From Science to Policy

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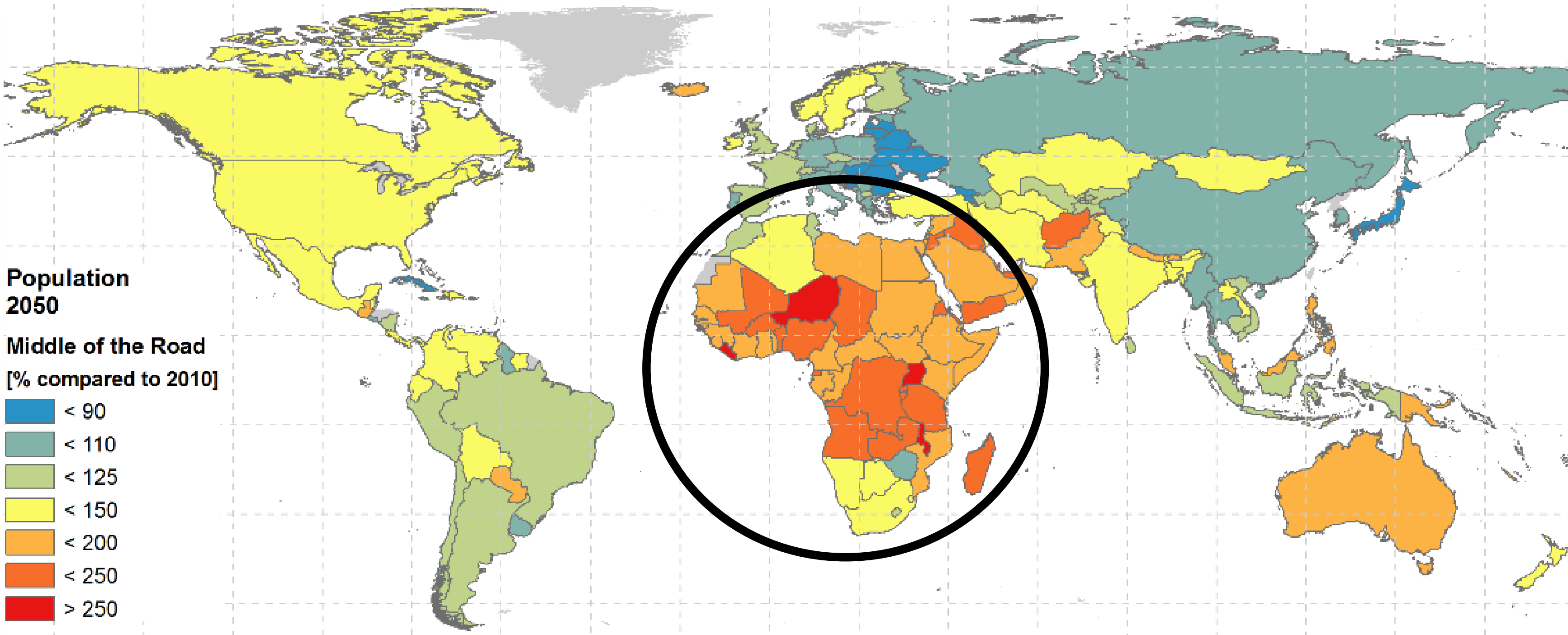
Science to policy elements

- Provide best available evidence
- Diagnostic- scale and magnitude of the problem
- Develop scenarios
- Targets and pathways
- Possible options for the future
- Understanding synergies and trade-offs

Population and Development continues



Middle of the Road future scenario

33% more people by 2050 compared to 2010 globally
(6.8 billion to 9.1 billion)

At the same time rural to urban 54-64 % and growth of mega cities, >10 million people

Africa

Pop:	1.0 to 2.0	2 times more
GDP:	2.8 to 19.2	7 times more
GDP pc:	2.7 to 9.5	3.5 times more

Population in [billion]
GDP [1000 billion US$/yr]
GDP per cap (PPP) in [1000US$/cap/yr

Context: Global and national frameworks

Policy

- Sustainable Agenda 2030 and the Sustainable Development Goals (SDG's)
- Addis Ababa Agreement
- Paris Agreement
- Sendai Framework

The 17 Sustainable Goals

World Economic Forum 2017
Top 5 Global Risks in Terms of Impact

http://reports.weforum.org/global-risks-2017/the-matrix-of-top-5-risks-from-2007-to-2017/

2013	2014	2015	2016	2017
Major systemic financial failure	Fiscal crises	Water crises	Failure of climate-change mitigation and adaptation	Weapons of mass destruction
Water supply crises	Climate change	Rapid and massive spread of infectious diseases	Weapons of mass destruction	Extreme weather events
Chronic fiscal imbalances	Water crises	Weapons of mass destruction	Water crises	Water crises
Diffusion of weapons of mass destruction	Unemployment and underemployment	Interstate conflict with regional consequences	Large-scale involuntary migration	Major natural disasters
Failure of climate-change mitigation and adaptation	Critical information infrastructure breakdown	Failure of climate-change mitigation and adaptation	Severe energy price shock	Failure of climate-change mitigation and adaptation

Economic Environmental Geopolitical Societal Technological

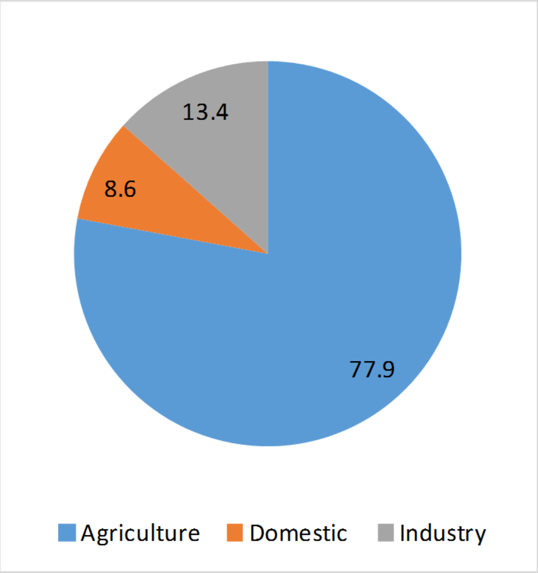
Need credible evidence base

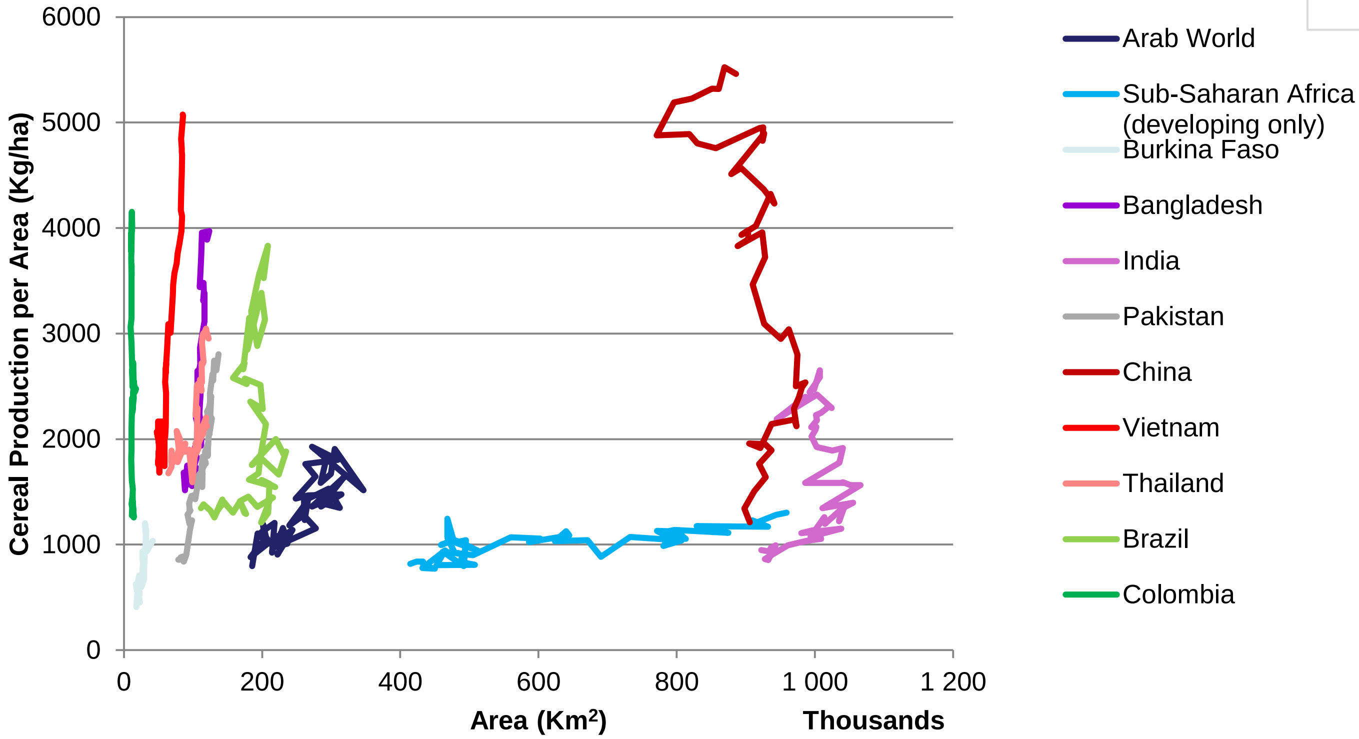
- **To convince**:
  - Investors
  - Policy
  - Practitioners

- **Evidence**
  - Experiments
  - Pilots
  - Monitoring and evaluation
  - Field days
  - Policy briefs
  - Publications

All of these input to achieving development and balancing societal and ecosystem needs in a sustainable manner

To feed more people, sustainably, need to increase productivity





Courtesy Simon Cook

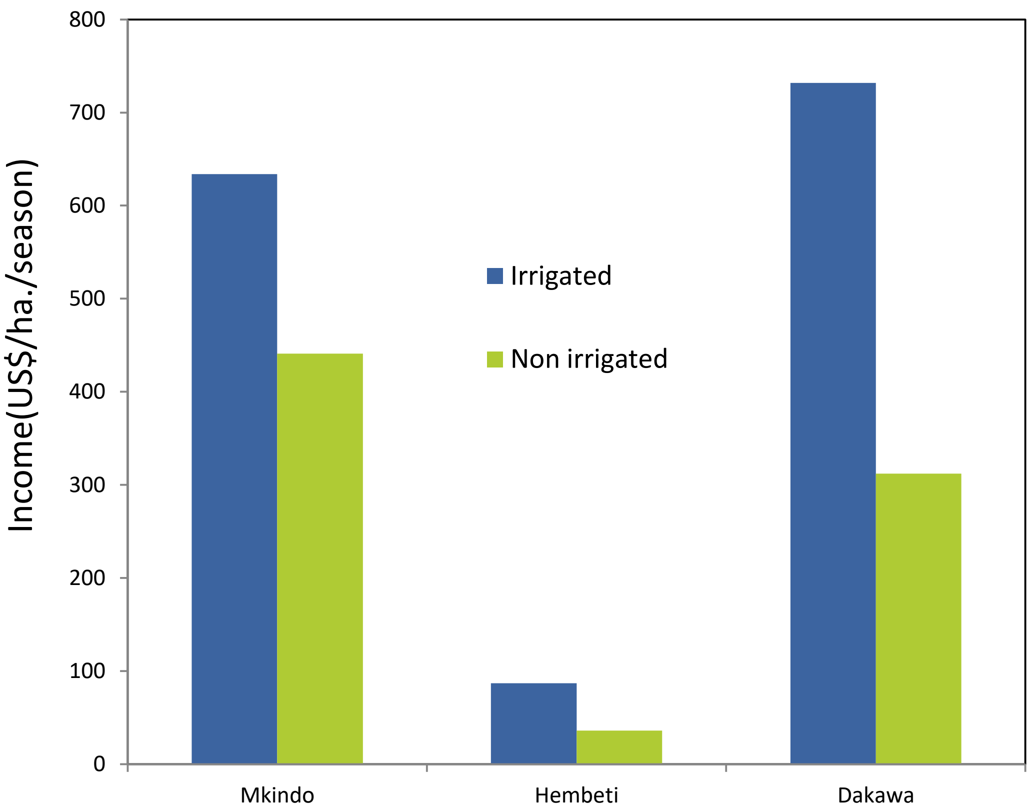
- more crop per drop in irrigated and rainfed systems

Small Scale Irrigation Progress : Moderate-growing evidence base

- Community managed river diversions increase yields and incomes

- Provides incomes when farmers need it most

Opportunities may be framed by biophysical setting but objective is economic development And reducing poverty/ hunger.



International Water Management Institute

Provide additional income when farmers need it most

- Ethiopia,
  - On average, generates revenue of 1586 dollars/ha
  - High labor employment/ha
  - Lead to input intensification
- Burkina Faso,
  - 94% of vegetable production is sold at local markets, generating revenue of US$350 per 0.1 hectare. Vegetable production increased in years when cereal yields were low.
- Ghana,
  - smallholder irrigation – primarily dry season vegetable cultivation - adds between USD175 to 840 to household income.

Irrigation and waste water

- While planning for reuse, do not forget the area under informal irrigation already using raw or diluted wastewater.
- In SSA, each major city has 30 - 650 ha of inner-urban irrigated farming and often > 10,000 ha in the peri-urban fringe.
- Many countries have more hectares under this "informal" irrigation than in "formal" irrigation schemes

IWMI International Water Management Institute

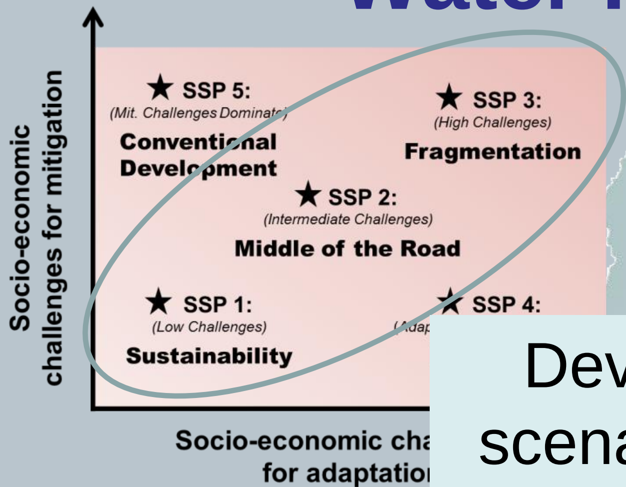
Benefits of informal reuse

- The informal wastewater sector supplies up to 90% of the most perishable vegetables consumed in the cities.
- It supports many livelihoods (poor migrant farmers, women dominate >95% vegetable marketing).
- Year-round irrigation allows an income of urban farmers above the poverty line.
- Women (traders) can earn more than men (farmers).

Risks of informal reuse

- In urban Ghana, **every day** over 700,000 people consume in streets raw vegetables together with other fast food.
- The main health risks derive from **pathogens** in domestic wastewater (→ excreta)
- Industrial pollution and heavy metal risks are more localized in most parts of SSA
- Of main concern are **exotic leafy vegetables** which are consumed raw.

Water Futures: Scenarios



SSP1: The world is moving toward sustainability

SSP characteristics

- Improved resource use efficiency
- More stringent environmental regulations
- …ge is
- …entally
- …mmons

Implications for Manufacturing Water Use:

- Manufacturing industries with efficient water use and low environmental impacts are favored.
- Enhanced treatment, reuse of water, and water-saving technologies;
- Widespread application of water-saving technologies in industry

Development of scenarios needs to be interactive between science and policy to get priorities and ownership

…le 3 Qualitative technological changes on water use intensities in the domestic and industry sectors …ording to HE-regions.

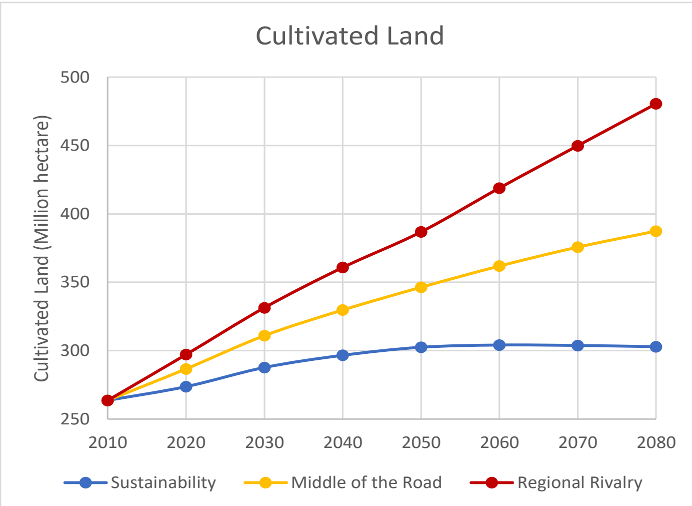
			L		M		H		M	
		socio-economic capacity	poor		rich		Rich		Poor	
		hydro-climatic complexity	low		low		high		high	
			HE-1		**HE-2**		**HE-3**		**HE-4**	
	SSP1	Sustainability Quest (SSP dominant)	HL	B	HM	B	HH	A	HM	B
M	**SSP2**	Business as Usual (SSP as HE)	ML	D	MM	C	MH	B	MM	C
L	**SSP3**	Fragmentation (HE dominant)	LL	E	LM	D	LH	C	LM	D

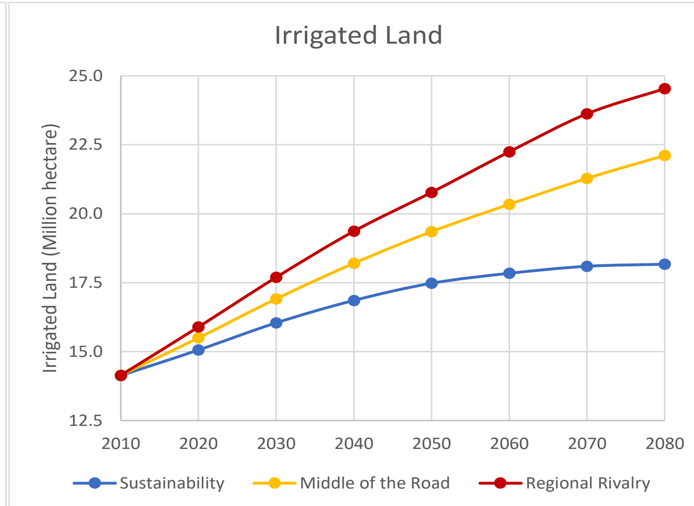
Table 4 Applied annual efficiency change rates as derived for different classes.

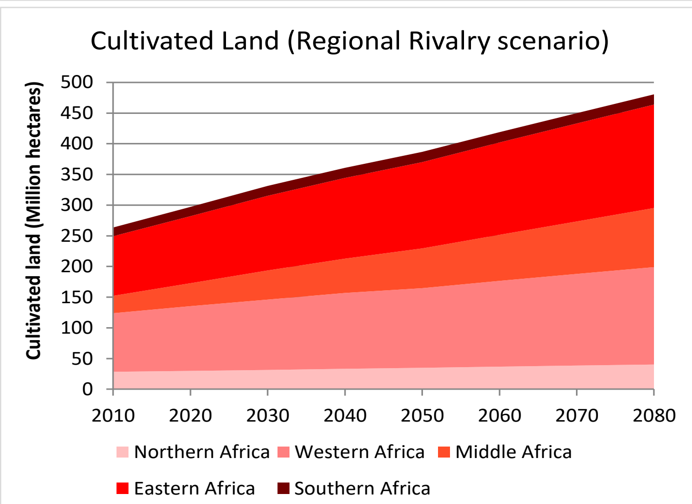
A	B	C	D	E
1.2%	1.1%	1%	0.6%	0.3%

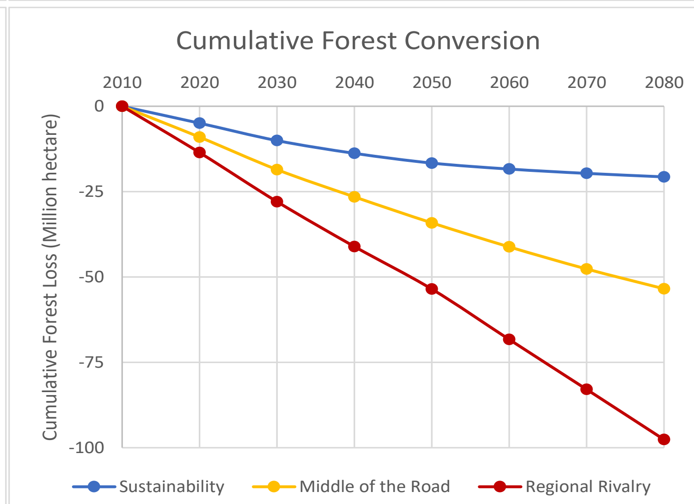
highest lowest

Changes in cultivated land – Africa







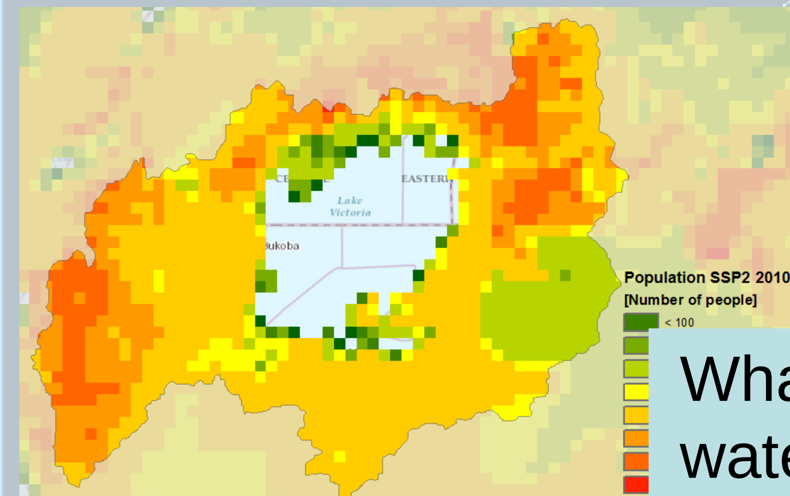


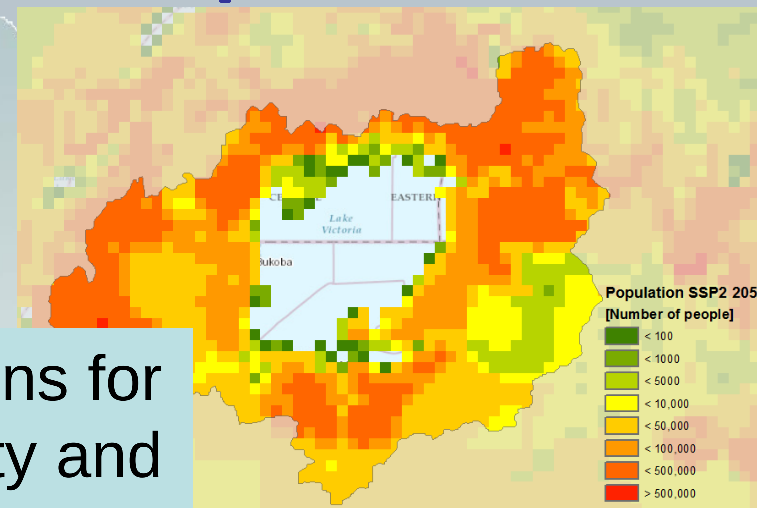
- Cultivate land will increase by 20-50% by 2050
- Irrigated land will increase by 25-40% by 2050
- African cropland expansion is likely to come with significant deforestation (20-54 m hectares by 2050)

Lake Victoria

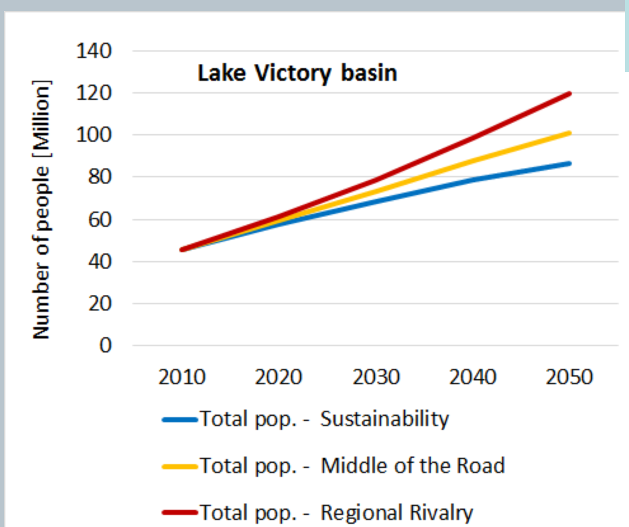
- Supports the world's largest freshwater fishery, with a total annual landed catch value estimated at around US$0.5 billion, supporting the livelihoods of 3 million people (World Bank, 2015).
- Lake and its catchment provide 90% of Uganda's hydro power and most of the hydro power for Rwanda and Burundi
- Water supply to major urban centers including Kampala, Entebbe, Kisumu, Mwanza.
- Expansion of sewer systems that discharge wastewater untreated into surface waters leads to poor water quality

Socio-economic change -Population





What implications for water availability and water quality?



toria basin

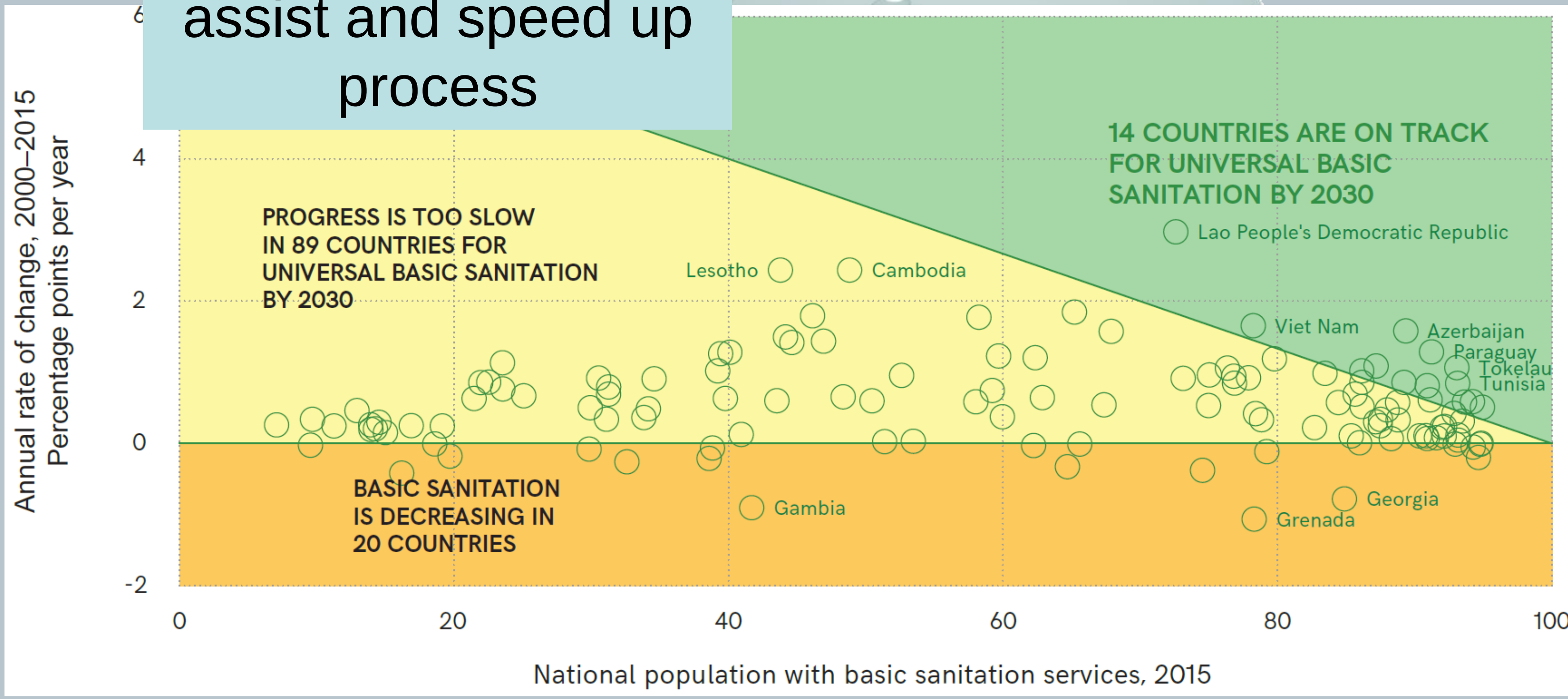
From 46 Mio. people in 2010 to 87 – 120 Mio. people in 2050
(+ 90% - 260% depending on scenario)

LVBC Strategy 2016 - 2021:

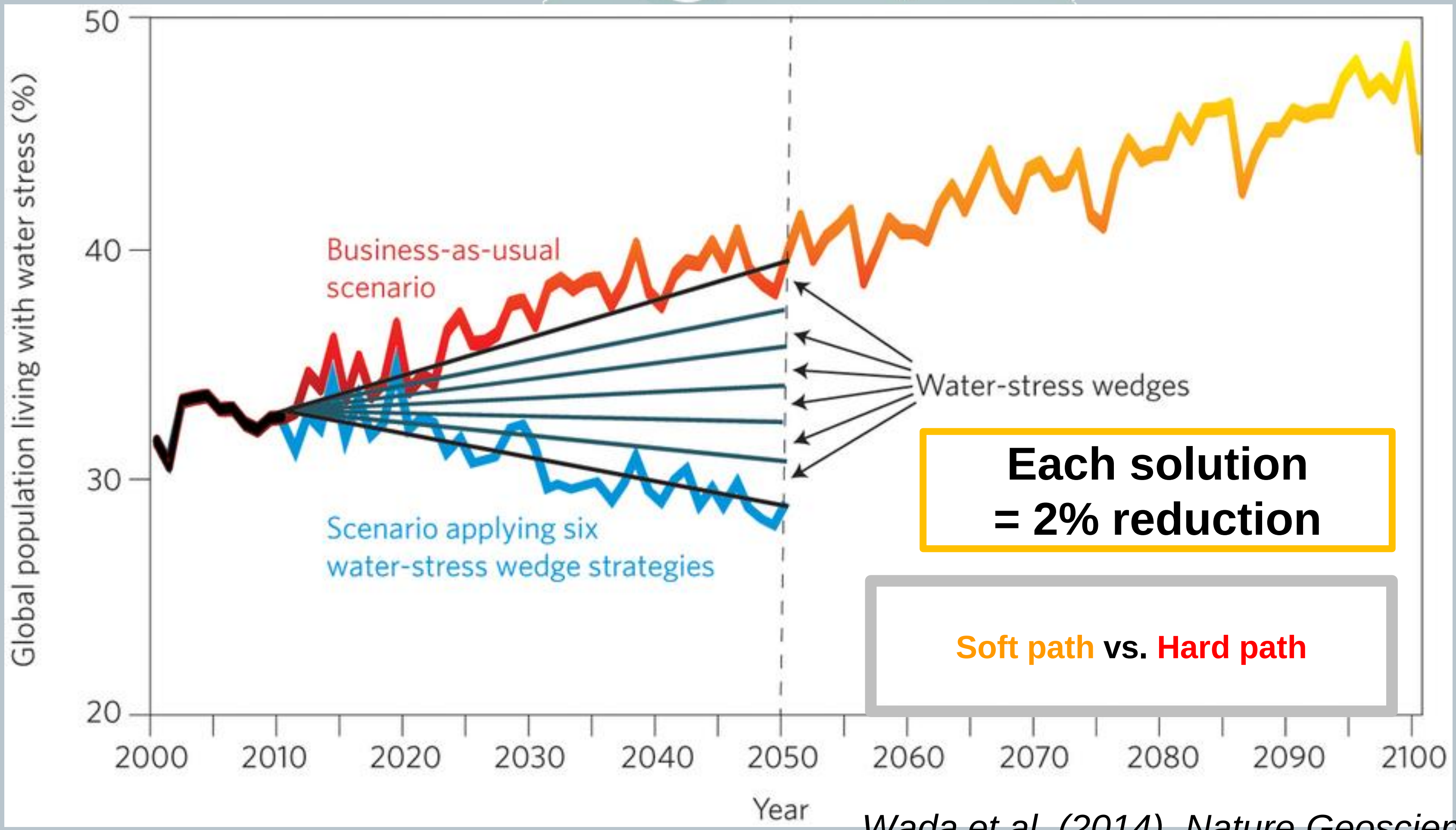
From 44.9 m people in 2015 to 59.5 m people in 2025

Progress towards SDG6.2 universal basic sanitation by 2030

Need Solutions to assist and speed up process



Solutions to water stress: Wedge approach



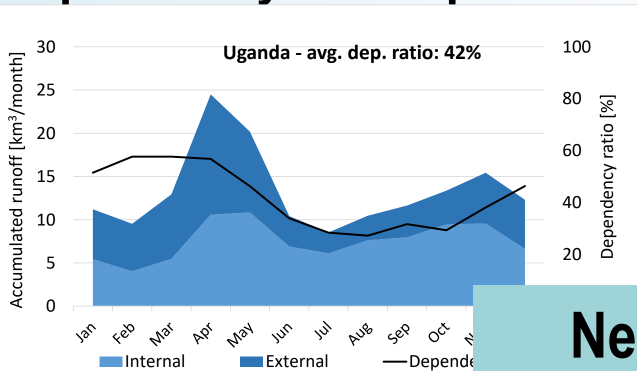
Each solution = 2% reduction

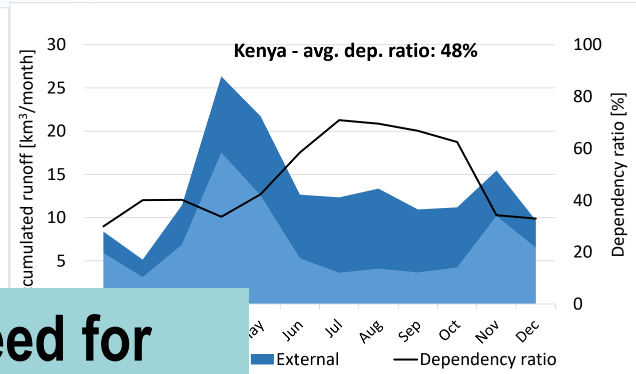
Soft path vs. Hard path

Wada et al. (2014), Nature Geoscience

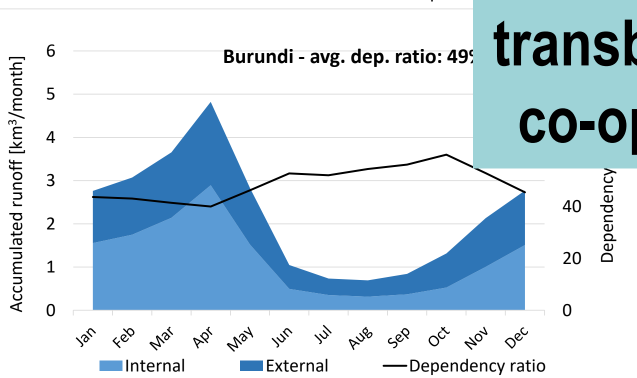
Transboundary dependency of water resources

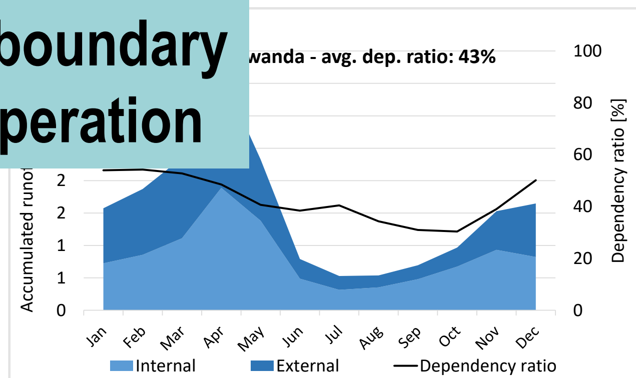
Dependency from upstream countries:

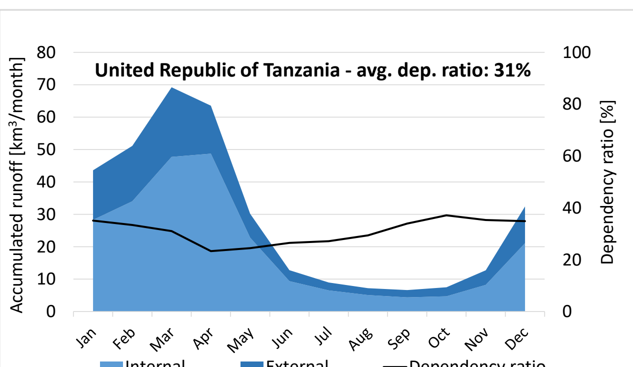


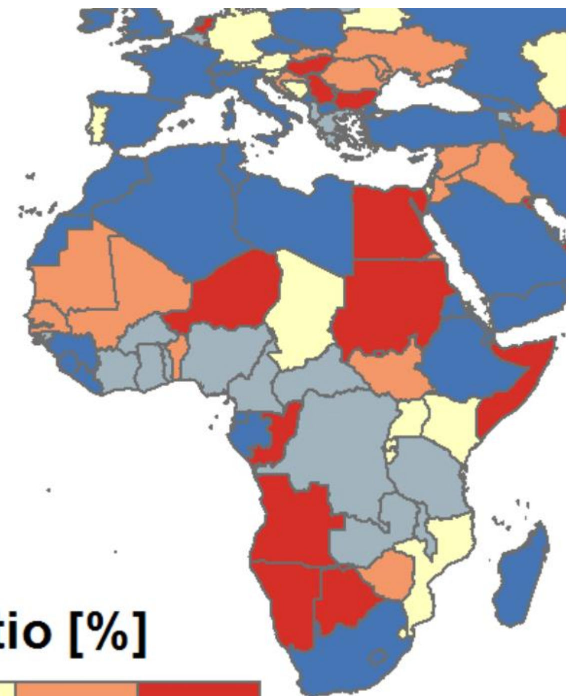


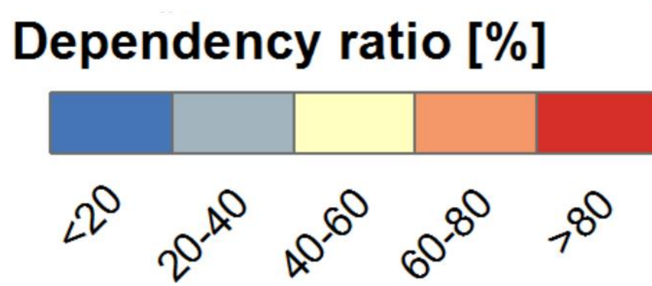
Need for transboundary co-operation











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- Provide best available evidence
- Economic, social and biophysical issues
- Diagnostic- scale and magnitude of the problem
- Develop scenarios
- Targets and pathways
- Possible options for the future
- Understanding synergies and trade-offs

Summary: Essential elements

- View as a process
- Build trust
- Provide evidence
- Be open as possible
- Communicate effectively
- Use existing frameworks
- Science and policy only part of the story

Thankyou

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