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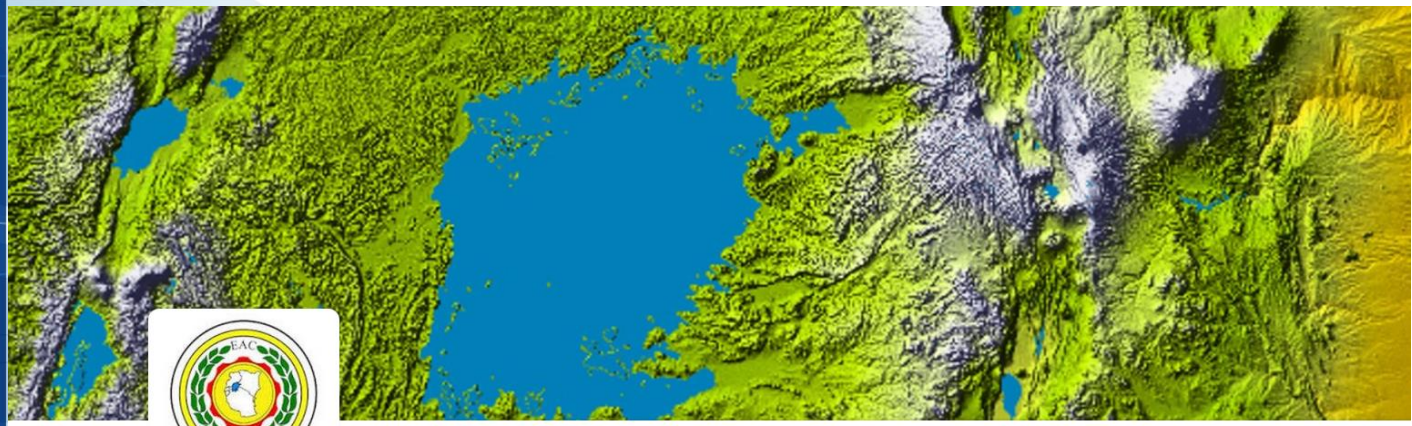
science for global insight



Water Futures and Solutions

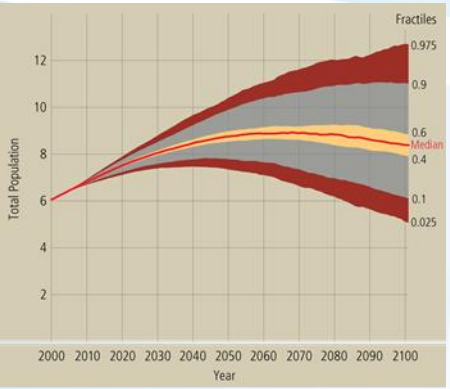
Contributions of earth observations and models for improved water sustainability

Simon Langan

IIASA WATER Program Director

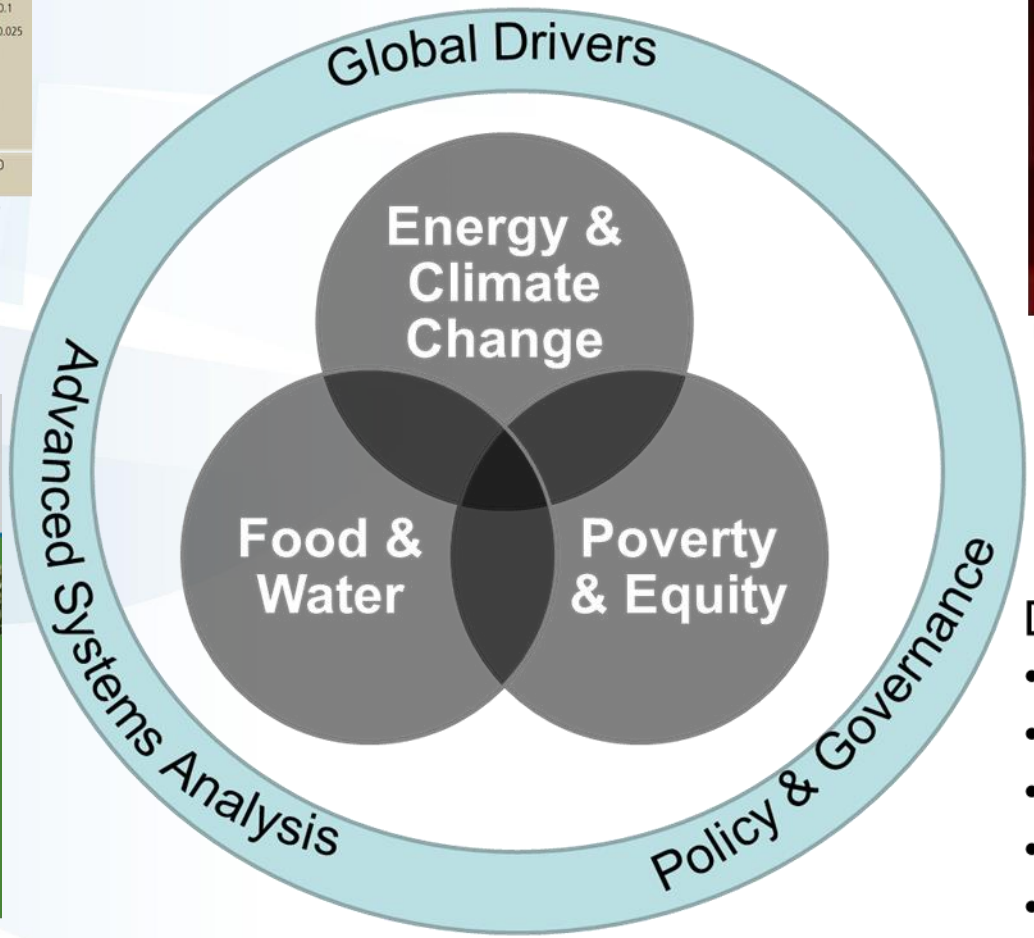
@WFAS_IIASA

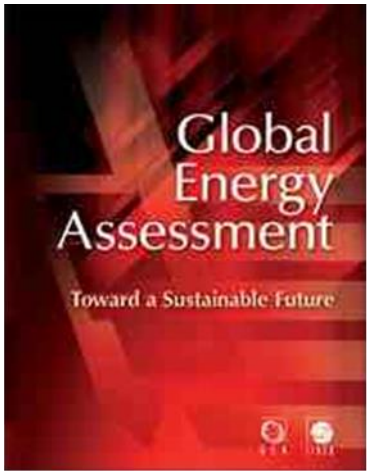
IIASA Research



http://www.iiasa.ac.at/Research/POP/proj07/

http://www.gaez.iiasa.ac.at





http://www.iiasa.ac.at/Research/ENE/GEA/

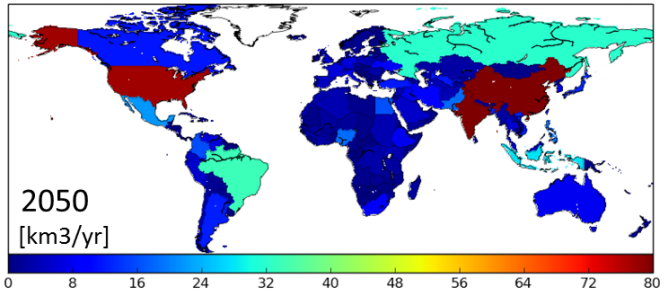
Data repository for:

- IPCC
- WATCH
- GEA
- GAEZ
- POP
- GAINS

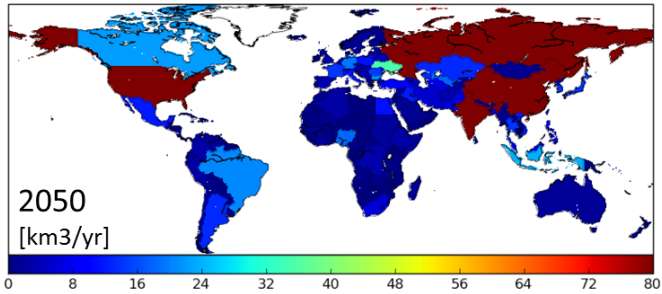
Water Futures and Multi-model Assessment: Water Demand

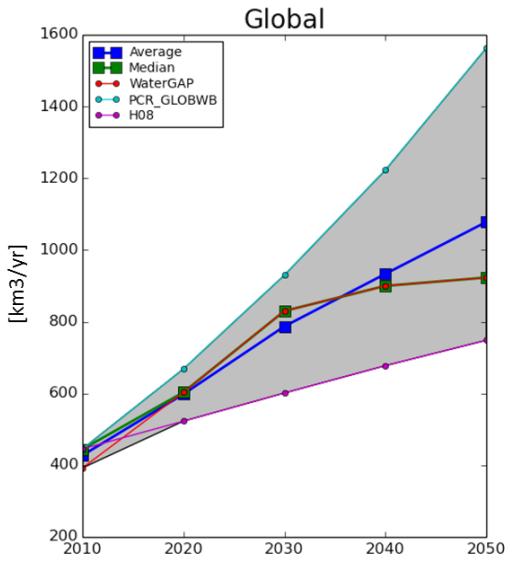
Models
Message/Globiom
WaterGAP
H08
PCR-GLOBWB
LPJmL
IMPACT
WFS/GAEZ/GLOBWAT

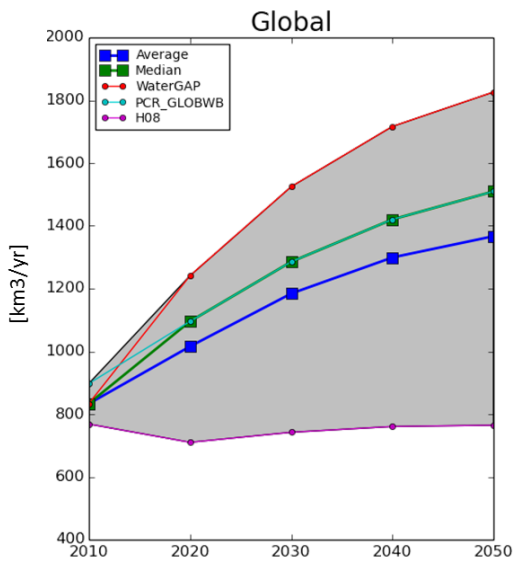
Domestic water demand



Industrial water demand



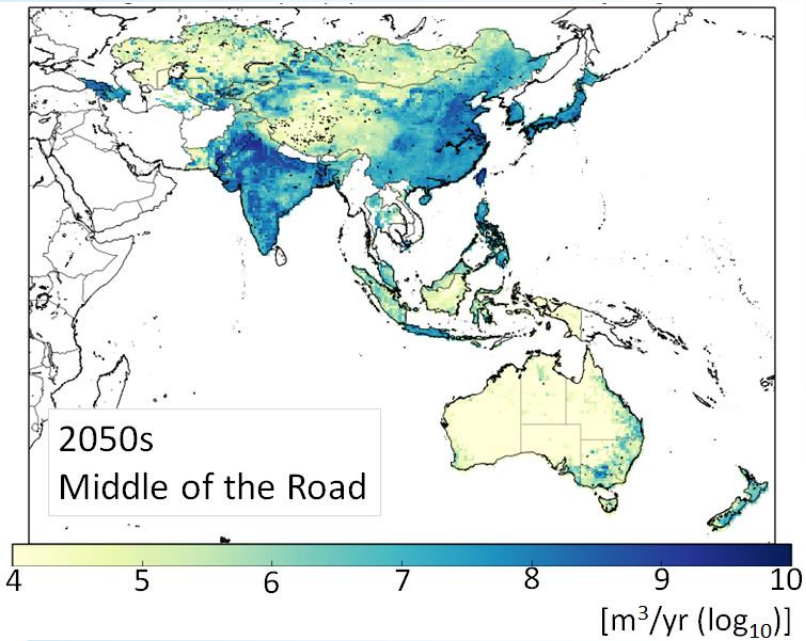




***Wada Y, Floerke M**, Hanasaki N, Eisner S, **Fischer G, Tramberend S, Satoh Y, van Vliet M, Yillia P**, Ringler C and **Wiberg D** (2015), Geoscientific Model Development*

Water availability

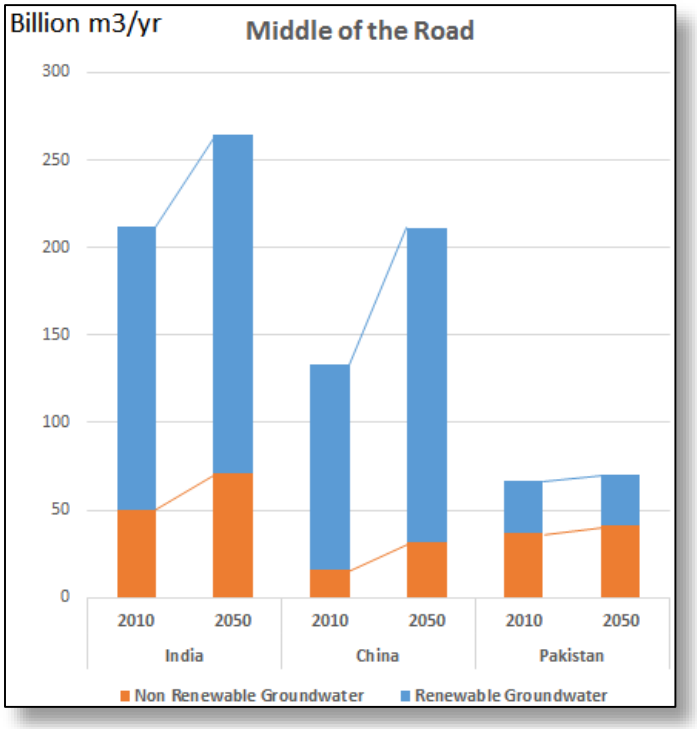
Groundwater use and over exploitation



Groundwater abstraction in 2050

Asia totals:
2010: 464 km³/year
2050: 645 km³/year

Increase compared to 2010



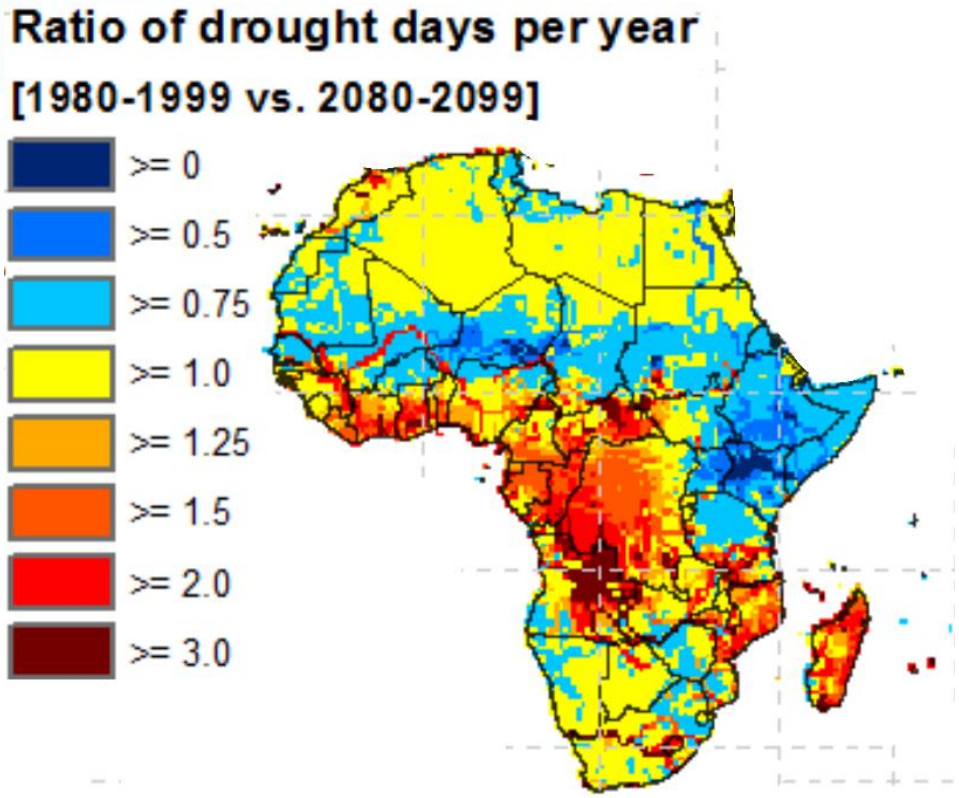
Groundwater abstraction in India, China and Pakistan

Water availability

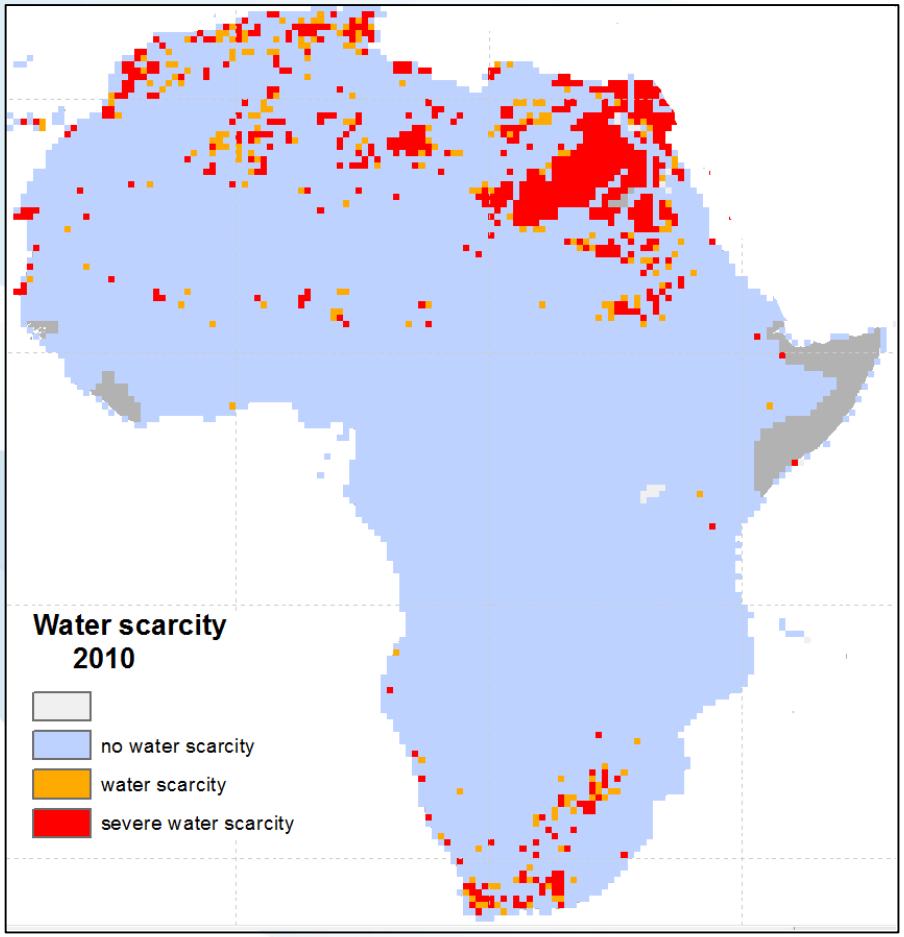
Droughts

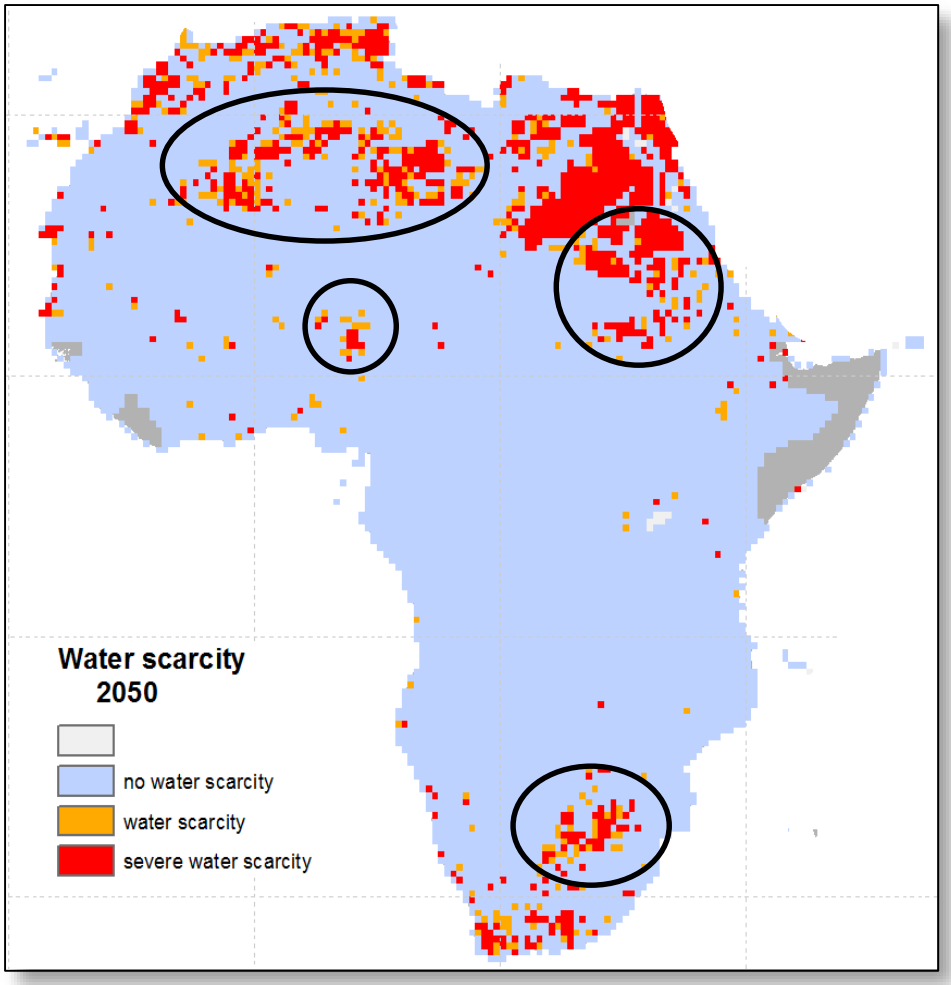
Impact of climate change on drought in Africa
Ratio of number of drought days per year.
1980-1999 vs 2080-2099
(Satoh et al. 2015)

Red: increasing days of drought condition



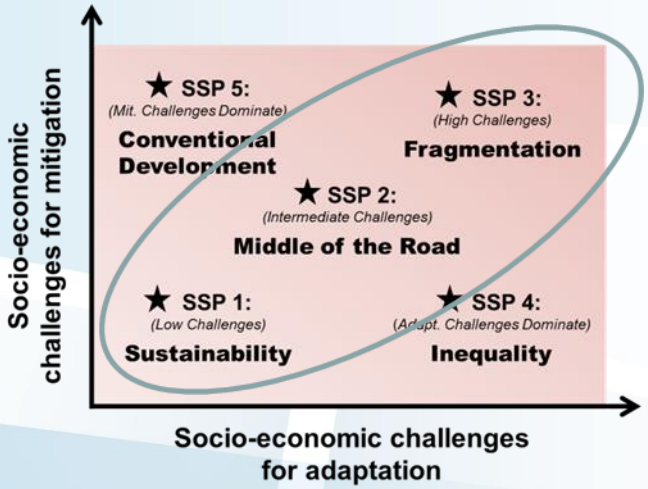
Water scarcity
Imbalance between supply and demand





Multiple scenarios

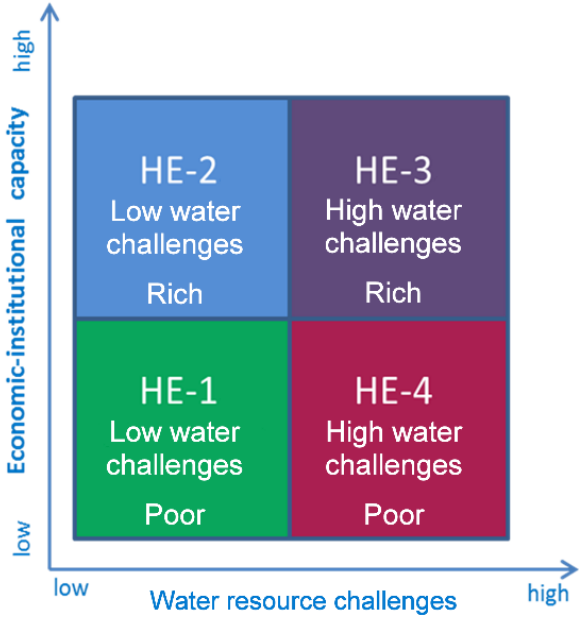
- Developing narratives of the future



SSP1: The world is moving toward sustainability

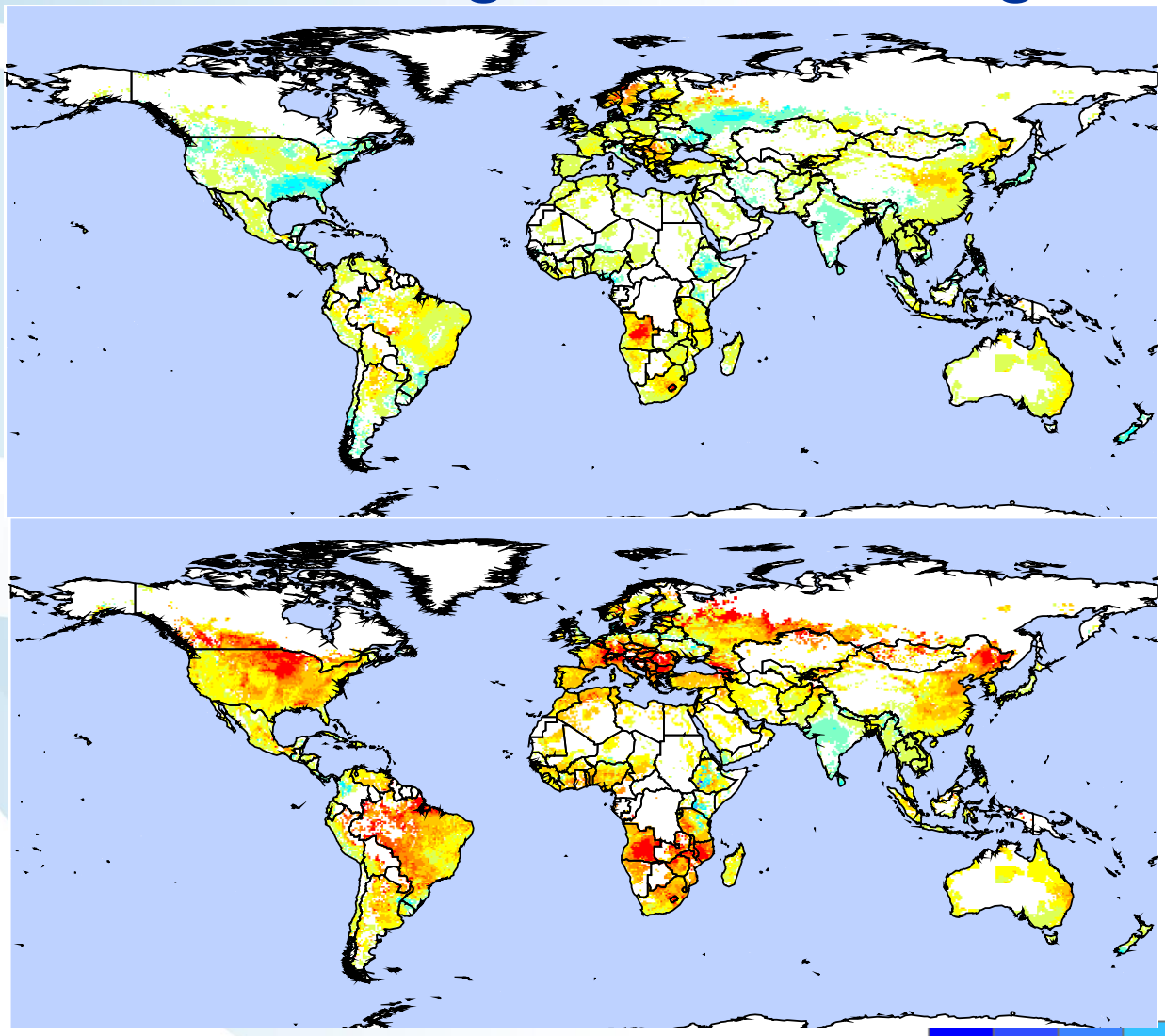
SSP characteristics

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



With global and regional stakeholders co-design scenarios that identify cross sectoral, transboundary issues and priorities for solutions to promote ownership.
Use these to drive Integrated Assessment models (MESSAGE, GLOBIOM, COMWAT)

Global change in future irrigation water demand



SSP1 - Sustainability

SSP2 – Middle of the Road

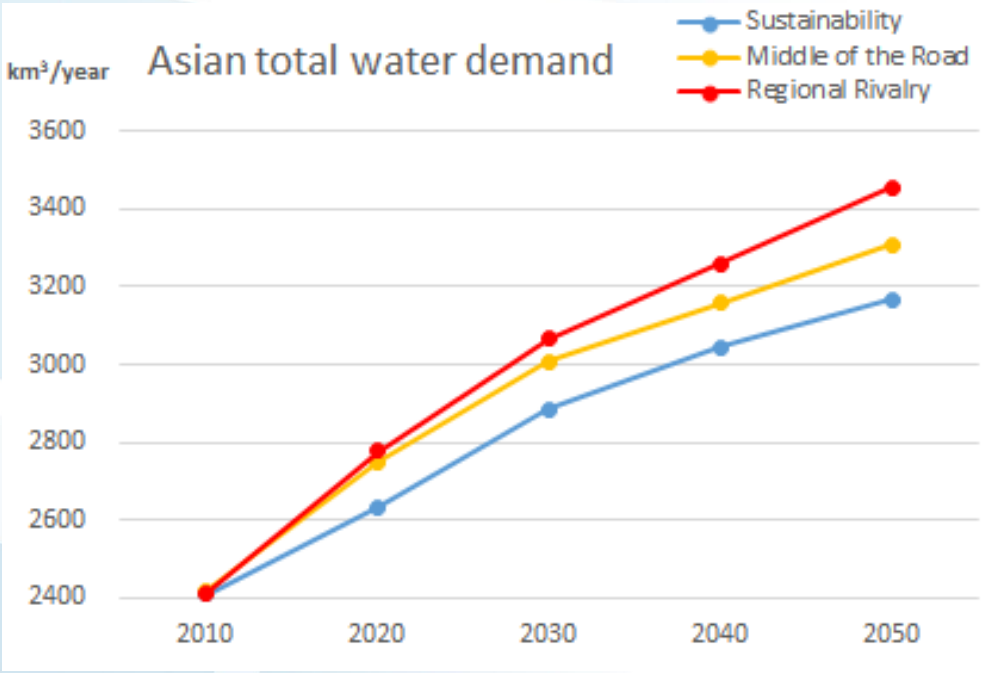
Relative increase compared to the present-day condition (2000), i.e. mean of 1980-2010

< -25 -20 -15 -10 -5 -1 0 1 5 10 15 20 25

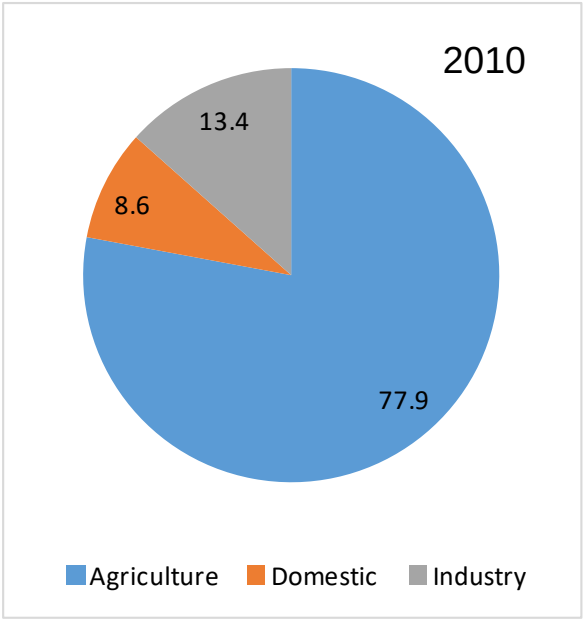
Global change by 2050

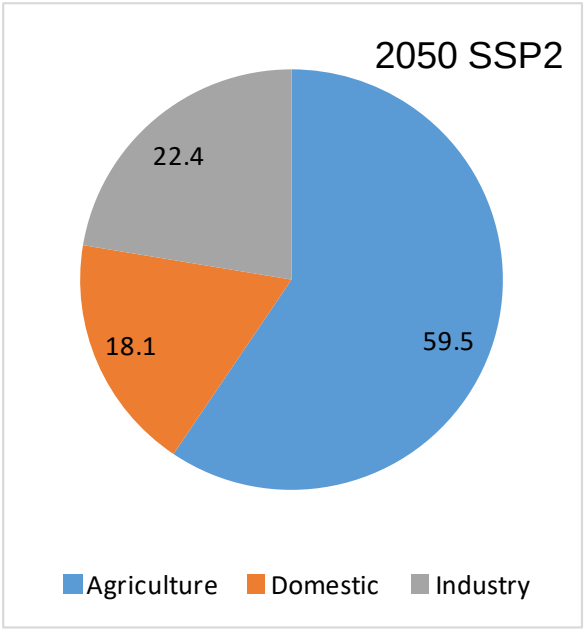
%

Water Demand - Asia



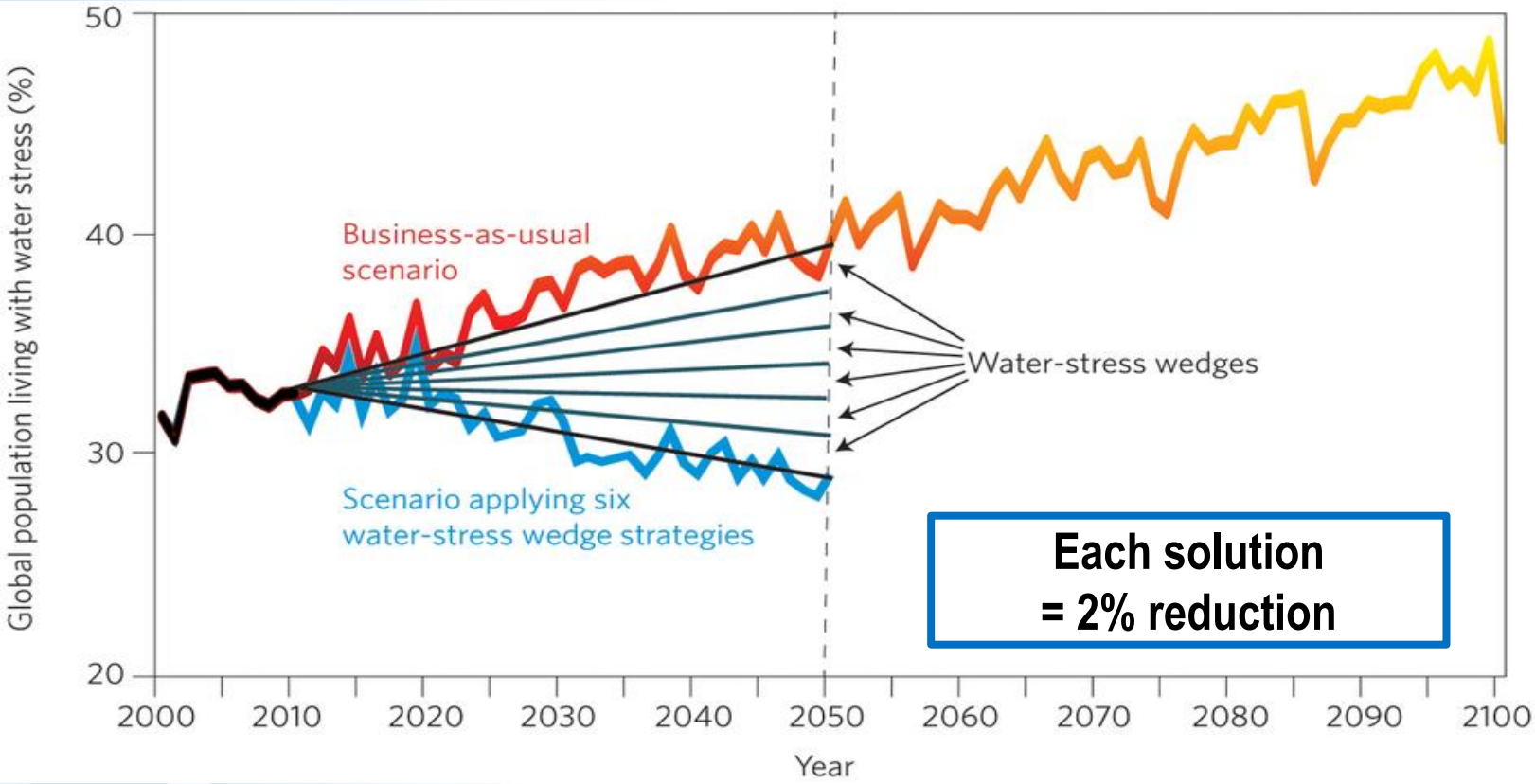
Water demand in Asia region, by sector (km^3/yr).





Asian total water demand in the 2010s is about 2410 km^3/year and will be 3170 - 3460 km^3/year (increase 30 - 40%) under the three scenarios

Is it possible to reduce water scarcity by 2050?



We present six strategies (planned, not autonomous), or water-stress wedges, that collectively lead to a reduction in the population affected by water stress by 2050.

- Water productivity – crop per drop
- Irrigation efficiency – decrease losses
- Water use intensity – industry and domestic
- Population growth

- Reservoir storage
- Desalination

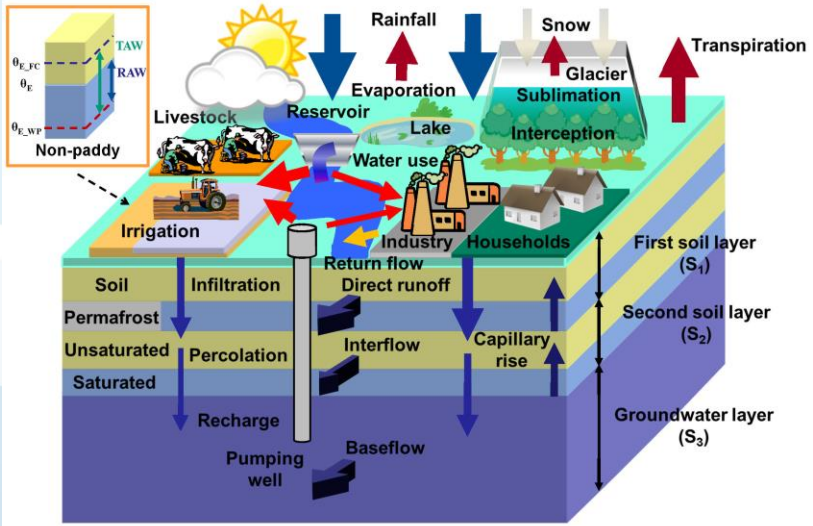
Soft path vs. Hard path

Source: Wada et al. 2014

Towards a common platform/apprach

Development of a community driven global water model (CWATM) by IIASA

Model design



- CWATM represents one of the new key elements of IIASA's Water program to assess **water supply, water demand** and **environmental needs** at global and regional level
- The hydrologic model is **open source** and flexible to link in different aspects of the **water energy food nexus**

Our vision for the short to medium term work is to introduce **water quality** and to consider qualitative and quantitative measures of **transboundary river** and **groundwater governance** into an **integrated modelling framework**.

Contact

www.iiasa.ac.at/cwatm
wfas.info@iiasa.ac.at

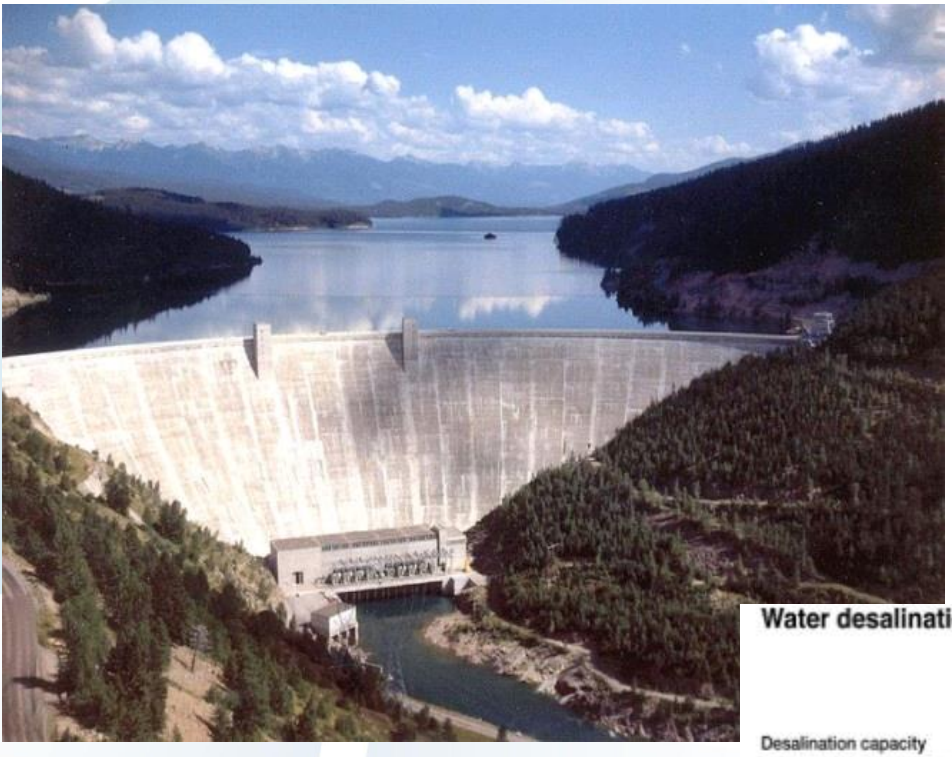
More Crop Per Drop

Improvement in water productivity at 0.5% per year (20% by 2050)

Efficiency increase by 1% per year (40% by 2050)

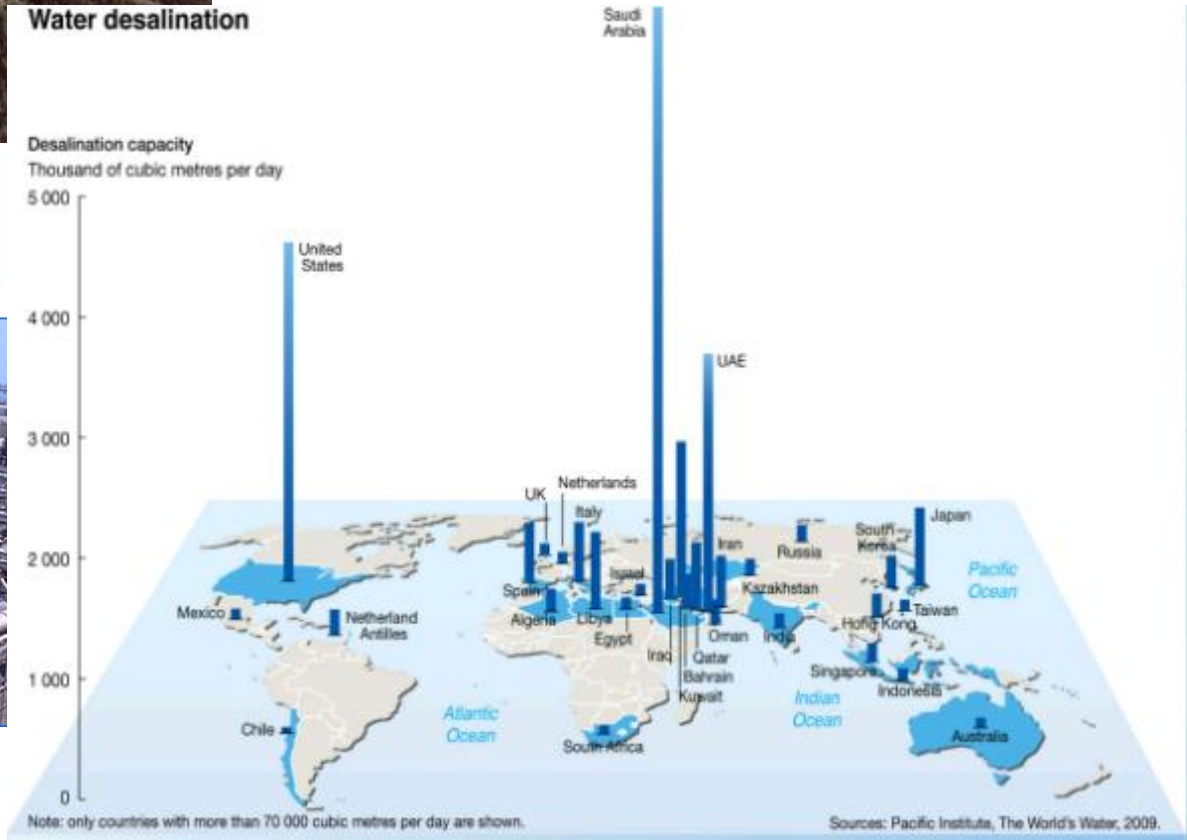
Improvement of 0.5% per year (20% by total)

Limit population growth by 0.5 billion (8.5 billion by 2050)

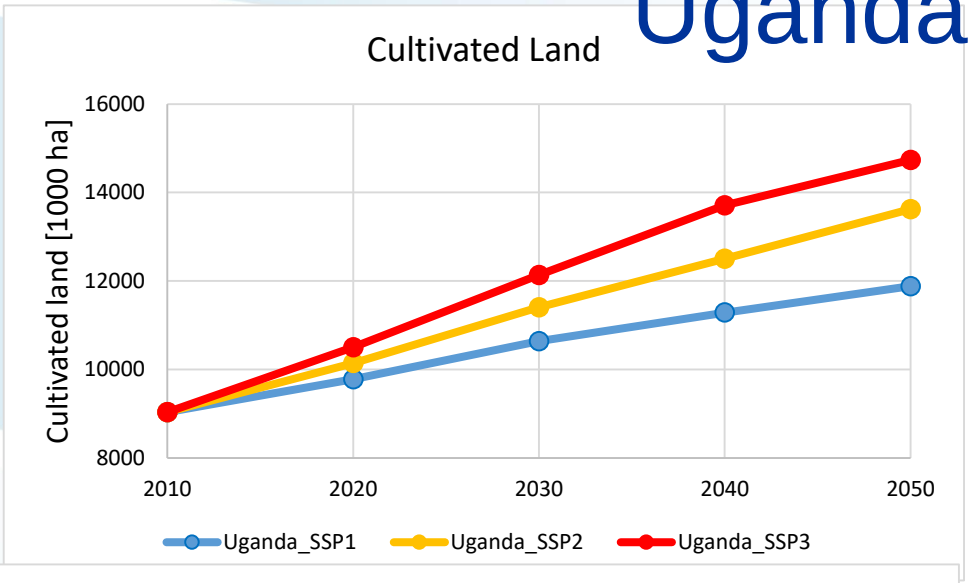


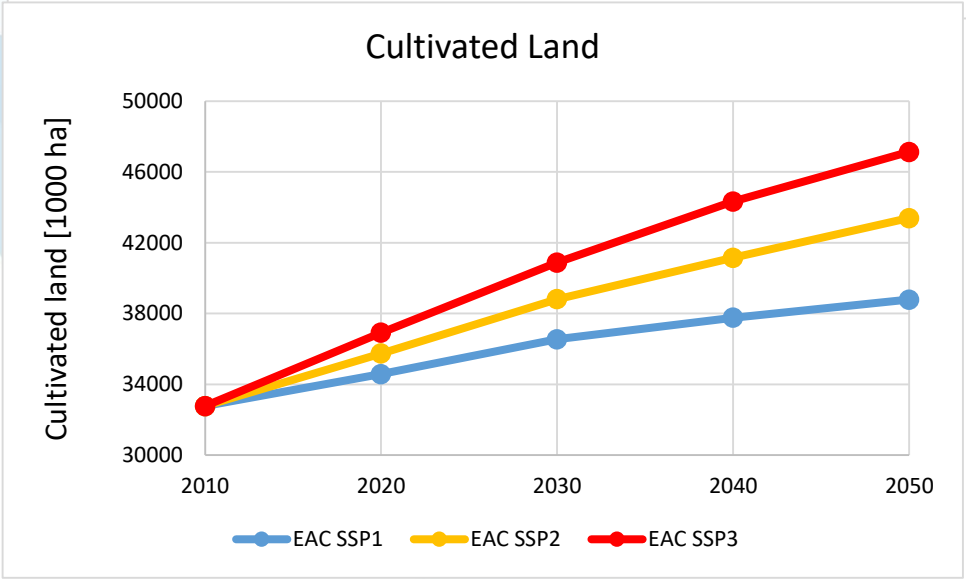
Additional 600 km^3 reservoir storage (by 2050) US$ 10 billion??

50 times increase in desalination capacity (by 2050) US$ 20 billion??

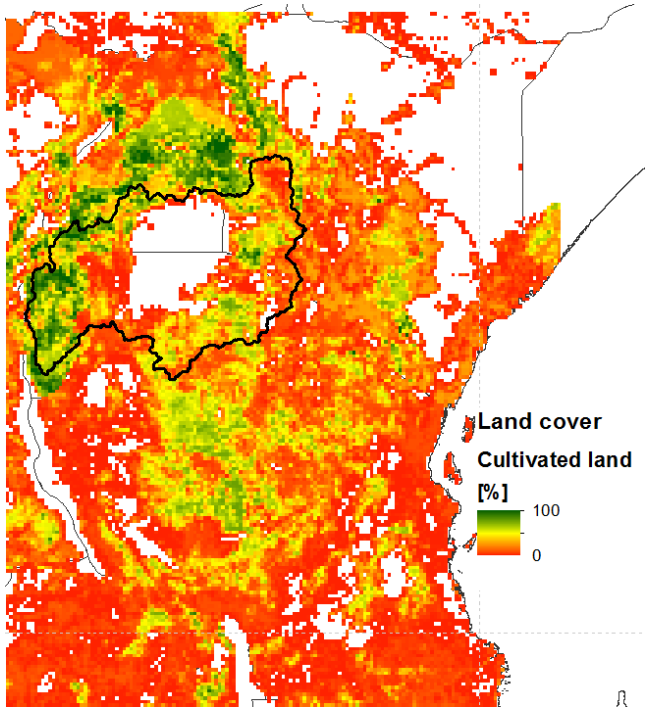


Evolution of cultivated land Uganda & EAC





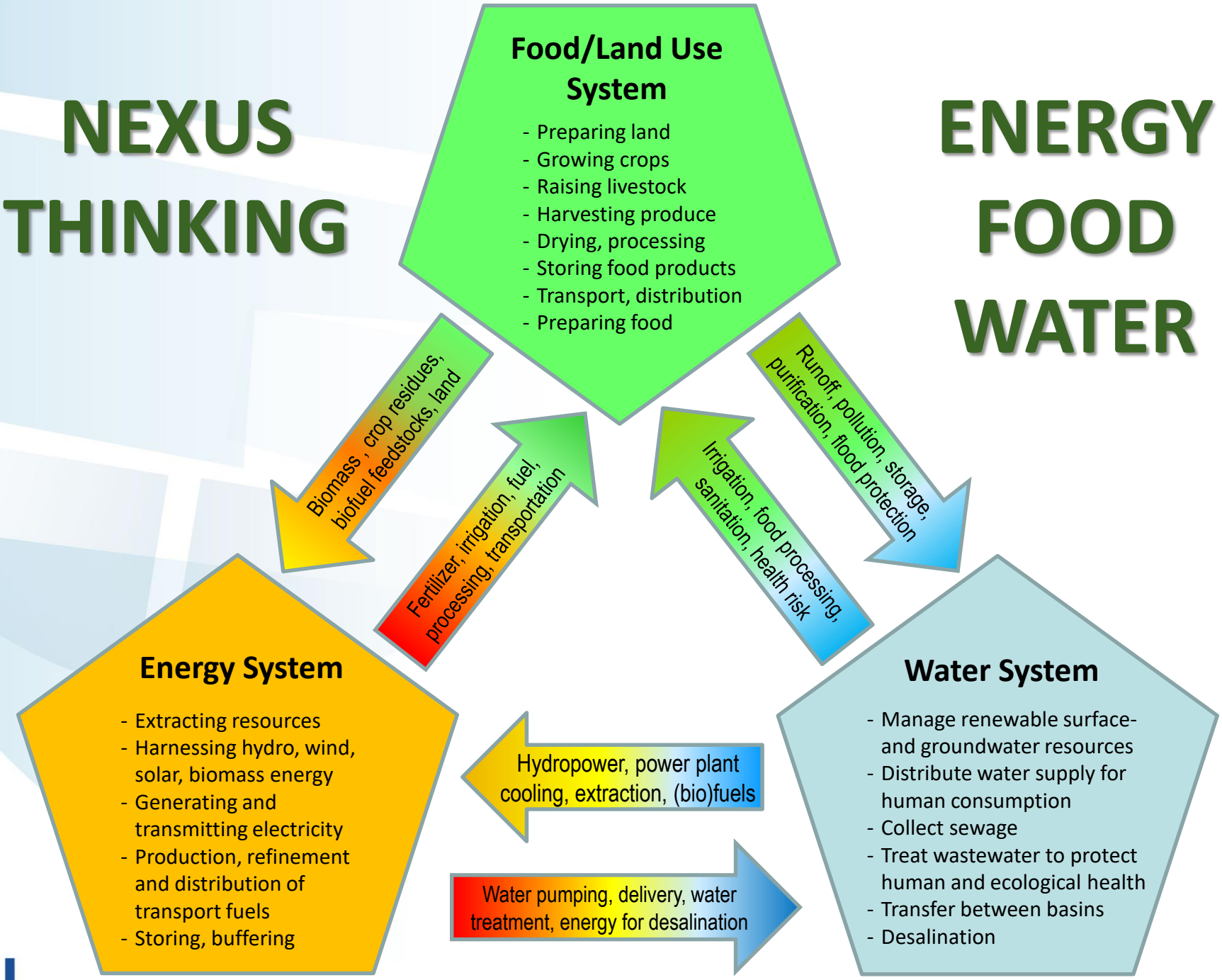
Maps available:
www.gaez.iiasa.ac.at



- Cultivated land will increase by 30-60% by 2050 for Uganda
- Cultivated land will increase by 20-40% by 2050 for EAC

NEXUS THINKING

ENERGY FOOD WATER



THANK YOU!

water futures and solutions

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wfas.info@iiasa.ac.at

Also see:

http://www.iiasa.ac.at/web/home/research/water-futures.html