International Institute for Applied Systems Analysis
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science for global insight

Looking at the spatial and temporal distribution of global water availability and demand

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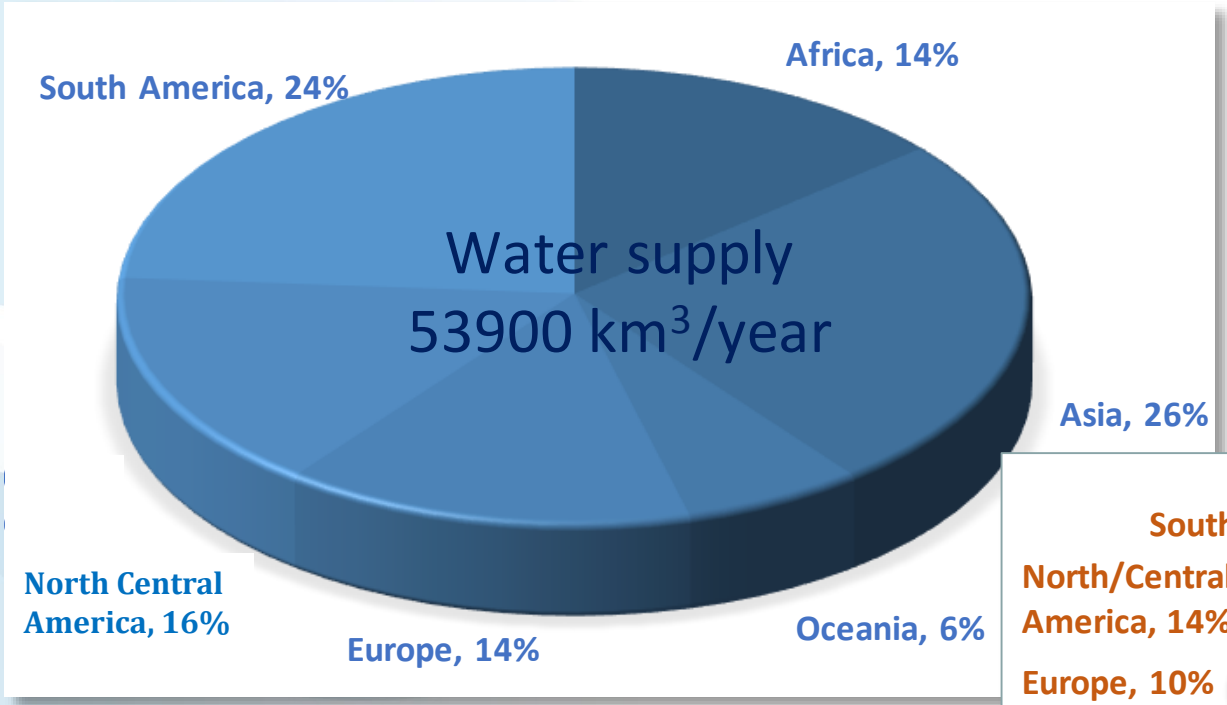
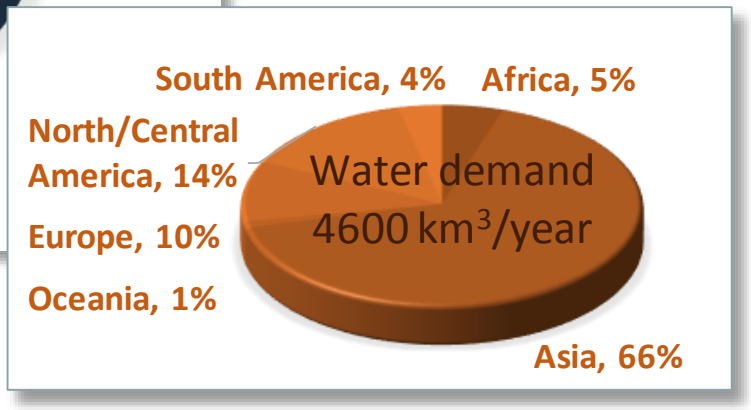
19th April, EGU 2016 Vienna

Session CL0.01/EOS8

Media Interdisciplinary Approaches in Climatic Change Research and Assessment

Half our planet's population are water insecure…





Humanity .

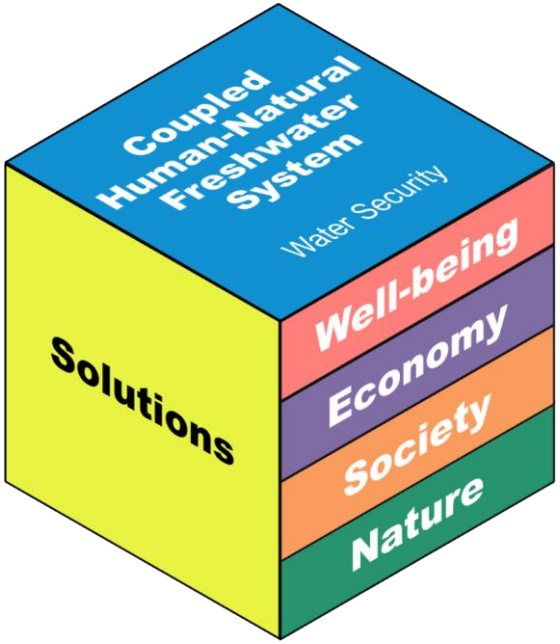
Lem, S. (1986) One Human Minute
writer of science fiction, philosophy

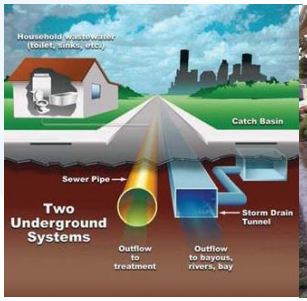
IIASA's
Water Future and Solution Initiative

Research Question:

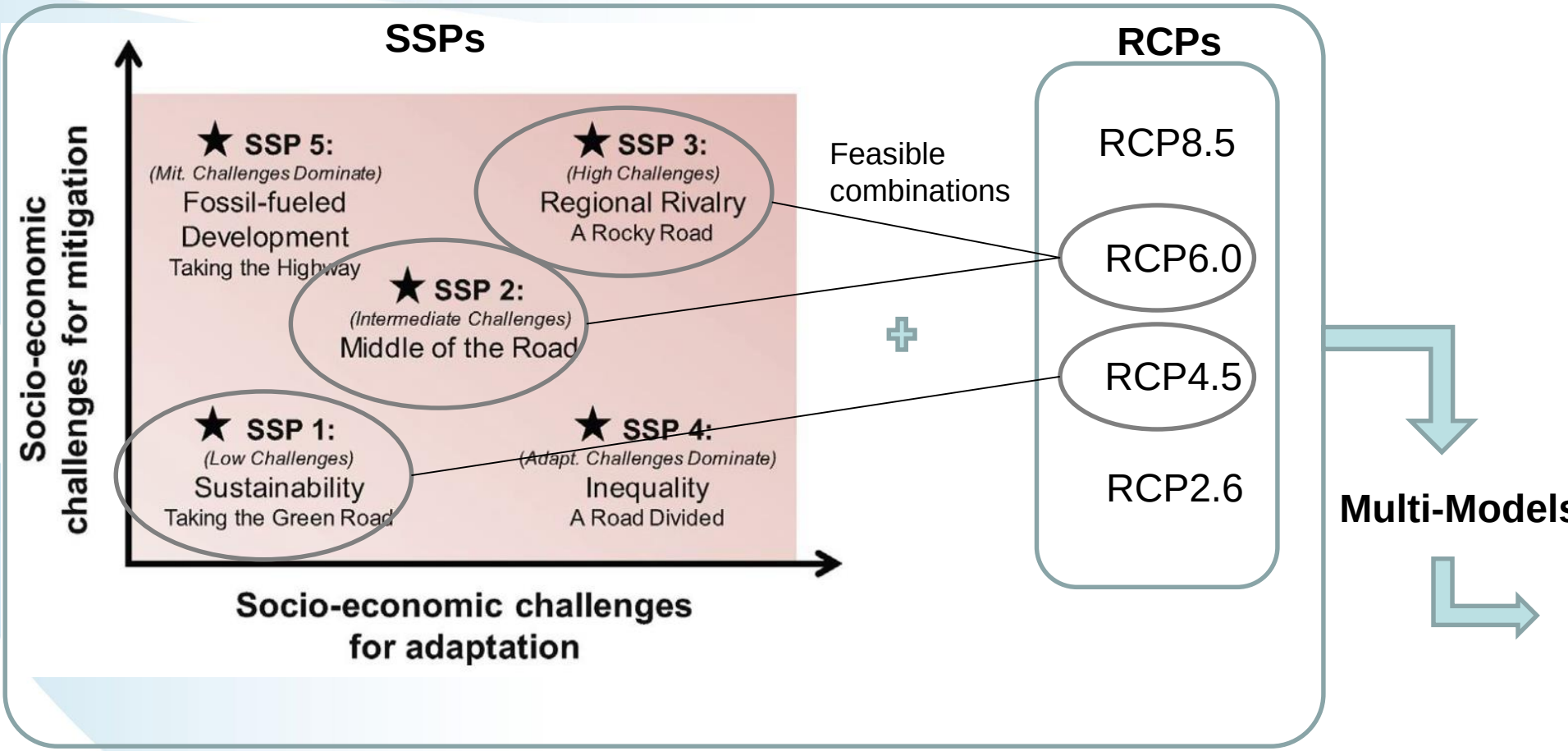
What water-related policies & practices can be implemented ***now***

that will be robust at ***improving*** *human well-being through* ***water security*** *across a wide range of* ***possible futures****?*





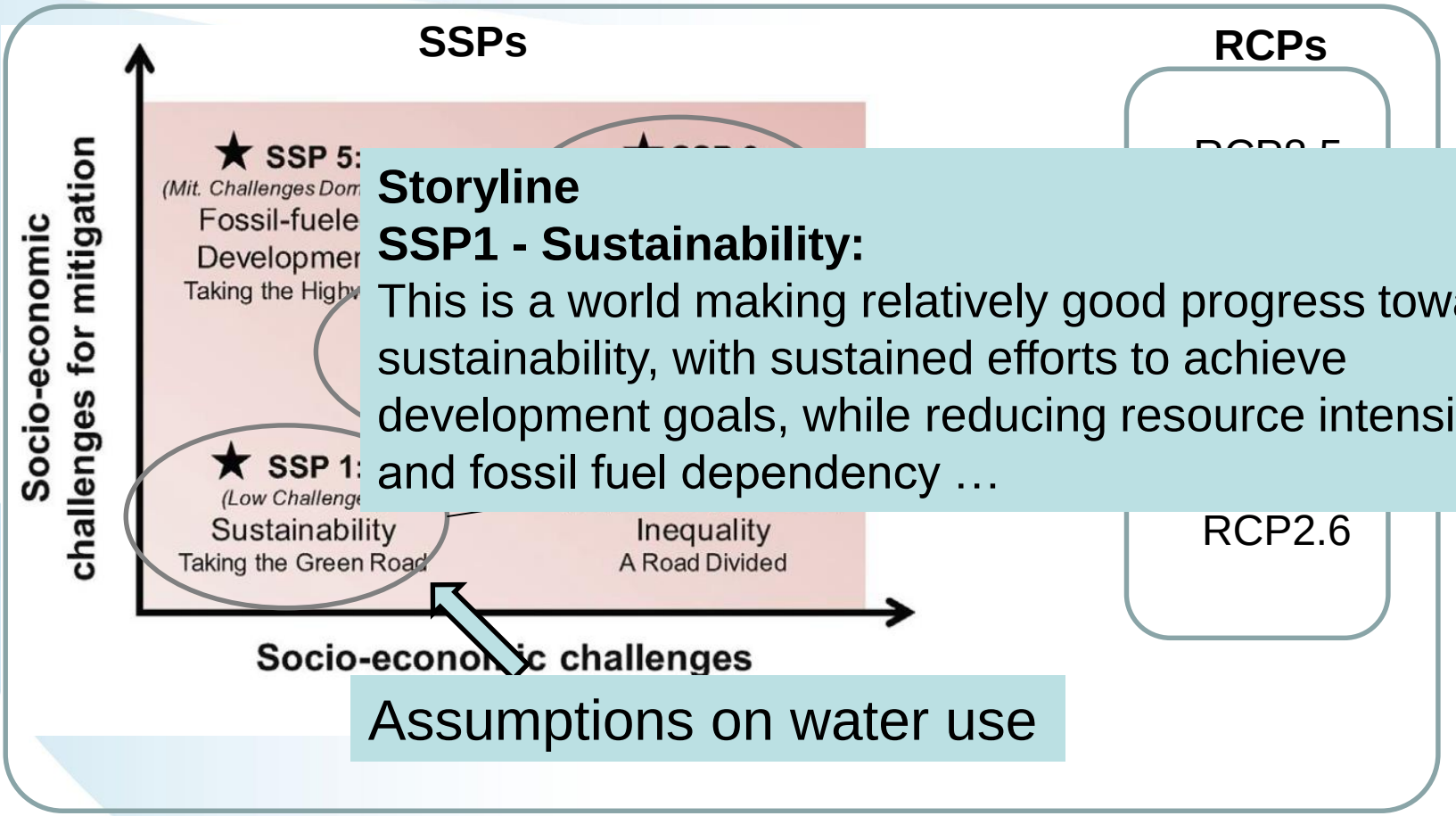
Water Future scenarios



① Socio-Economic change scenario:
Shared Socioeconomic Pathways (SSPs)

② Climate change scenario:
Representative Concentration Pathways (RCPs)

Water Future scenarios



① Socio-Economic change scenario:
Shared Socioeconomic Pathways (**SSPs**)

② Climate change scenario:
Representative Concentration Pathways (**RCPs**)

Water Futures: Scenarios

SSP1: The world is moving toward sustainability

SSP characteristics

- Improved resource use efficiency
- More stringent environmental regulations
- Rapid technological change is directed toward environmentally friendly processes
- Management of global commons improves.

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

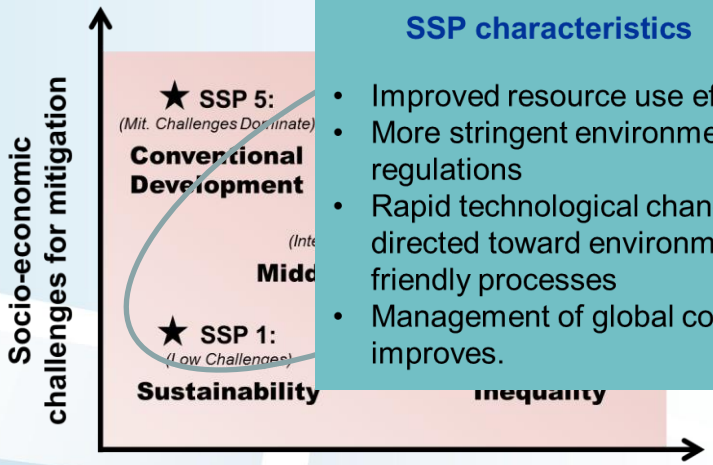


Table 3 Qualitative technological changes on water use intensities in the domestic and industry sectors according to HE-regions.

			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**	
H	**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.

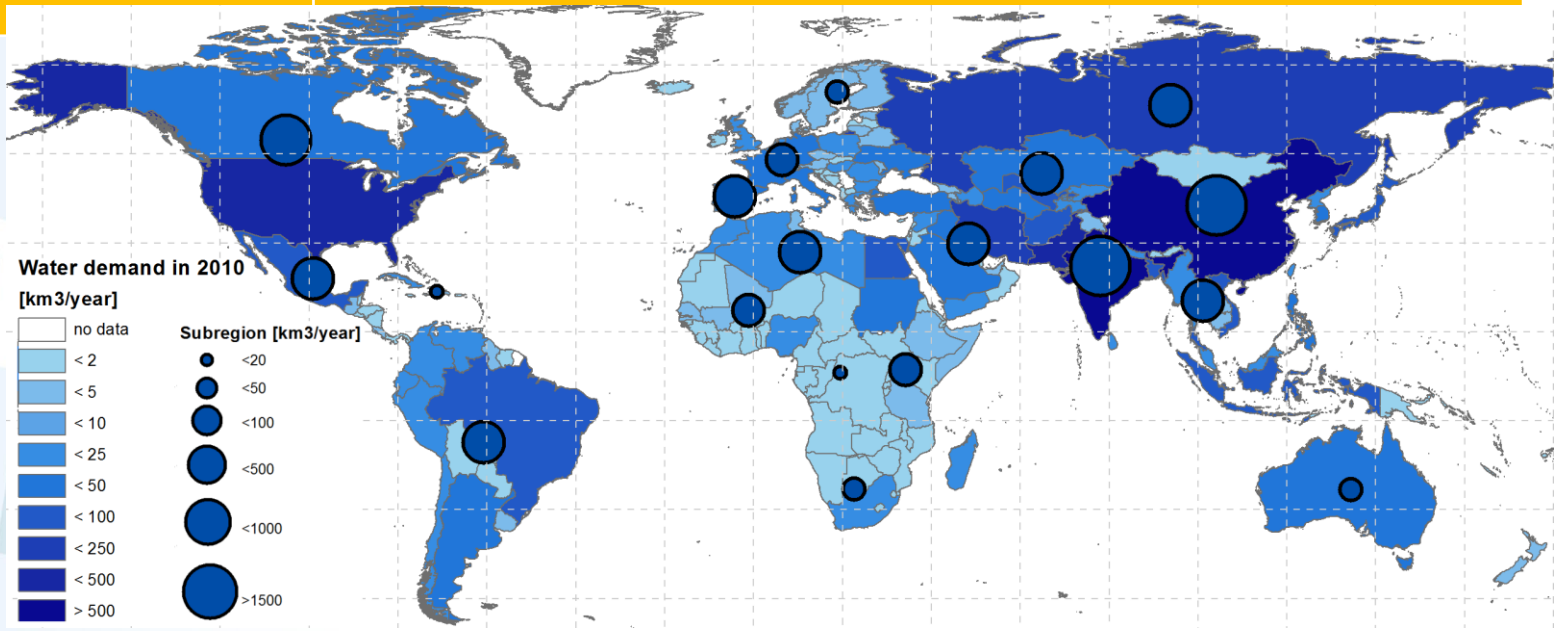
A	B	C	D	E
1.2%	1.1%	1%	0.6%	0.3%

highest lowest

Multi-model Assessment: Water Demand

Models	Institution
WaterGAP	Kassel University (Germany), Frankfurt University (Germany)
H08	National Institute for Environmental Studies (NIES, Japan)
PCR-GLOBWB	Utrecht University (The Netherlands)

ISI-MIP



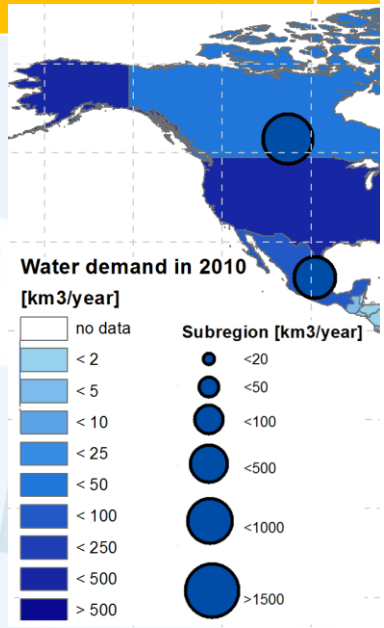
Wada Y, Floerke M, Hanasaki N, Eisner S, Fischer G, Tramberend S, Satoh Y, van Vliet M, Yillia P, Ringler C, Burek P. and Wiberg D (2015), Geoscientific Model Development

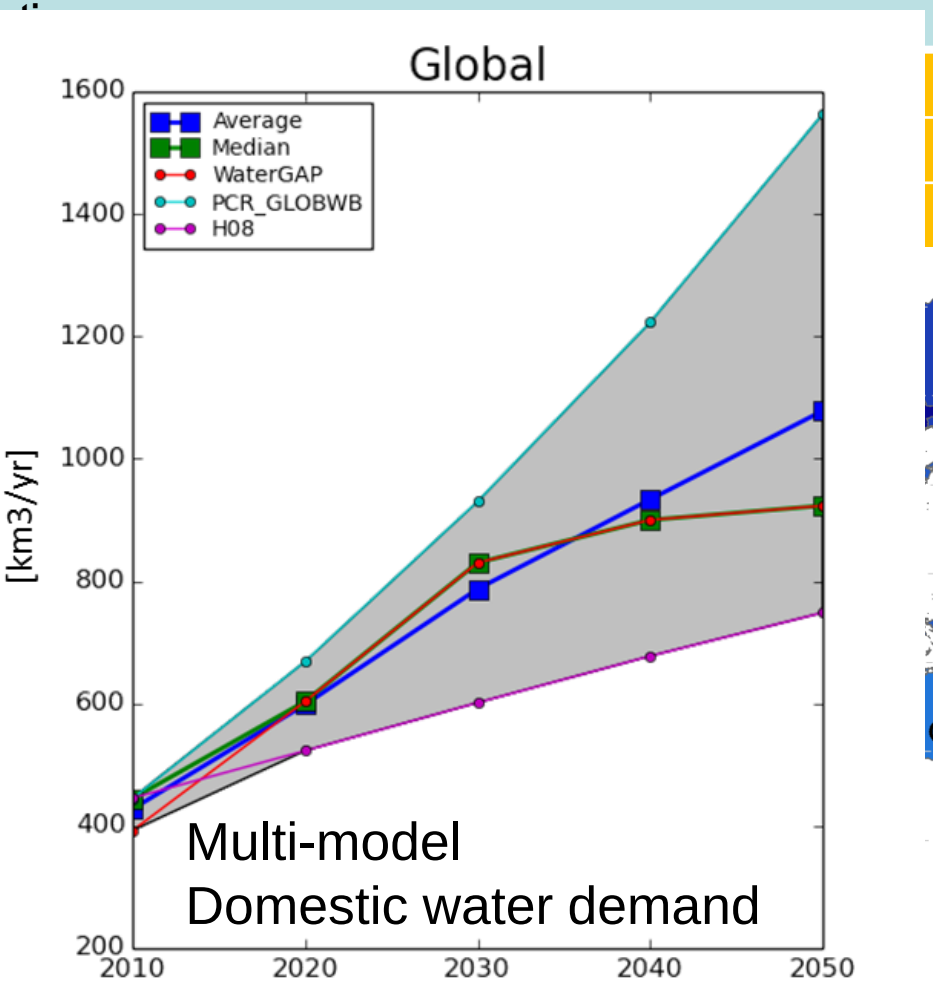
IIASA

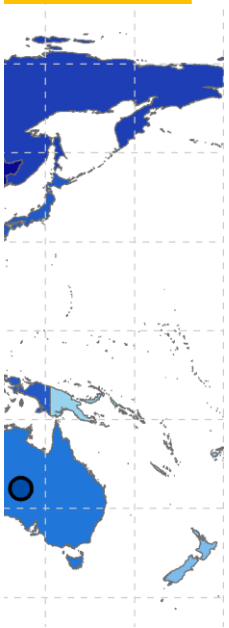
Approach

Multi-model Assessment: Water Demand

Models	Ins
WaterGAP	Kas
H08	Nat
PCR-GLOBWB	Utr







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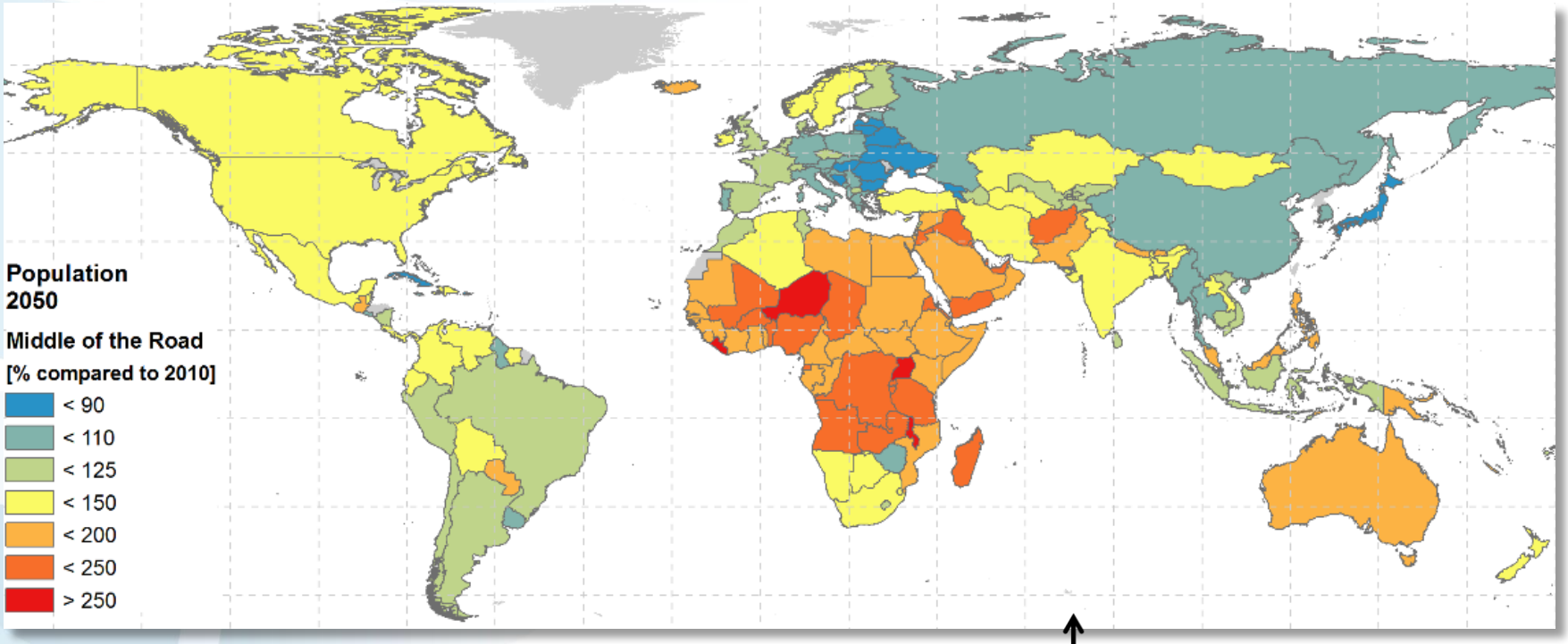
Approach

Results

WFaS fast track analysis

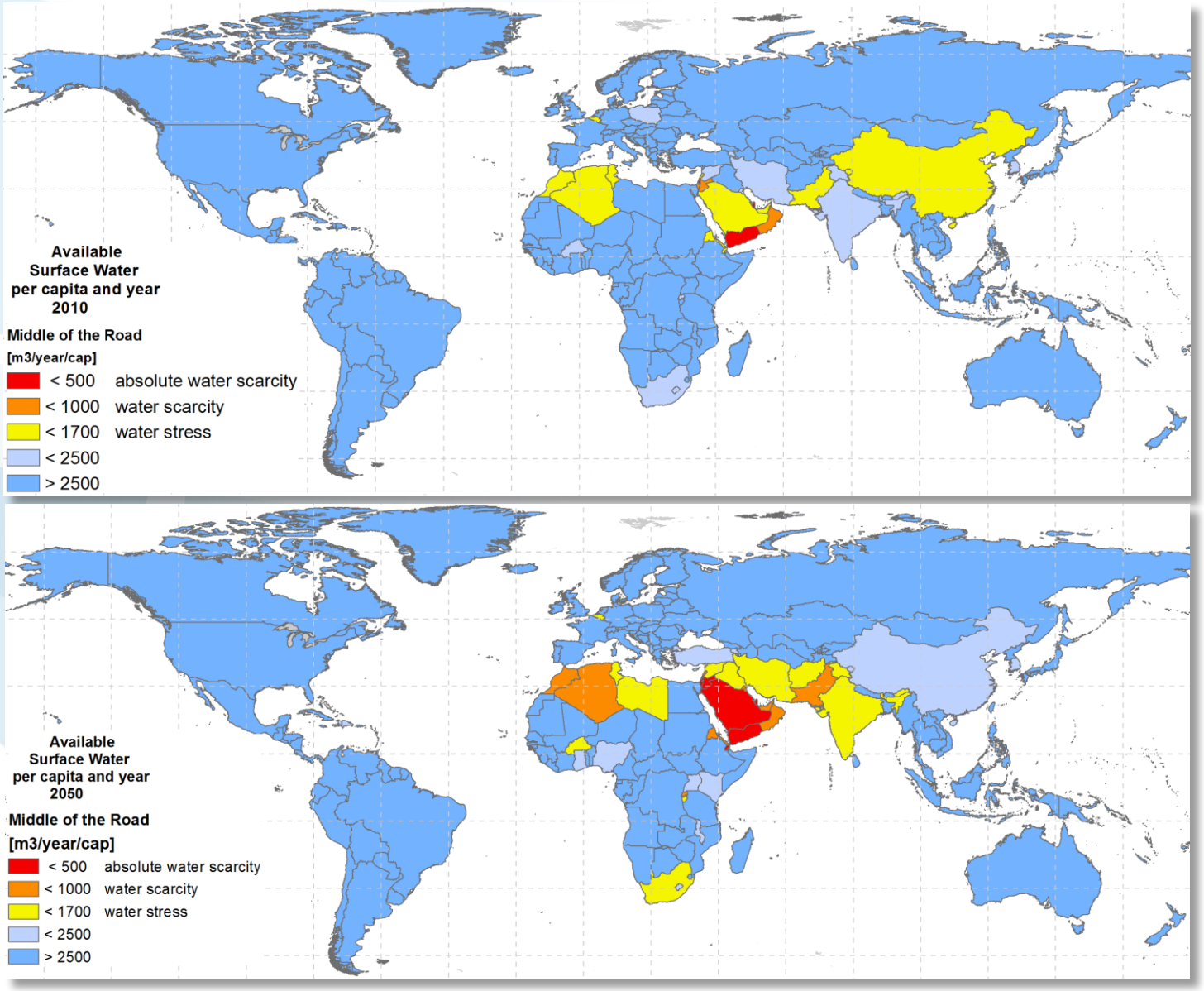
Population Growth Continues



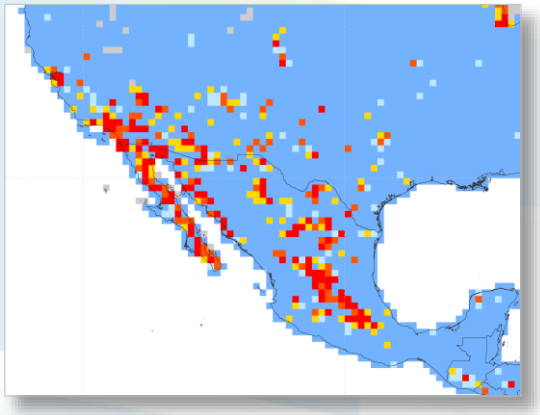
- 33% more people by 2050 compared to 2010 globally (6.8 billion to 9.1 billion)
- 24% more people by 2050 in Asia 4.1 billion to 5.1 billion

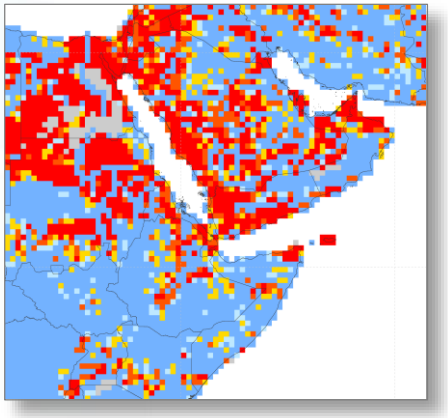
Middle of the Road scenario

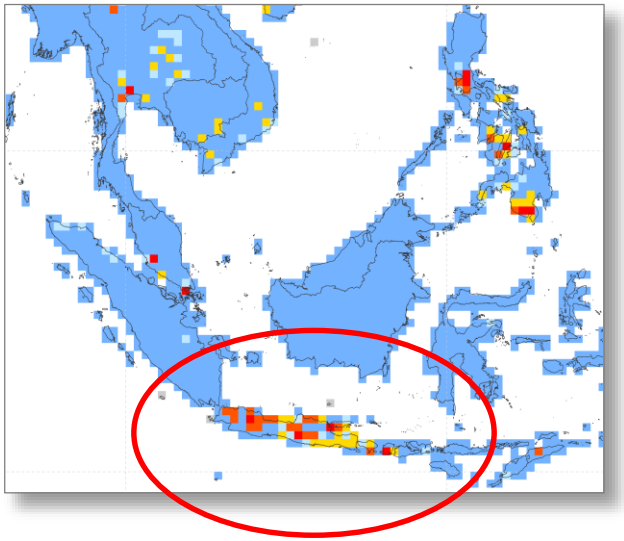
Available water resource per capita

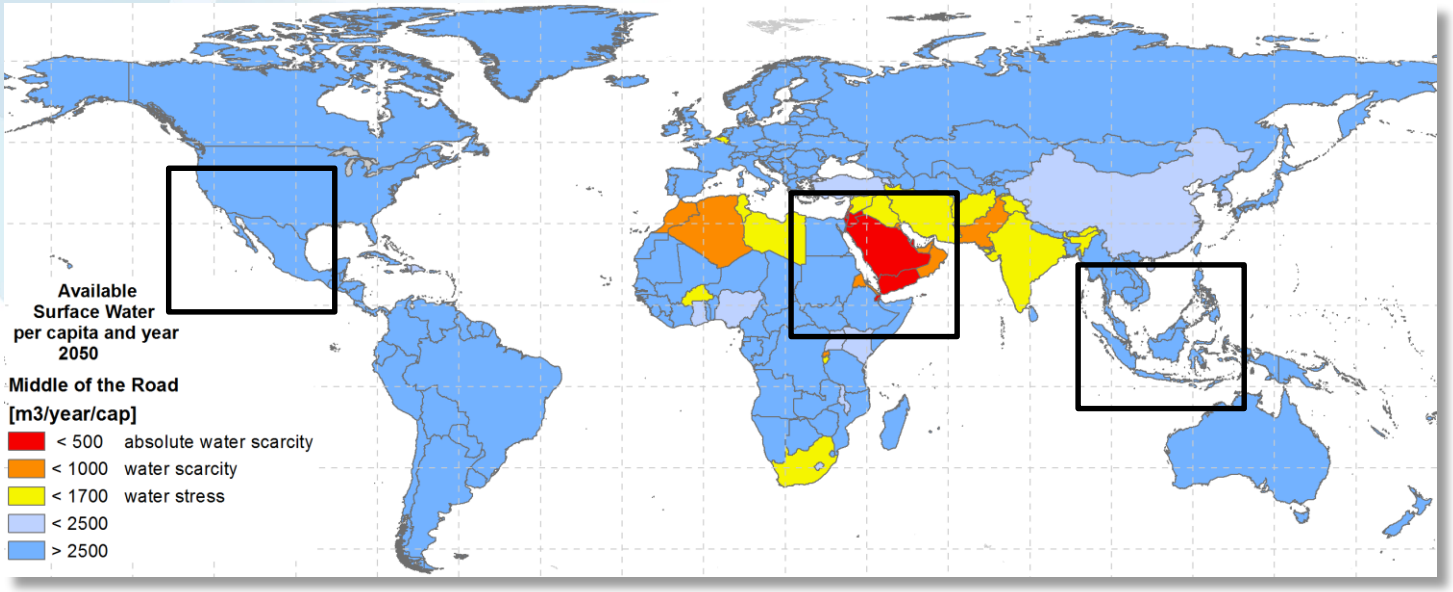


Available water resource per capita

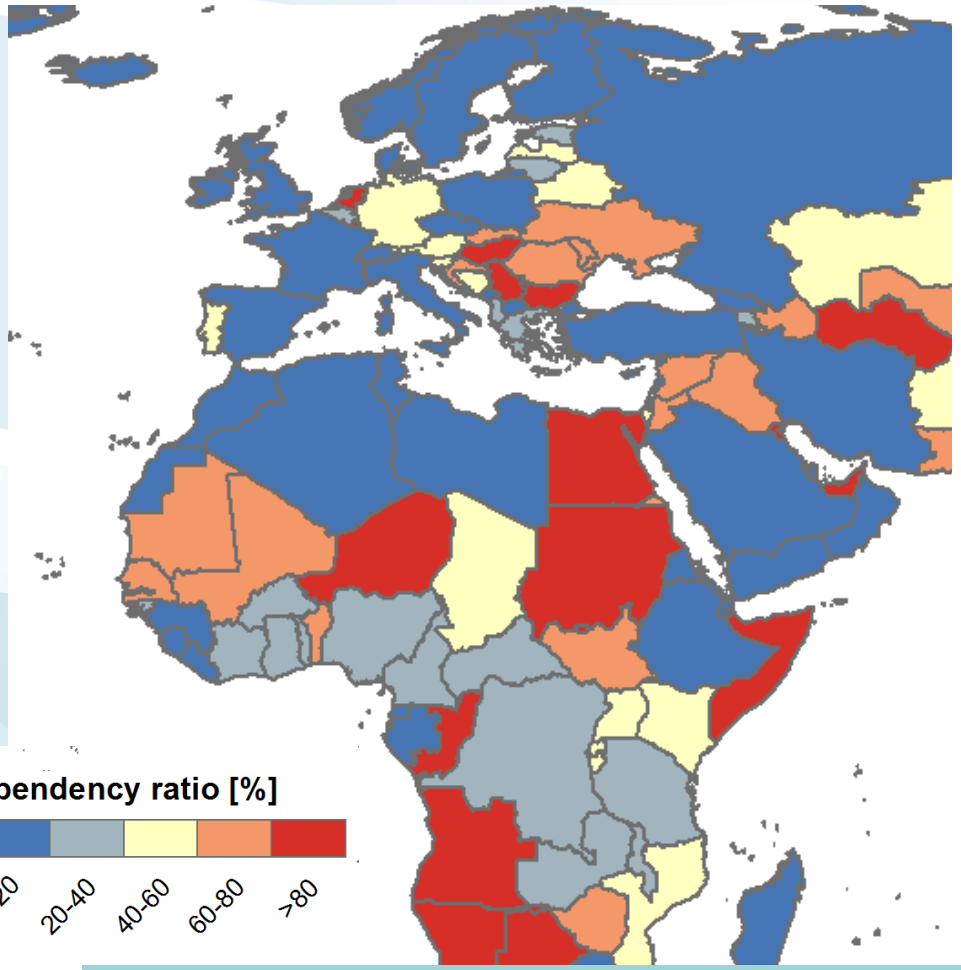


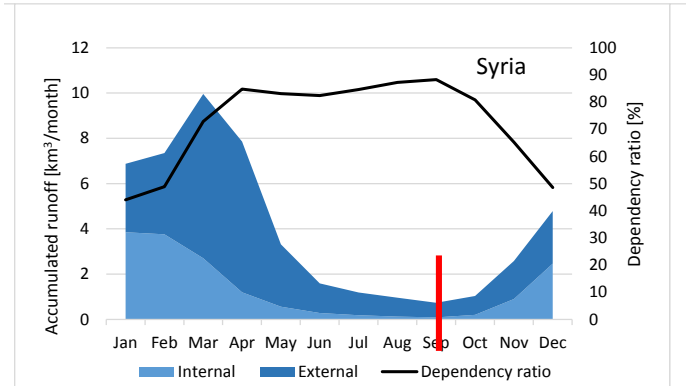


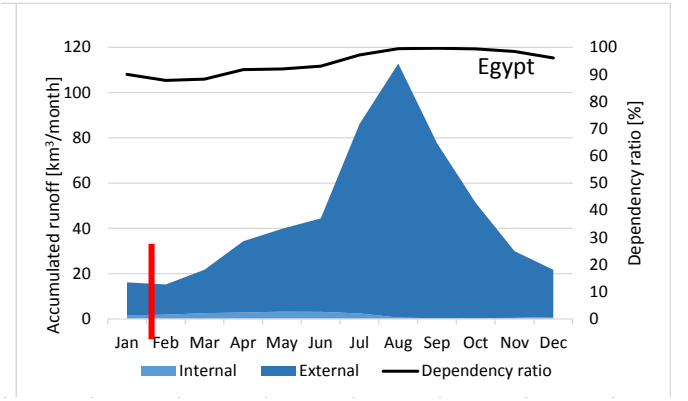


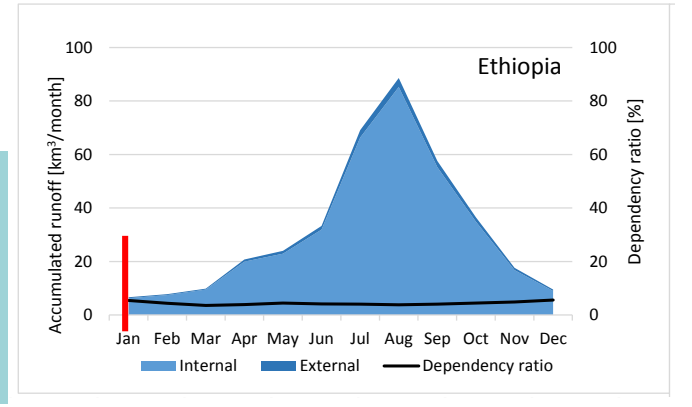


Seasonal water resources



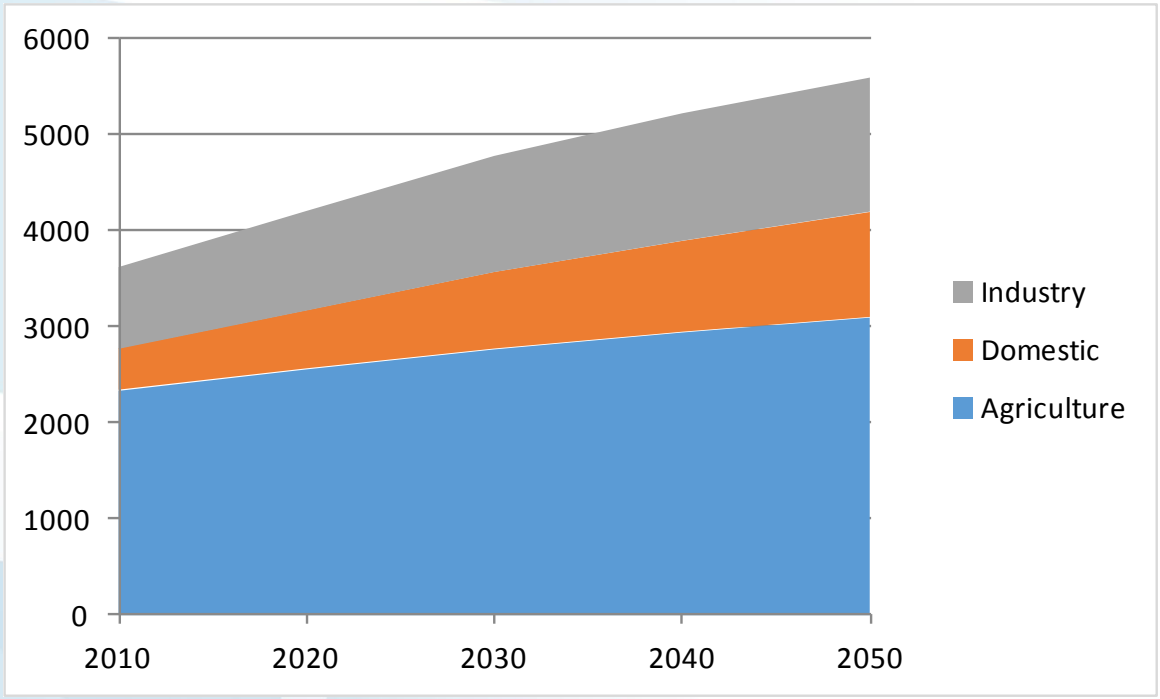


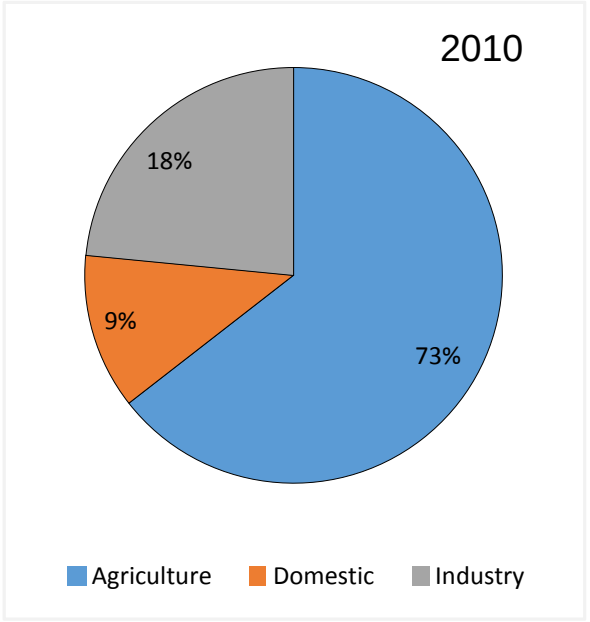




Dependency from upstream countries:
Ethiopia: 4%
Syria: 73%
Egypt: 94%

Water Demand – Middle of the Road





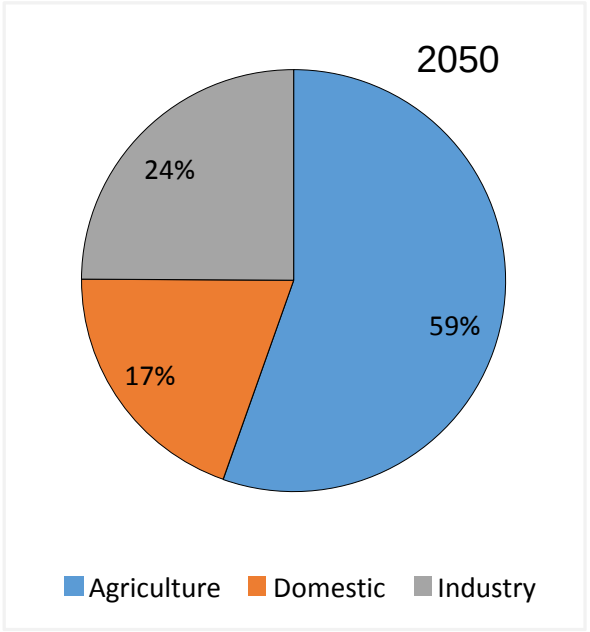
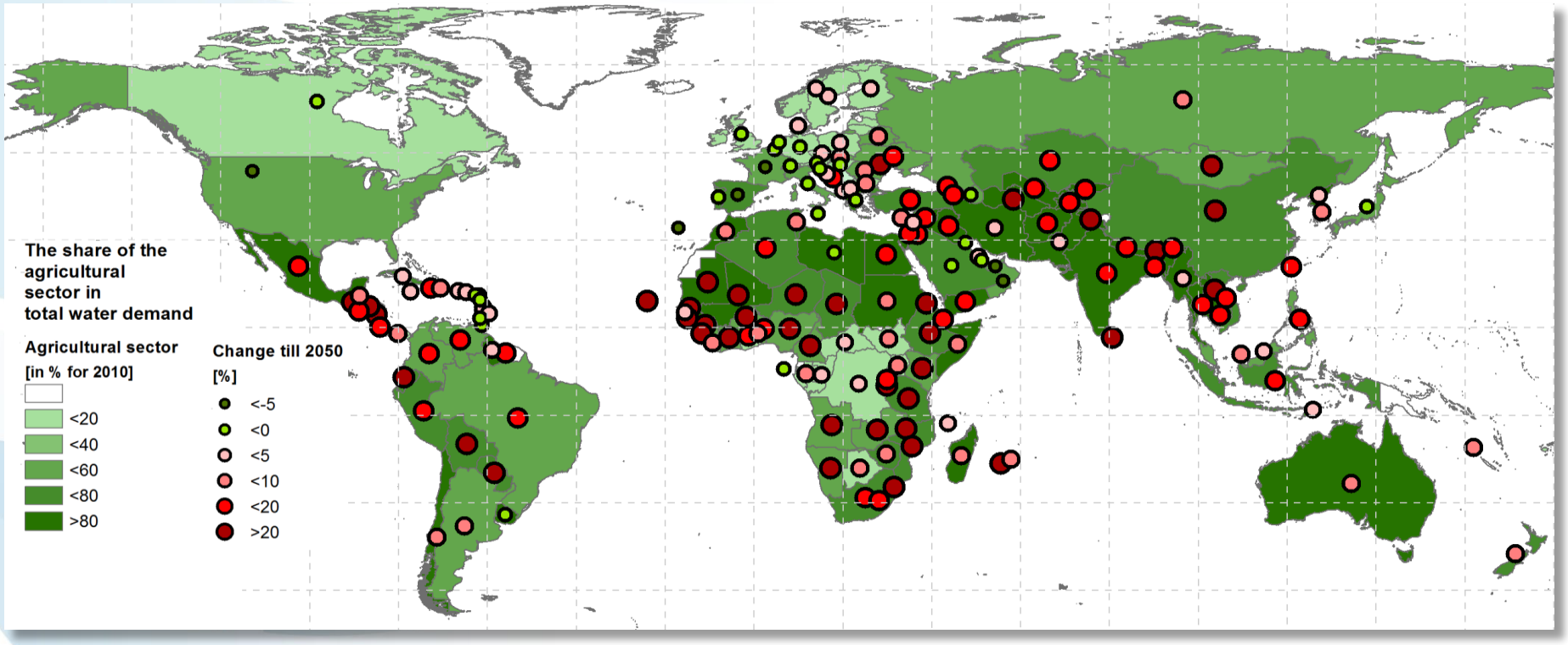


Figure: Global water demand, by sector (km^3/yr).

Note: The figure shows the estimated future total water demand (km^3/yr) by sector for *Middle of the Road* scenario and the sector-wise distribution of water demand in 2010 and 2050. In SSP2 in 2050, total global water demand increases by 27% above 2010. During this period the share of agriculture in total water demand drops from 73% to 59%.
(Note: In this projection the irrigation system efficiency is kept at base year level.)

Water Demand – Global Middle of the Road



The share of the agricultural sector in total water demand decreases from 73% to 59%

Water Demand – Global Middle of the Road

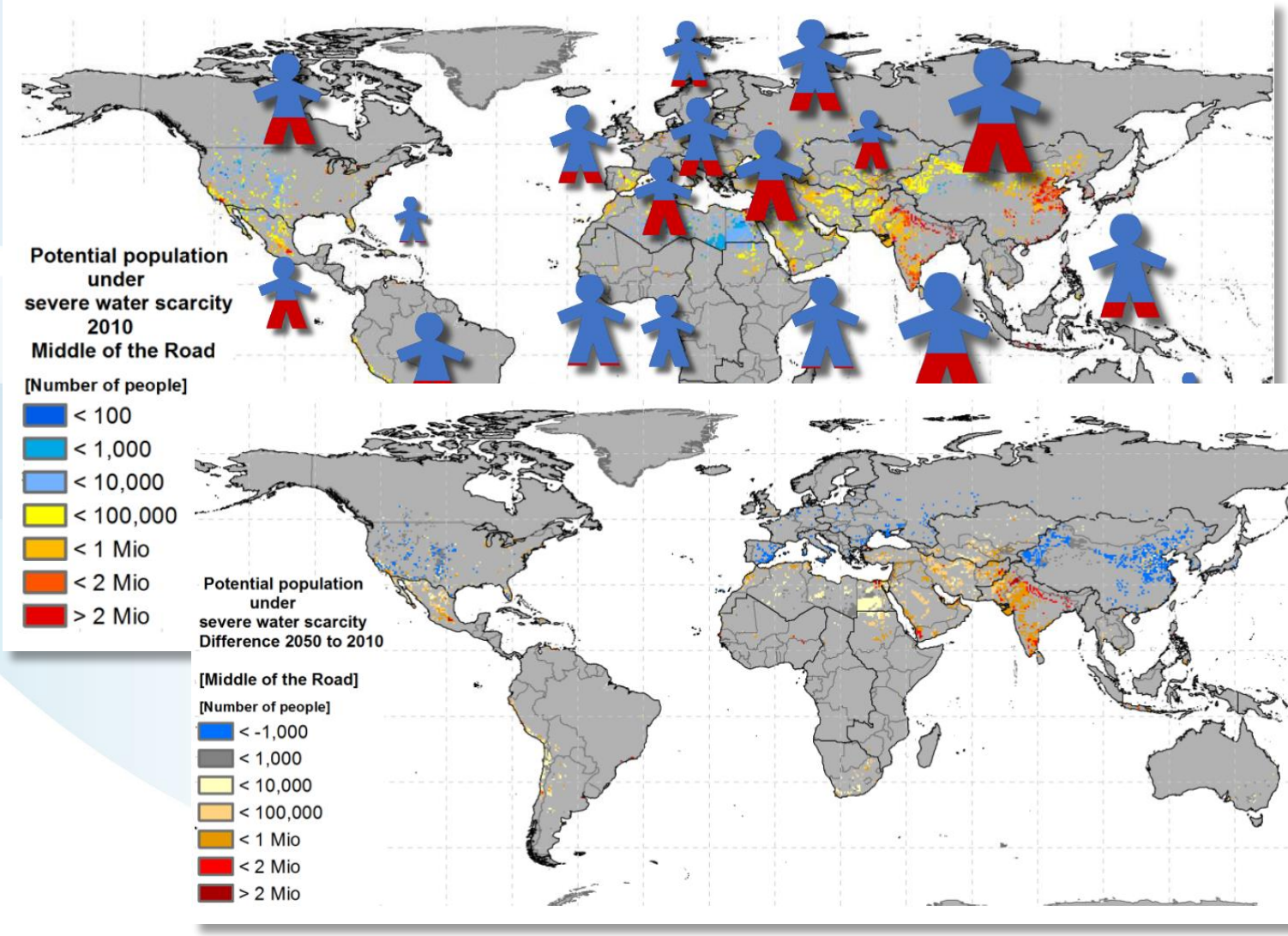
Increasing Demands, Increasing Challenges

Domestic water withdrawals more than double till 2050

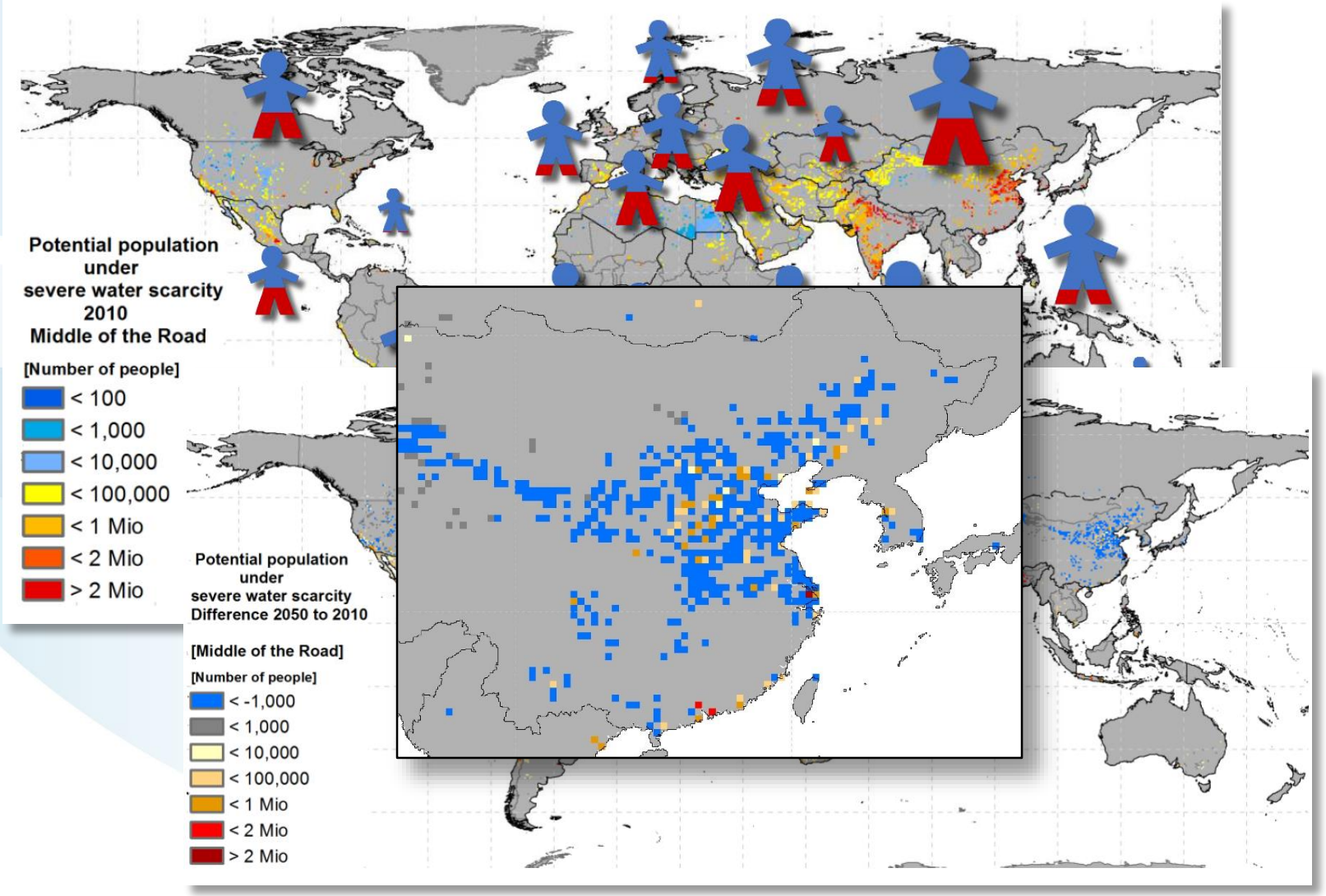
Industrial water withdrawals 60% more

Agricultural water withdrawals increase by 25%

Potential population exposed to severe water scarcity



Potential population exposed to severe water scarcity



Thank you