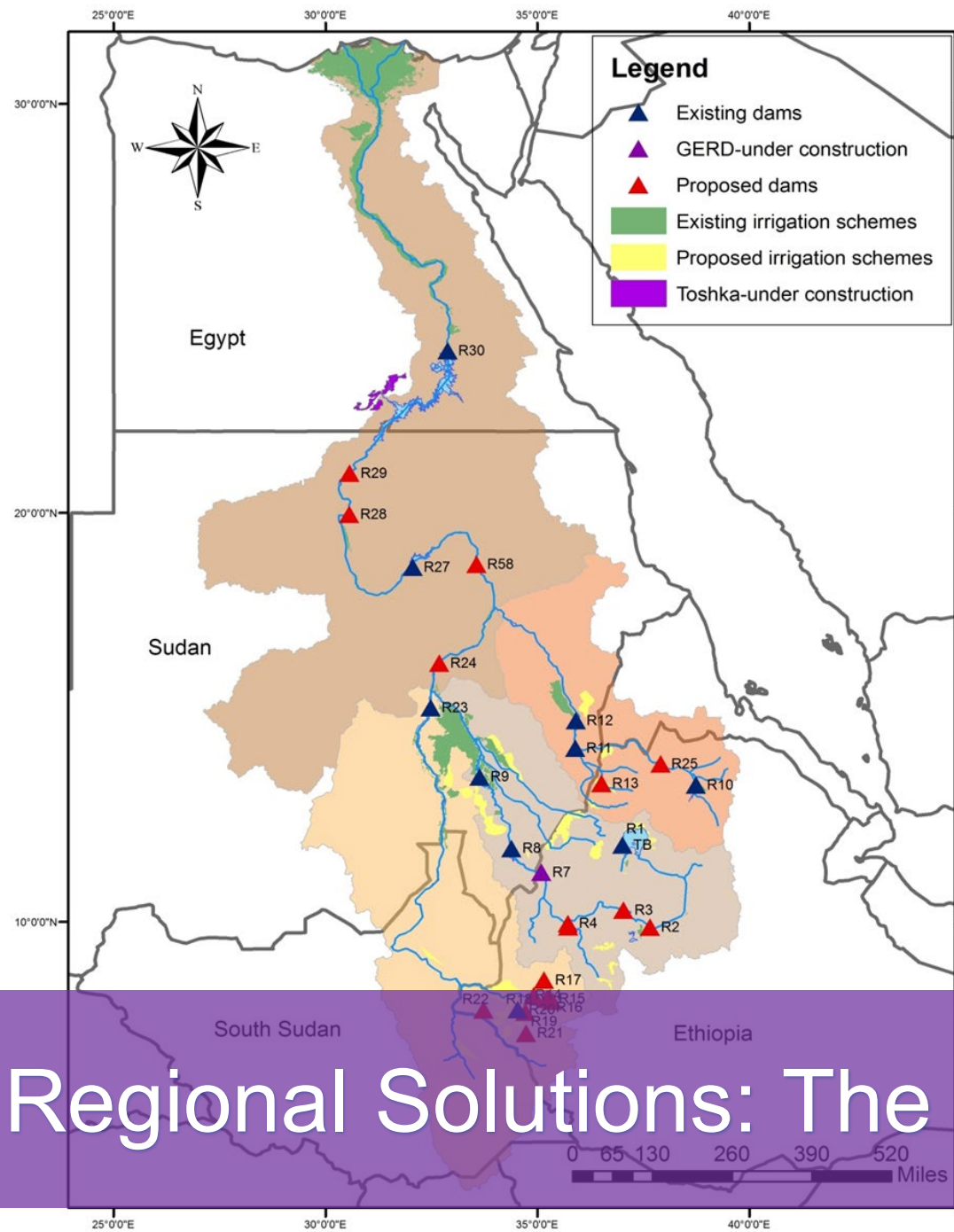
→ **Need for a systematic WEF Nexus approach!**



U.S. Department of Energy, 2006



LaB, 2010



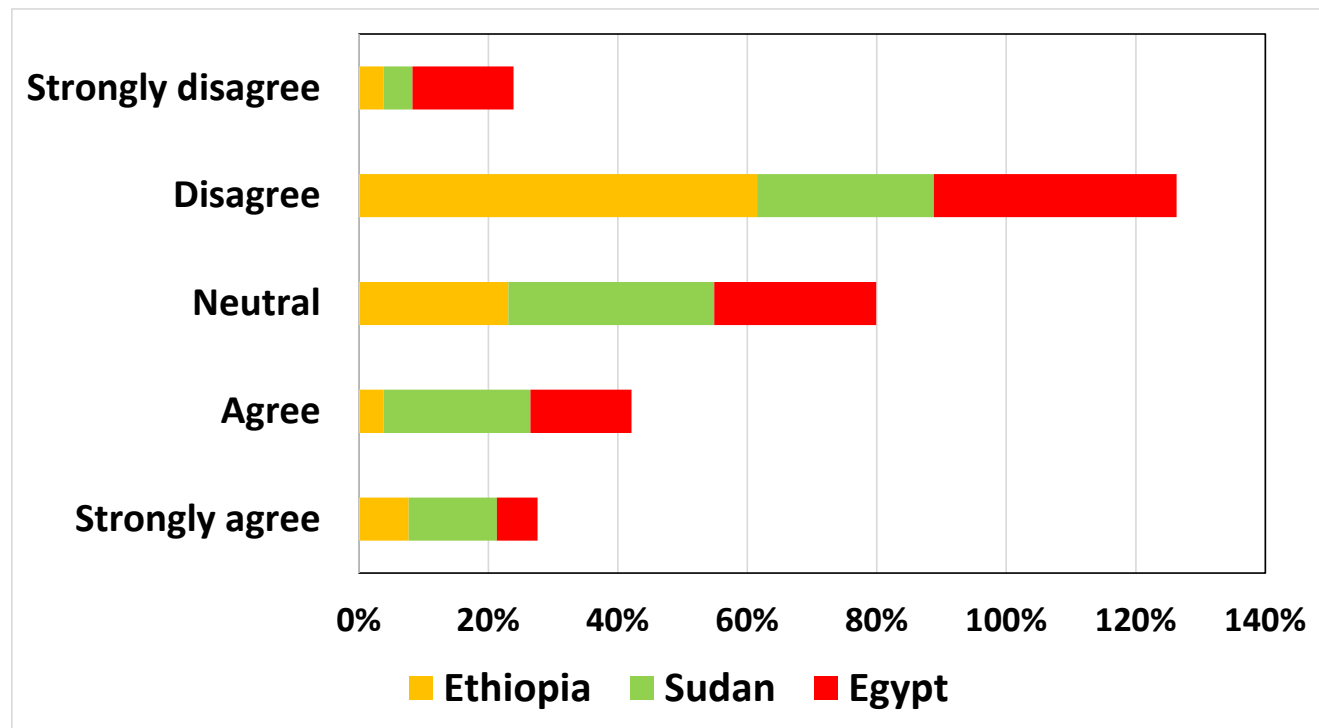
Regional Solutions: The need for Trade and Cooperation

Regional collaboration around WEF is important, but is not happening enough

Regional collaboration around water, energy and food is important for future adequate provision of resources

	Sudan	Egypt
Strongly agree	90.9%	69.7%
Agree	0.0%	24.2%
Neutral	4.5%	3.0%
Disagree	4.5%	3.0%
Strongly disagree	0.0%	0.0%

Ongoing regional cooperation is adequate to minimize tradeoffs and exploit synergies



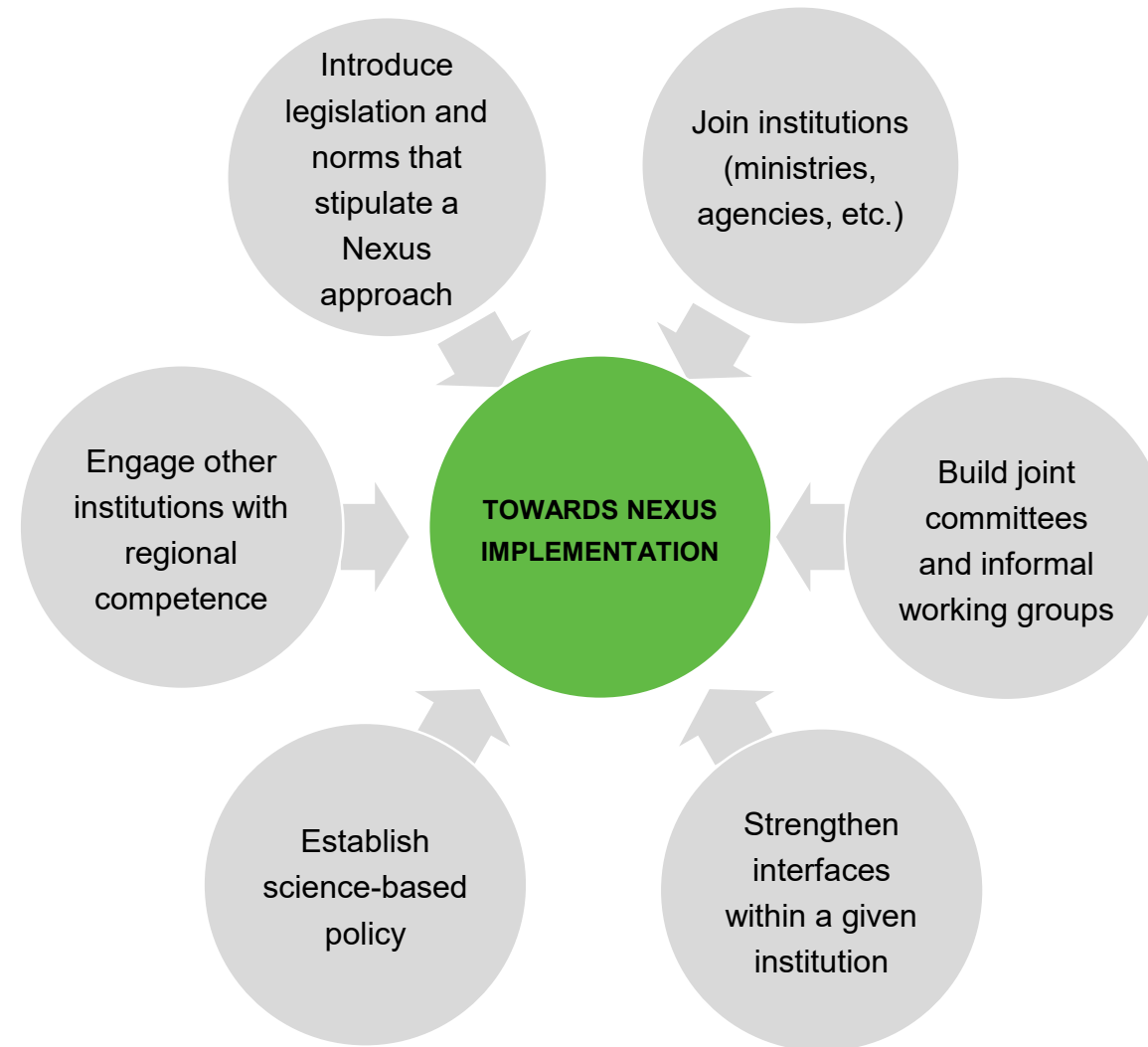
Source: Berga et al. 2017.

Ringler et al 2019



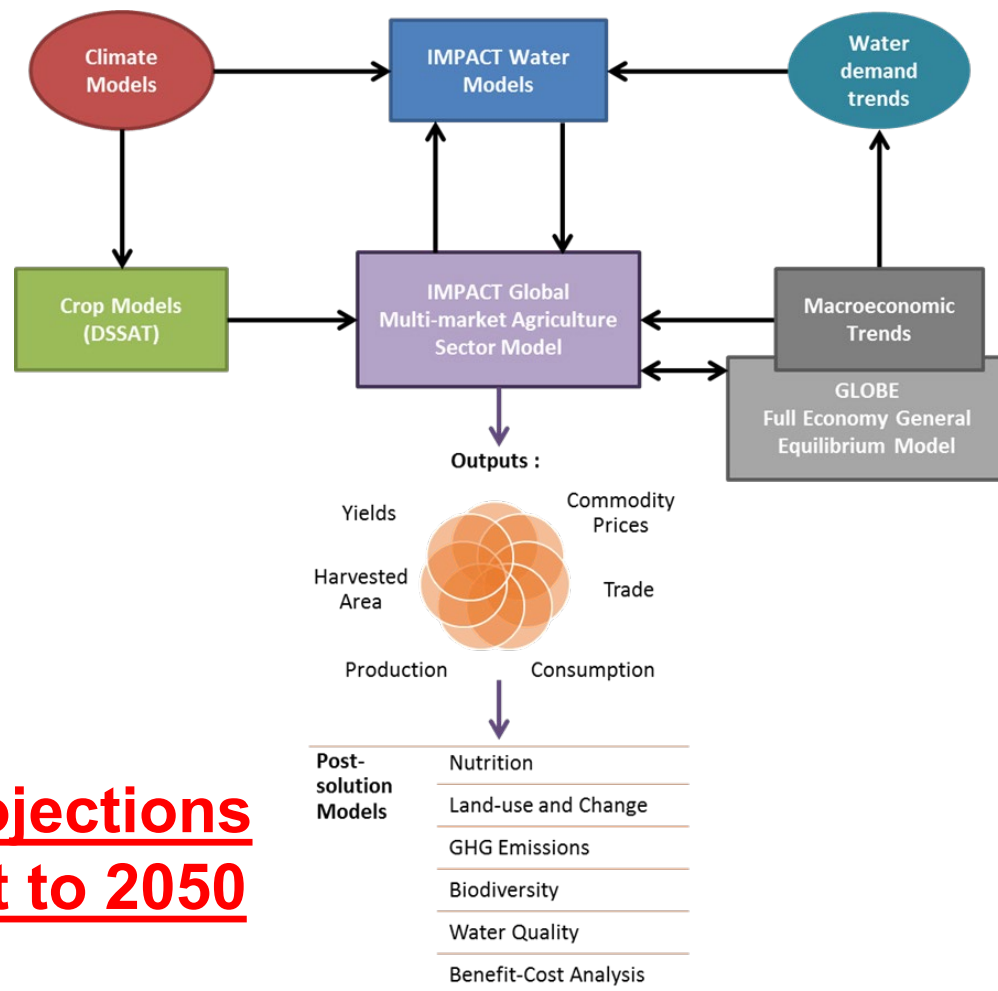
Potential for Nexus Solutions at National Level

Possible measures for Nexus implementation at National Level

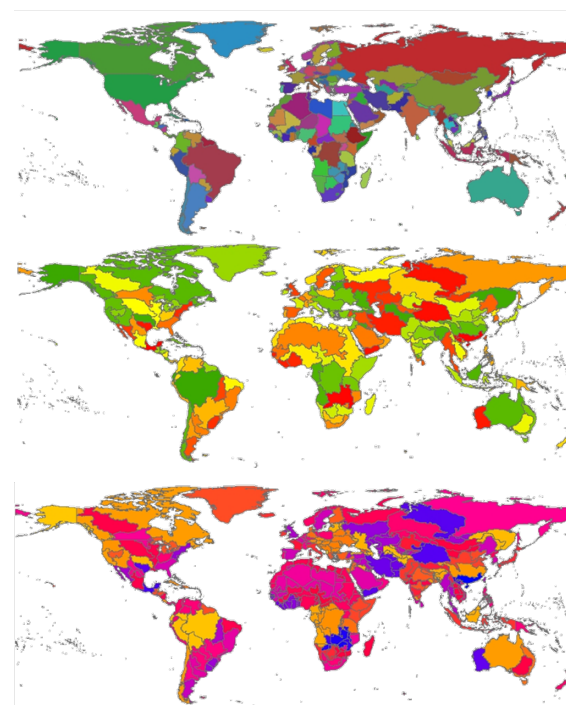


Modeling-based WEF solutions are critical for sound policy making and investment decisions

Example: Quantitative Foresight Modeling – IFPRI's IMPACT Model



- Linked climate, water, crop and economic models



159

• Countries

154

• Water Basins

320

• Food Production Units

- Estimates of production, consumption, hunger, and environmental impacts

Projections
out to 2050

Main take-away messages

- The WEF sectors are closely related and **integrated nexus solutions are usually more effective**. In fact, single-mindedly pursuing individual goals may interfere with other goals.
- **Regional collaboration** around WEF and shared resources is important but is not happening enough.
- At country levels, opportunities for a WEF nexus approach exist at **institutional, legislative, policy and scientific levels**.
- We need to move from declarations (e.g. G20 AMM Declaration 2017) to **concrete commitments and implementation**.