World Water in 2025

Scenario Analysis for the World Commission on Water for the 21st Century

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University of Kassel

World Water in 2025

- Scenario Analysis for the World Water Vision -

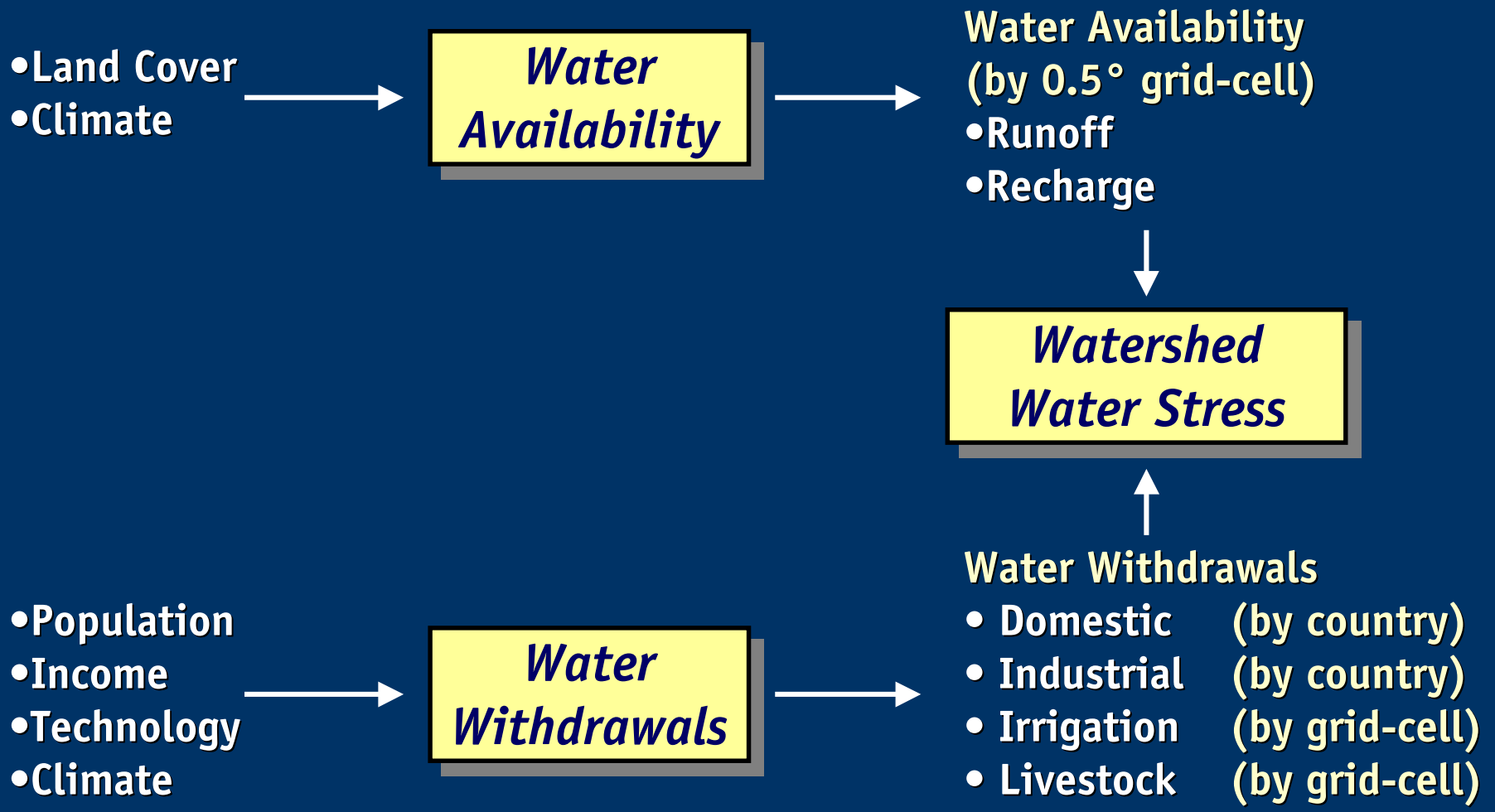
- WaterGAP model

- The World Today

- Water Futures

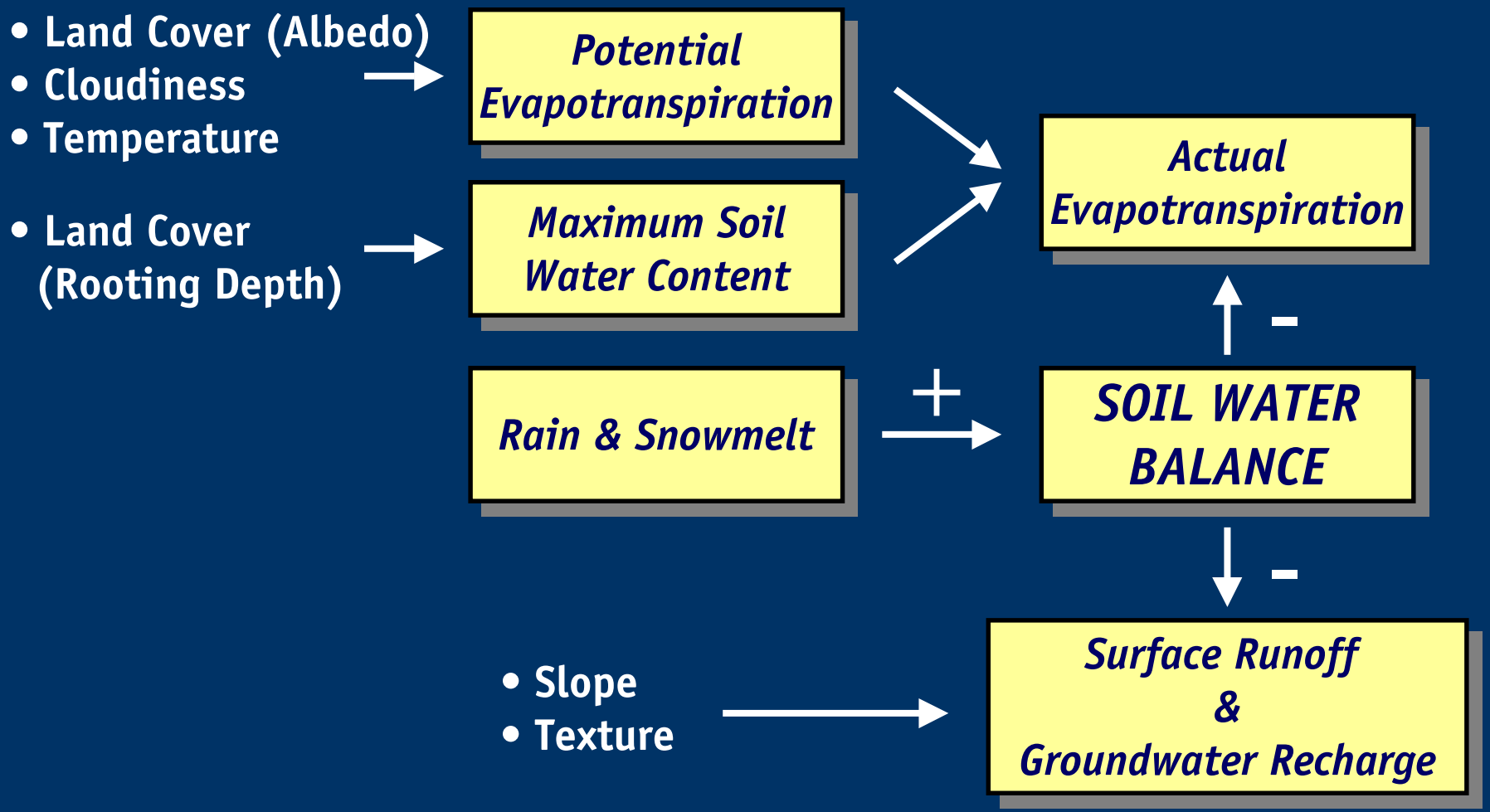
WaterGAP 2

- Overview -



WaterGAP 2

- Water Availability Model -



WaterGAP 2

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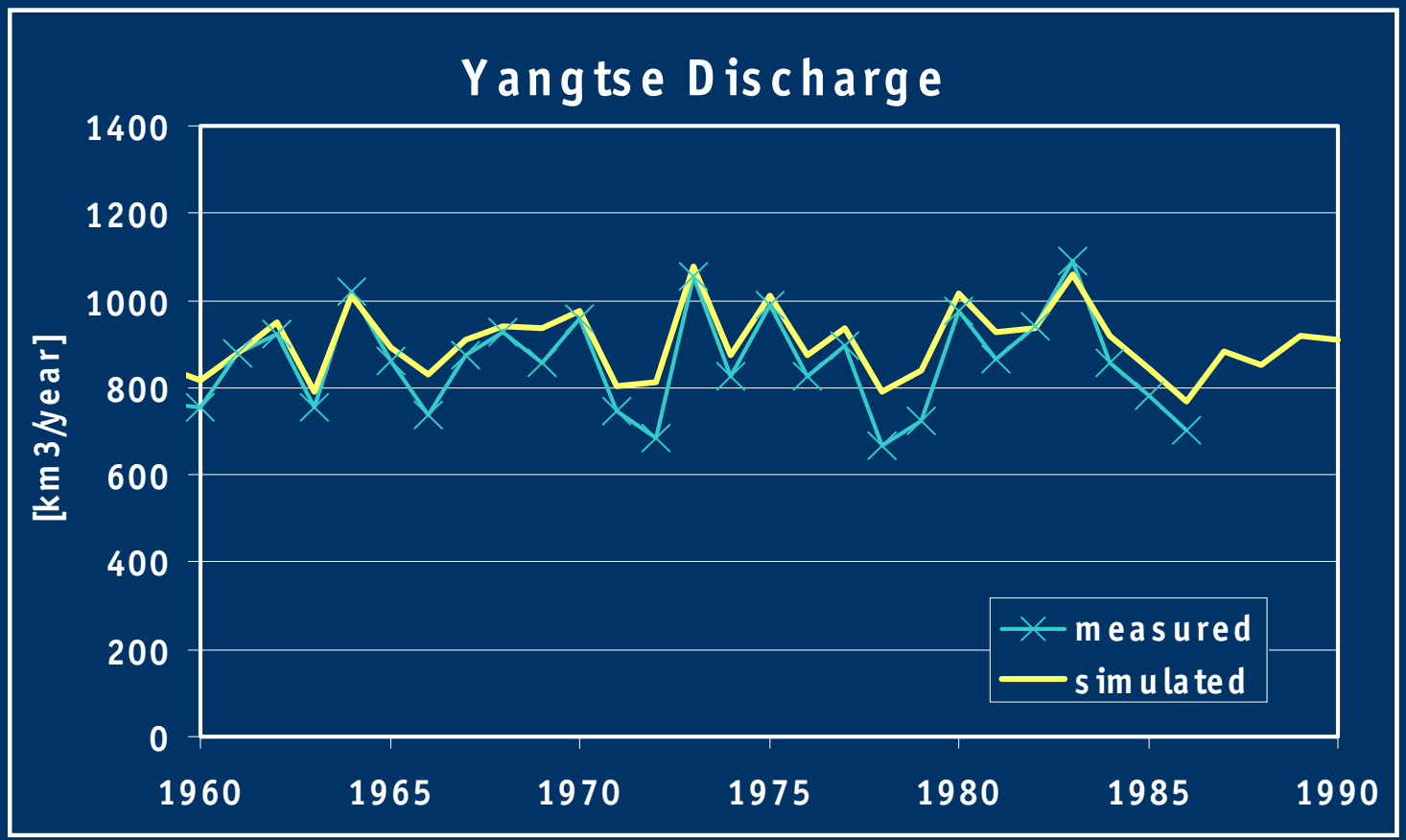
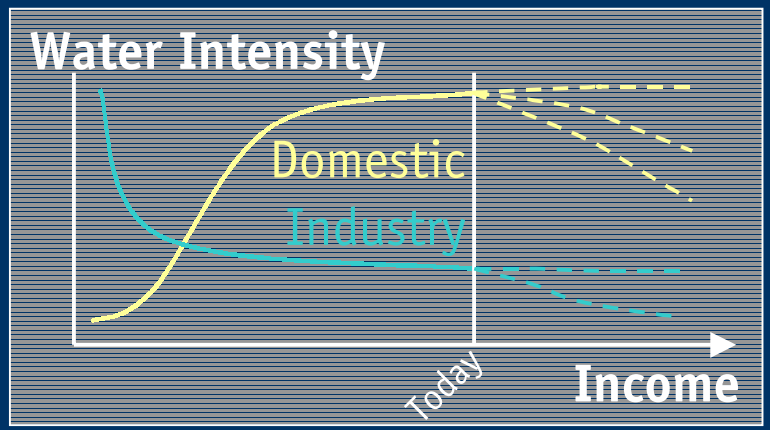
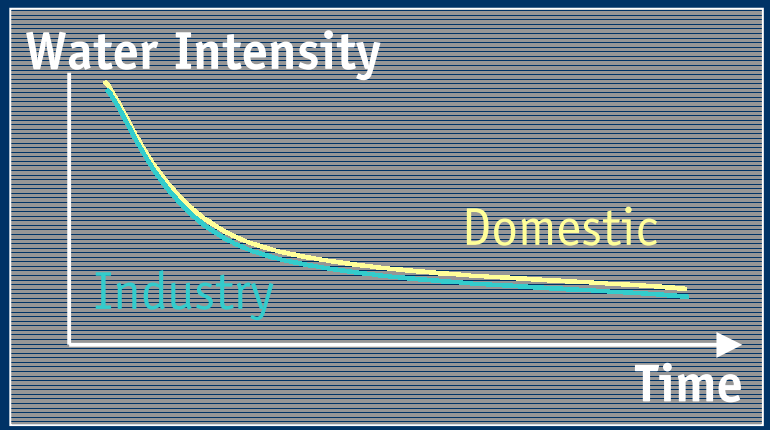


WaterGAP 2

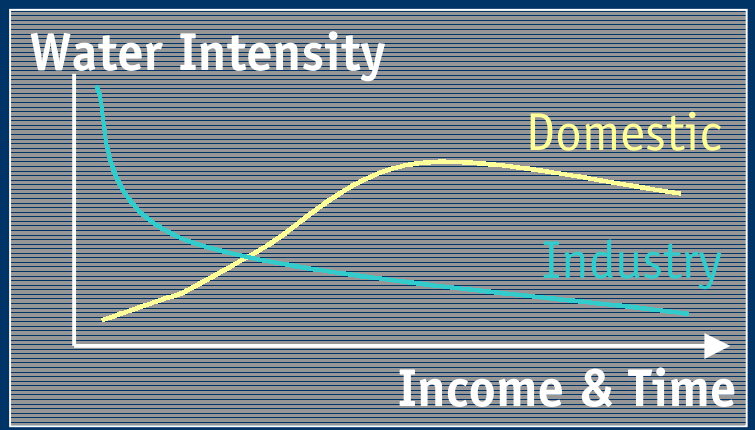
- Water Withdrawals Model : Domestic & Industry -



Structural Change
(changing behaviour and infrastructure)



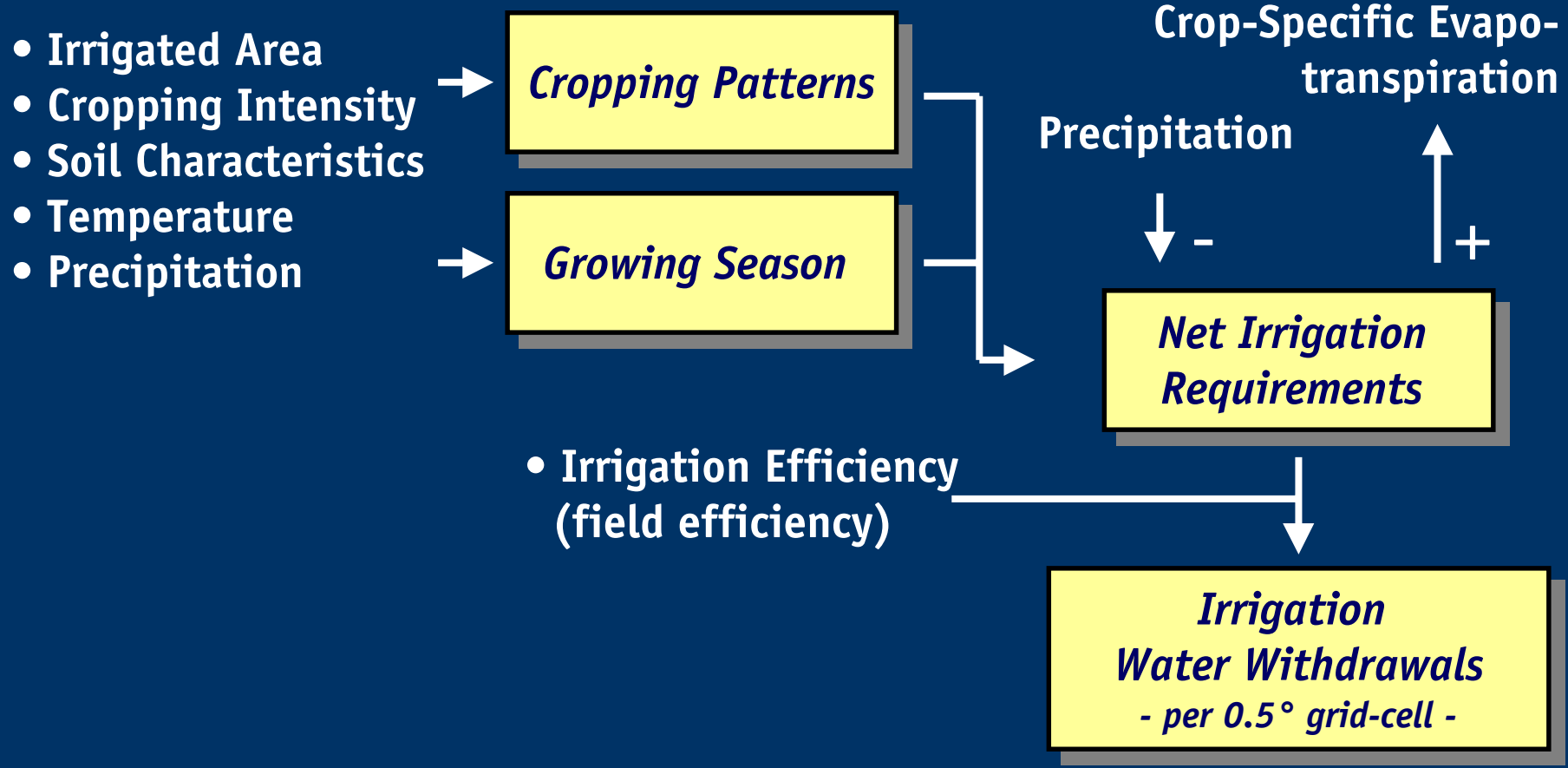
Technological Change
(improving water use efficiency)



Structural & Technological Change

WaterGAP 2

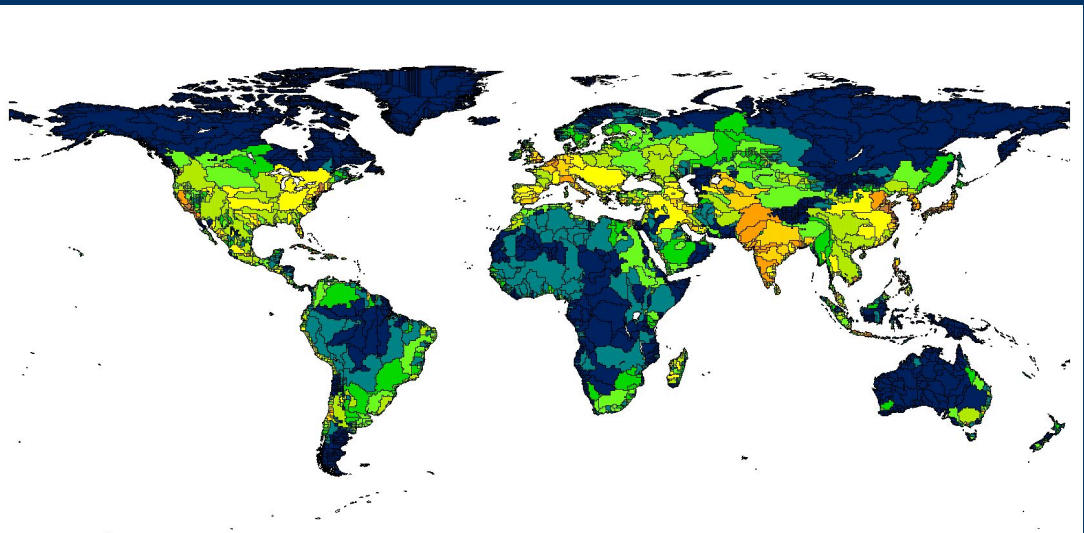
- Water Withdrawals Model : Irrigation -



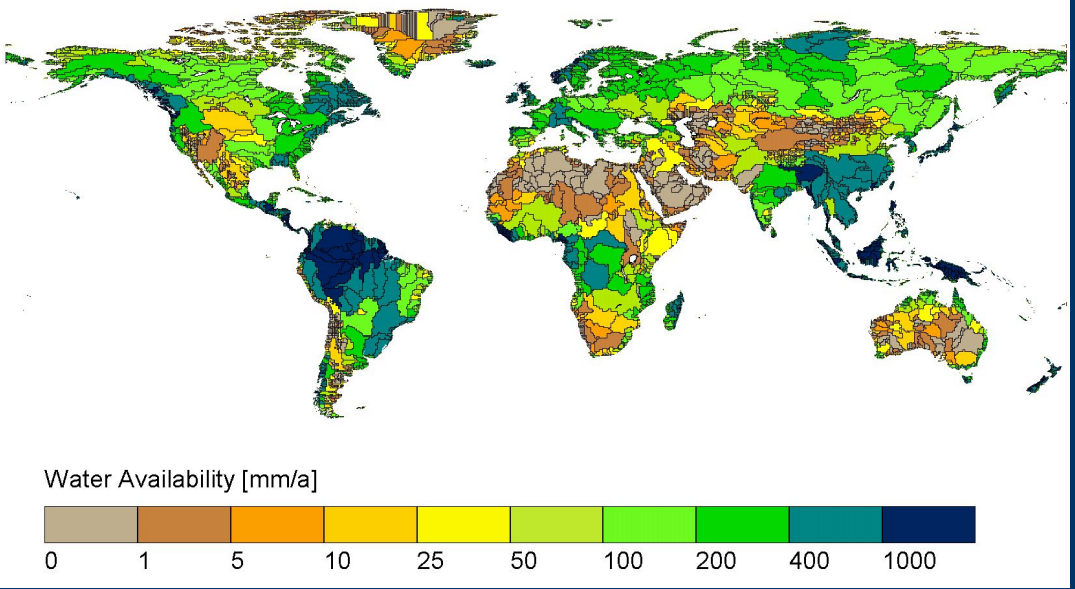

- The World Today -
picture by FAO

The World Today [1995]

Water Withdrawals



Water Availability



How to Assess Water Scarcity?

For each watershed:

Withdrawals vs. Availability or "Criticality Ratio" (CR)

$$\mathbf{CR} = \frac{\textbf{Annual Withdrawals}}{\textbf{Annual Availability}}$$

When does "Severe Water Stress" occur?

A common guideline : CR > 0.4

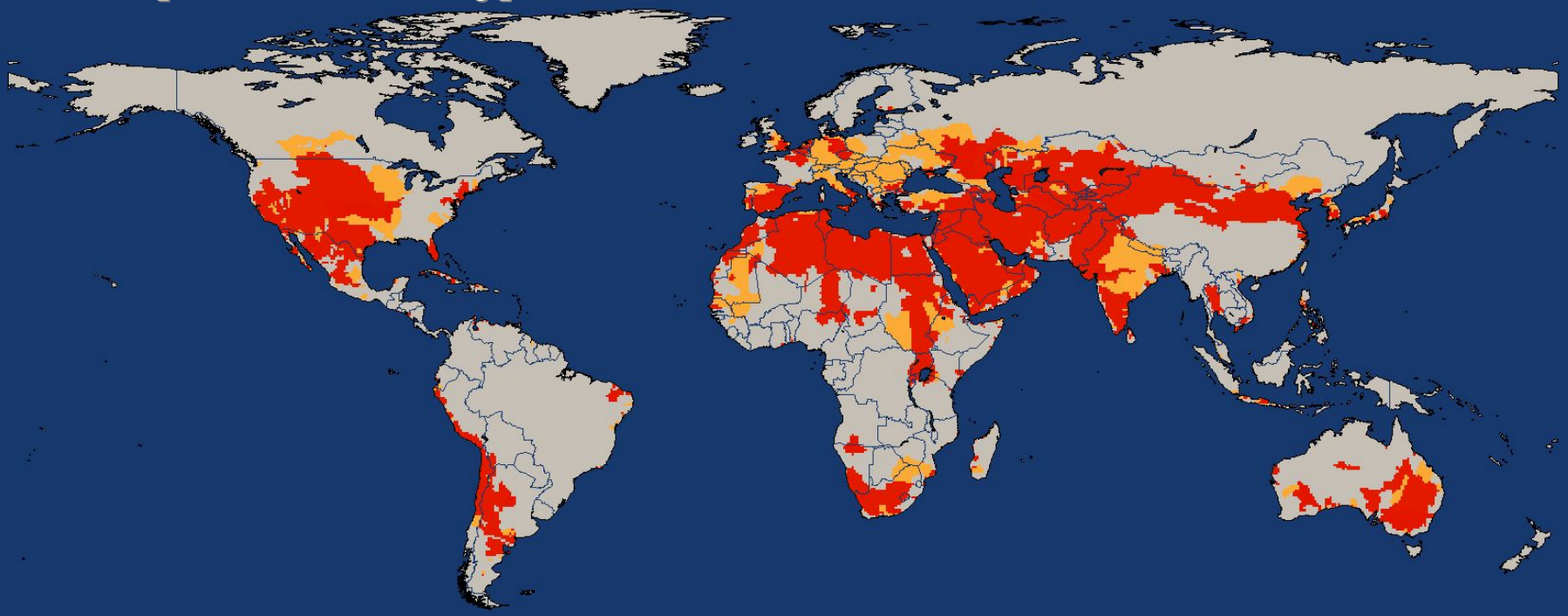
Does "Severe Water Stress" lead to "Water Crises"?

In *high-income* countries probably not often; because wastewater treatment, recycling of industrial water, etc. allow intensive (re-)use of water resources.

In *low-income* countries water emergencies continue; because the lack of wastewater treatment, etc. causes the quality of water to degrade.

Water Criticality

- 1995 [The World Today] -



Criticality : Withdrawal-to-Availability Ratio

Low Stress	Mid Stress	Severe Stress
0	0.2	0.4

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System Research
University of Kassel
March 2000 (TH)


- Water Futures -
picture by National Geographic

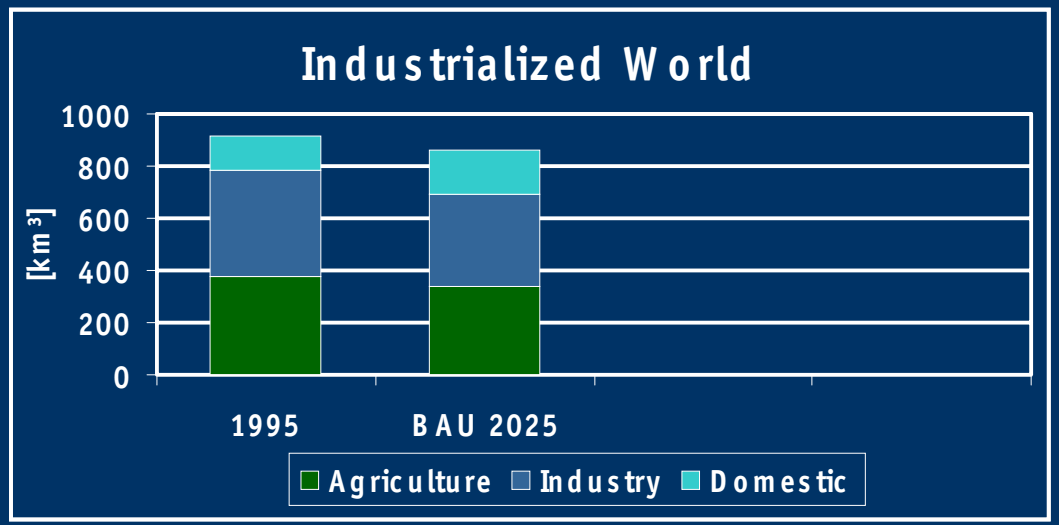
Scenario Assumptions

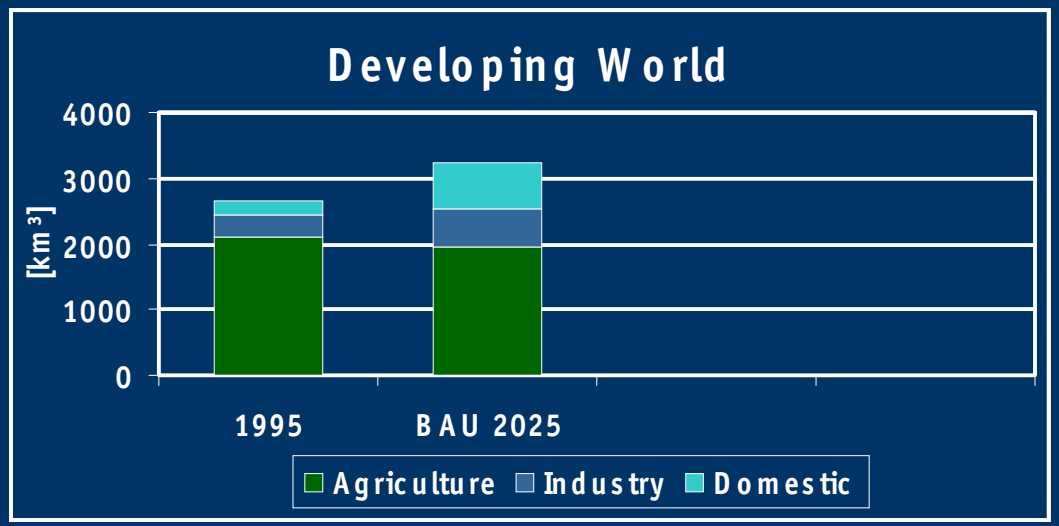
- Developments until 2025 -

Business as Usual [BAU]

- Continuation of current policies and trends
- *No special efforts* to save water:
- Global population: 8 billion, Global income: + 59 %
- Irrigated land: stabilizes

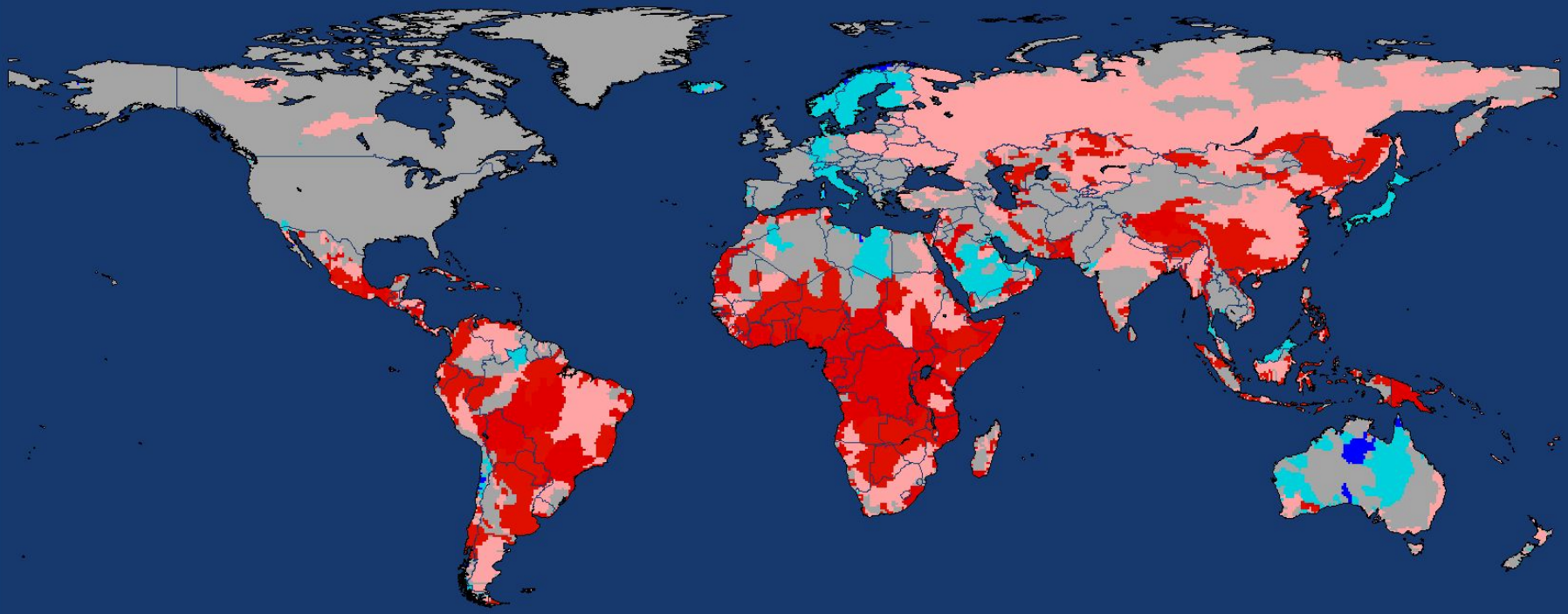
Water Withdrawals





Change in Pressure on Water Resources

- between 1995 and 2025 [Business-as-Usual] -



Pressure on Water Resources:

DECREASE ⇦ large moderate | small changes | ⇨ moderate large INCREASE

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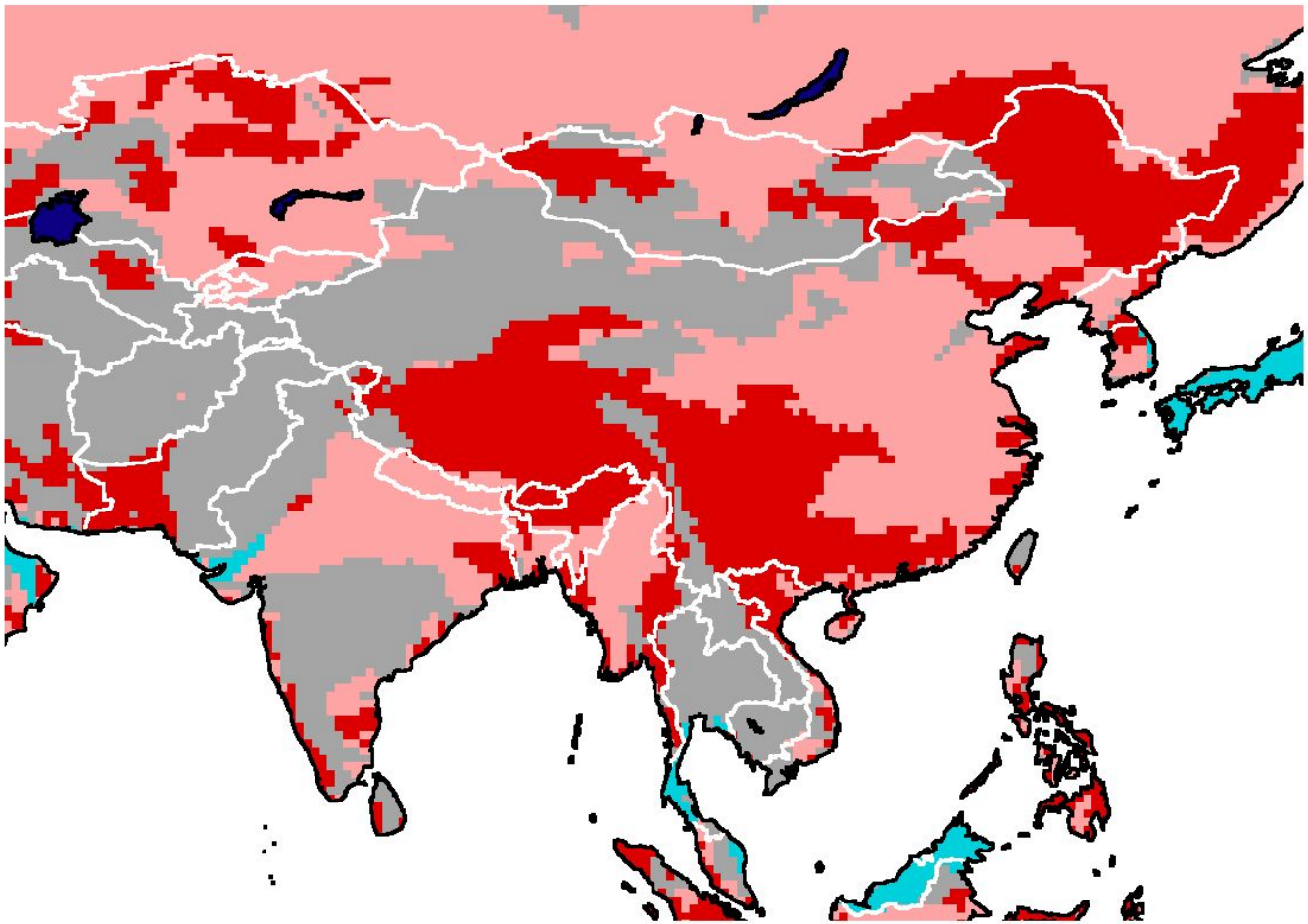
Change in Pressure on Water Resources

Between 1995 and 2025 (Scenario Business-as-Usual)

Regional Focus: Asia



Pressure on Water Resources:

DECREASE INCREASE

large moderate constant moderate large

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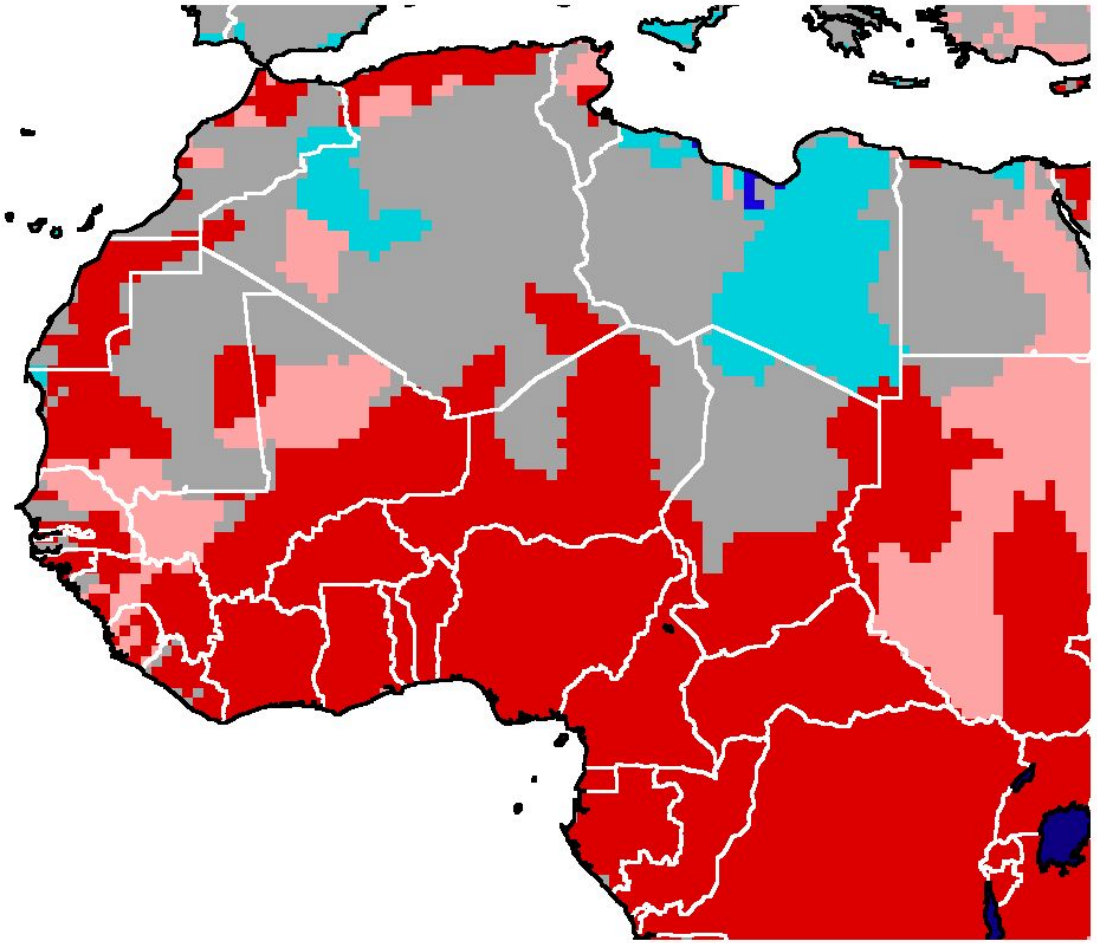
Change in Pressure on Water Resources

Between 1995 and 2025 (Scenario Business-as-Usual)

Regional Focus: Western & Central Africa



Pressure on Water Resources:

DECREASE — INCREASE

large | moderate | constant | moderate | large

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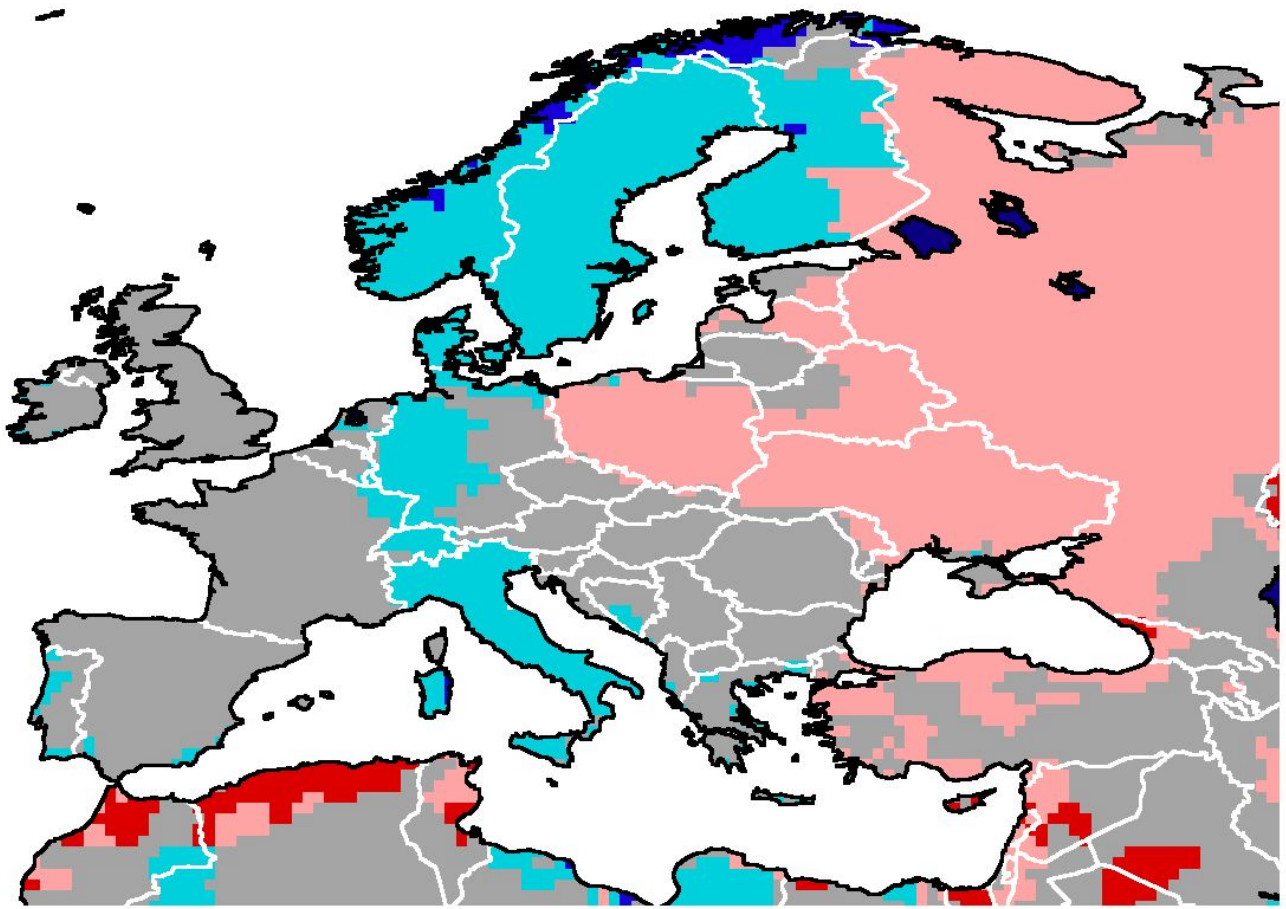
Change in Pressure on Water Resources

Between 1995 and 2025 (Scenario Business-as-Usual)

Regional Focus: Europe



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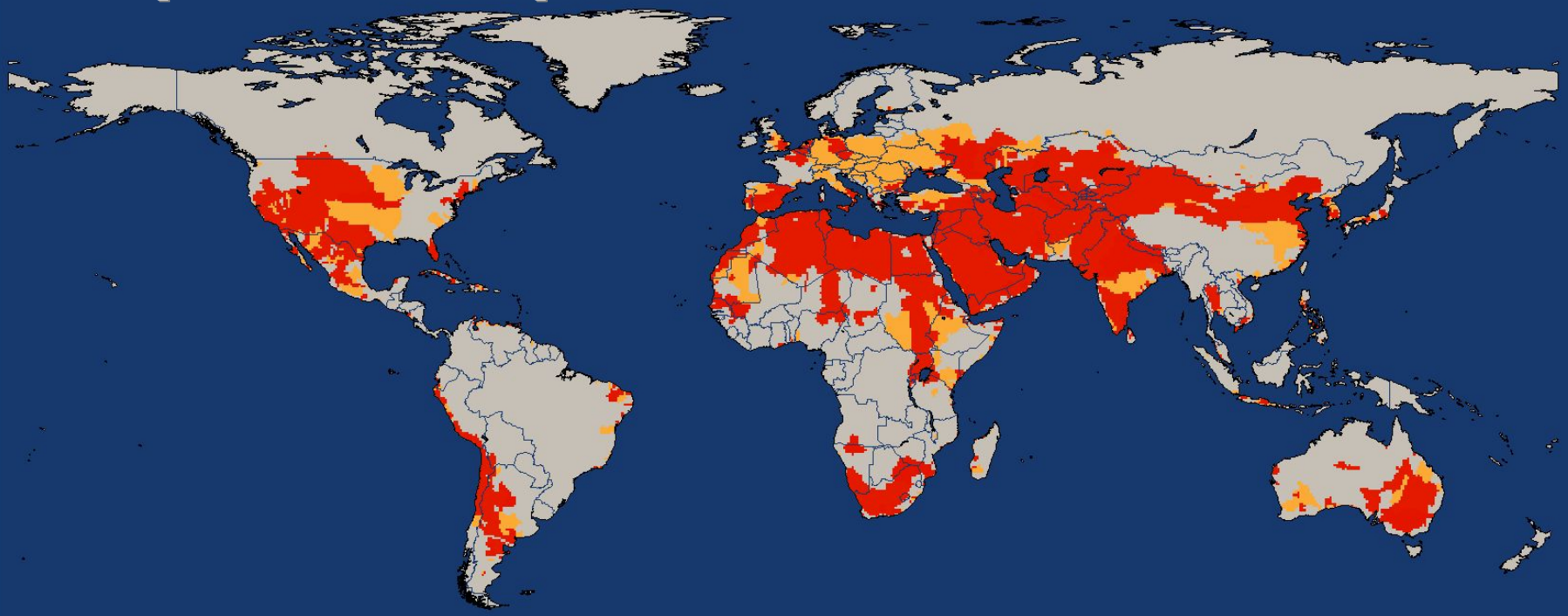
Water Criticality

- 2025 [Business-as-Usual] -



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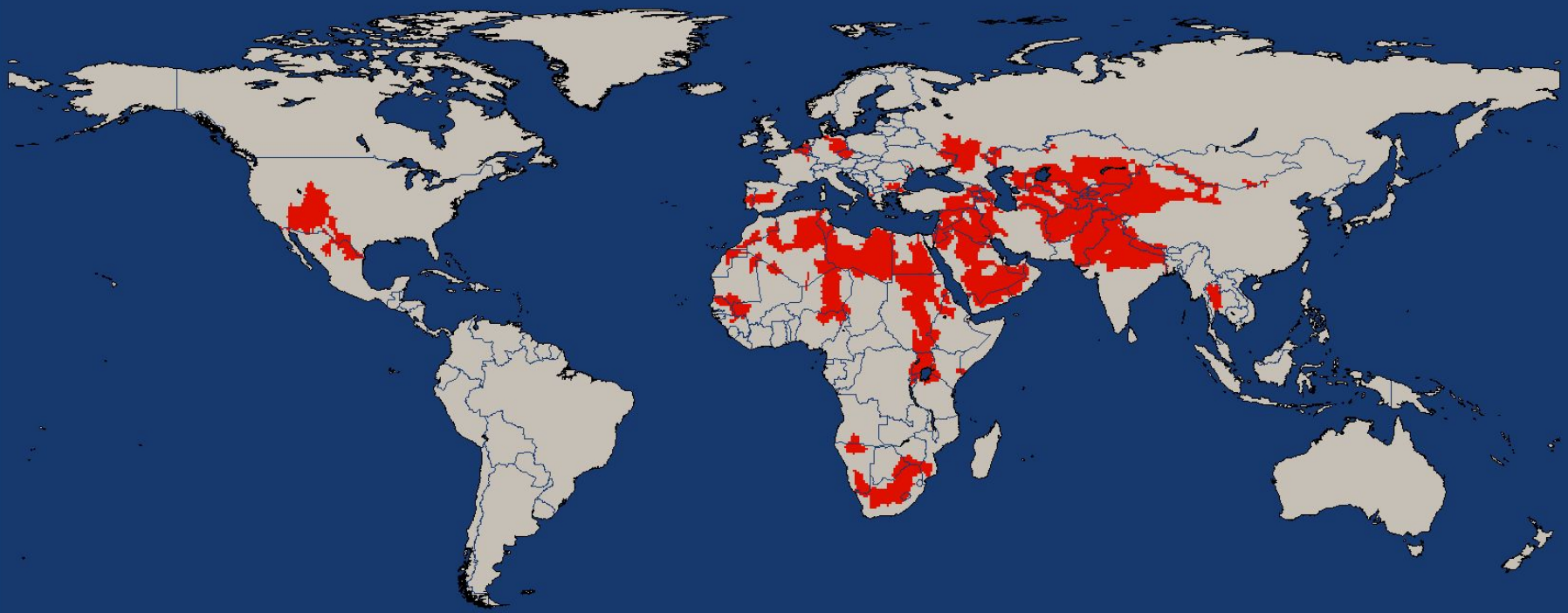
The Hague, March 2000 (TH)

International River Basins under 'Severe Water Stress'

- 2025 [Business as Usual] -



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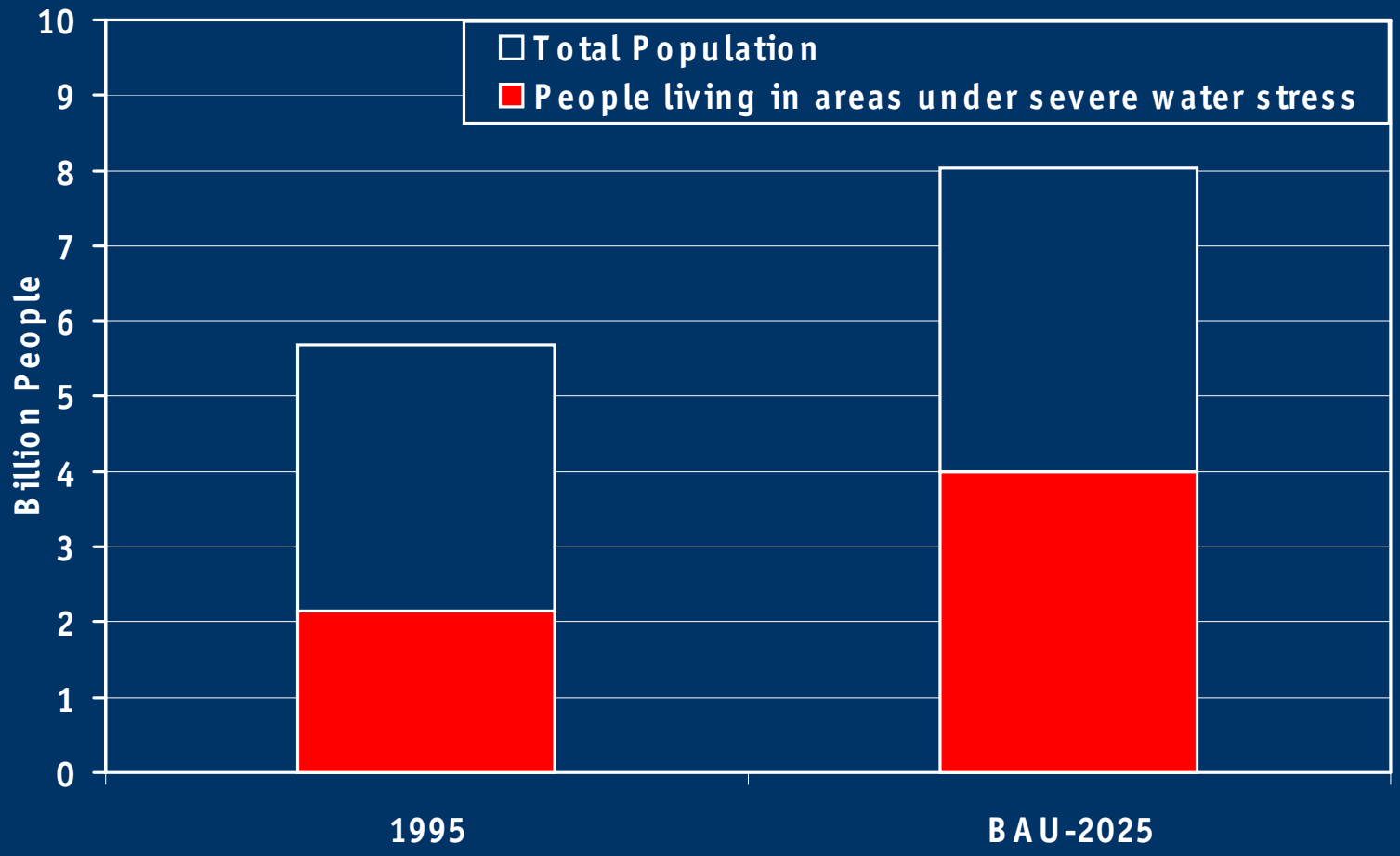
The Hague, March 2000 (TH)

Population

Living in Areas under 'Severe Water Stress'



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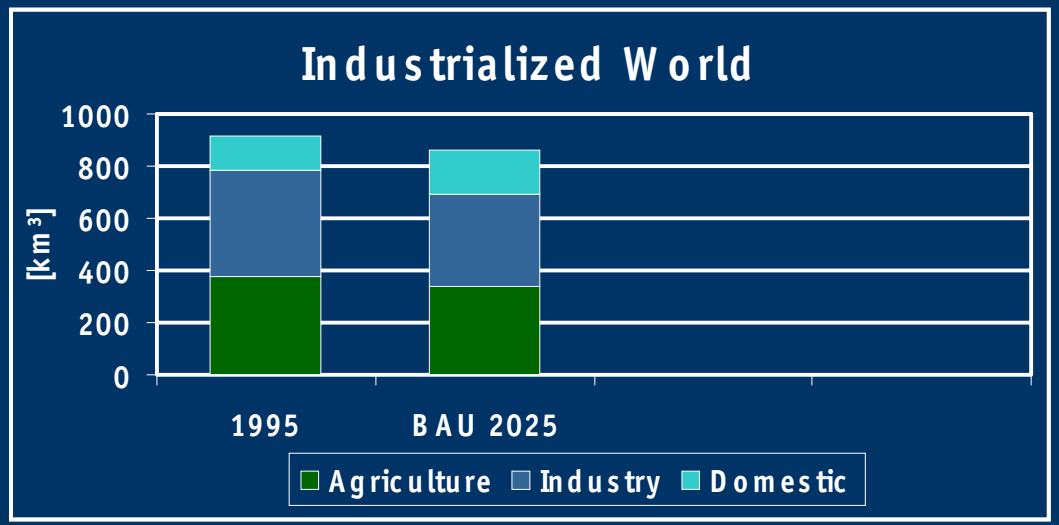
Technology, Economics, and Private Sector [TEC]

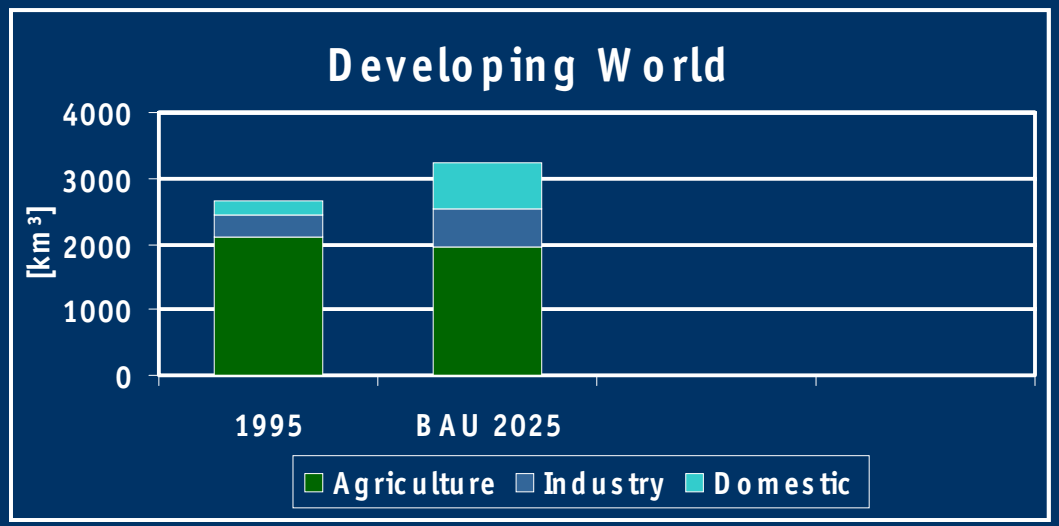
- Focus on water savings through private sector
- Investments -> Strong *technological improvements* in efficiency of water use
- Global population: 7.9 billion, Global income: + 93 %
- Irrigated land: + 23 %

Values and Lifestyles [VAL]

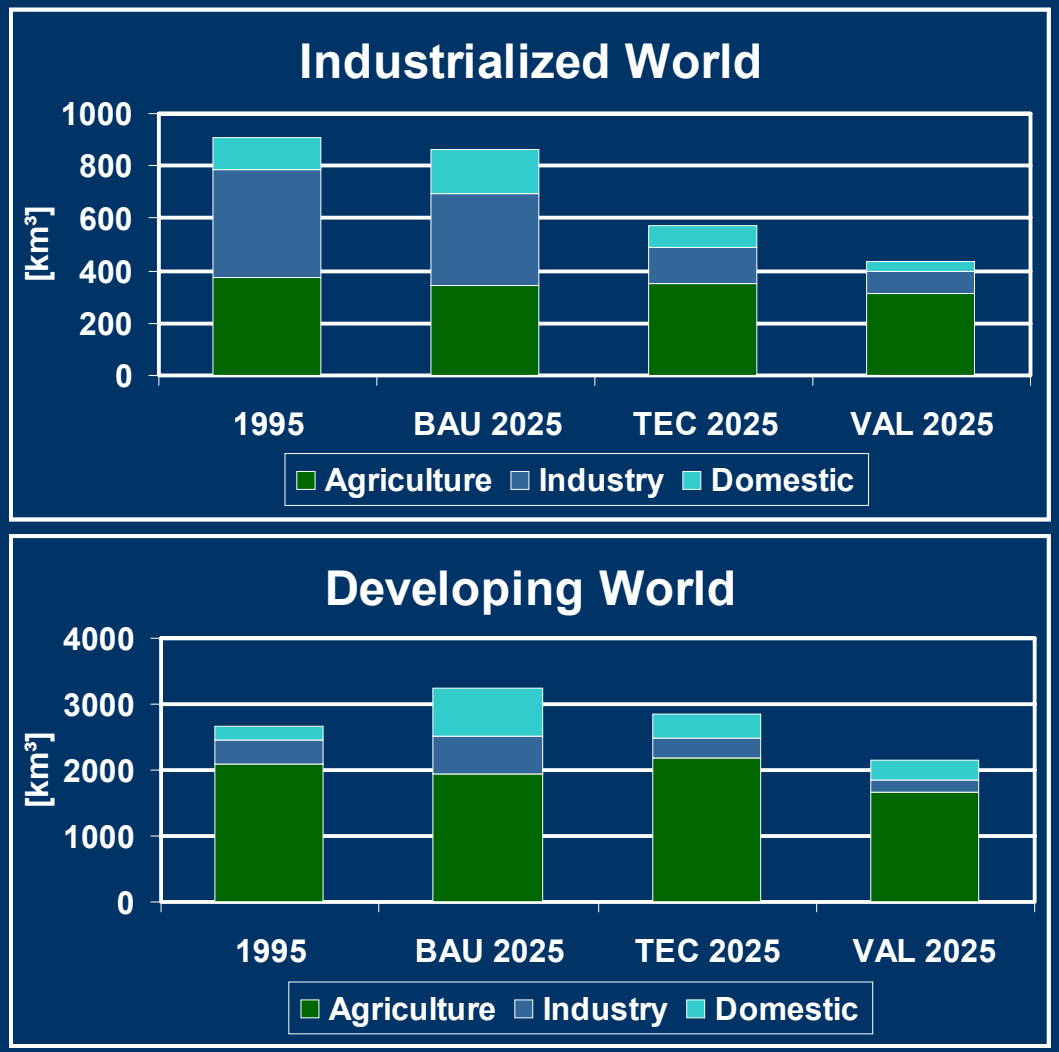
- Focus on water savings through changes in values and behavior
- Changing values and behavior -> *Strong structural changes* in use of water
- Global population: 7.5 billion, Global income: + 88 %
- Irrigated land: +5

Water Withdrawals





Water Withdrawals



Change in Pressure on Water Resources

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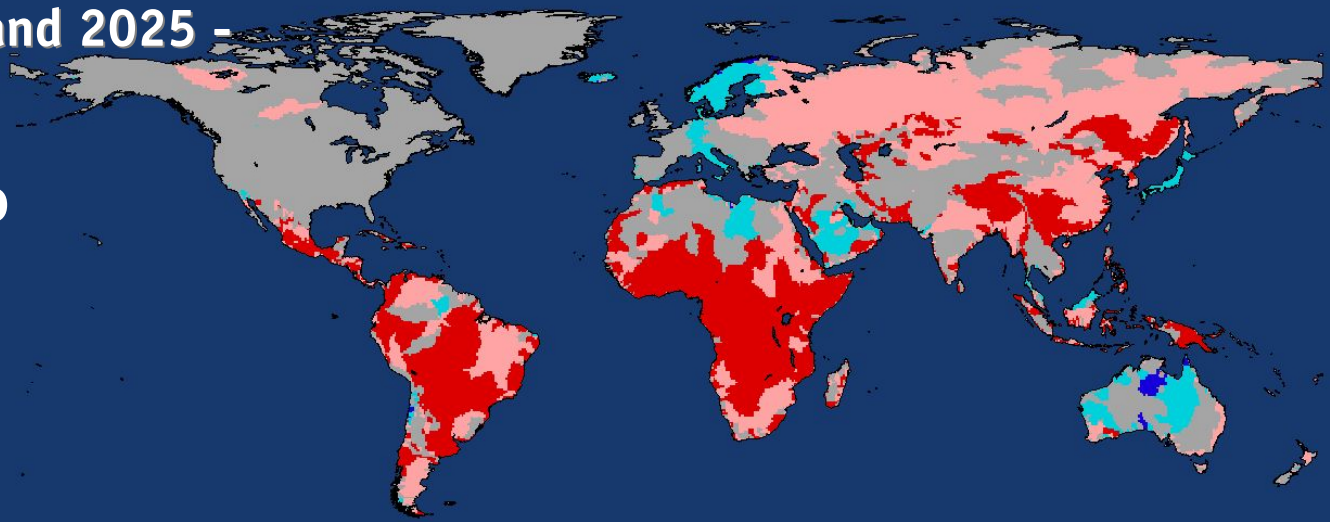
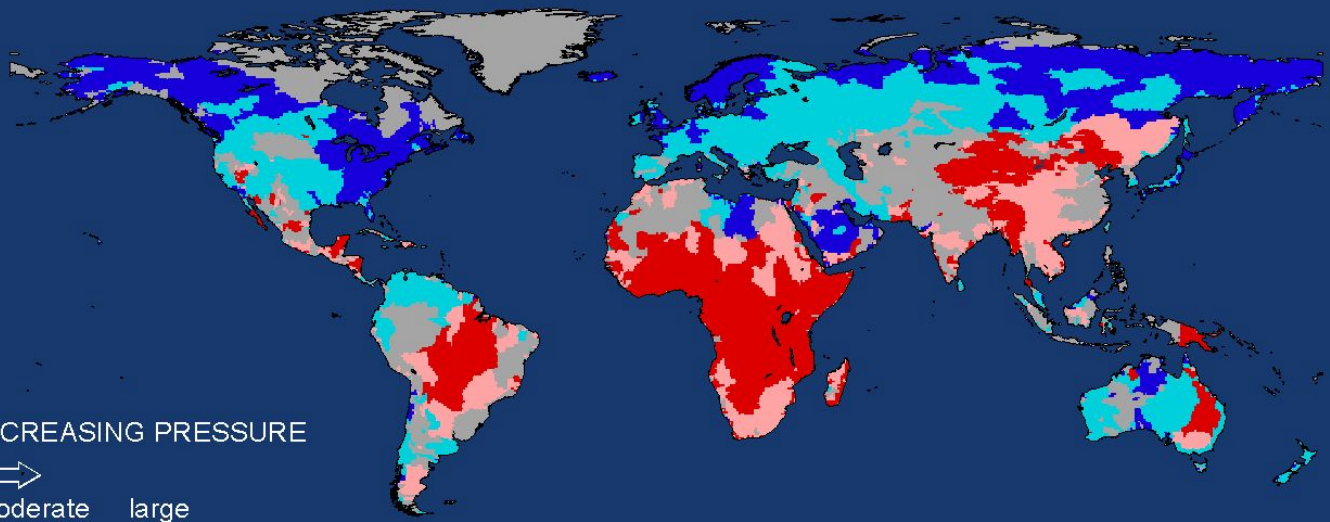


TEC - Scenario



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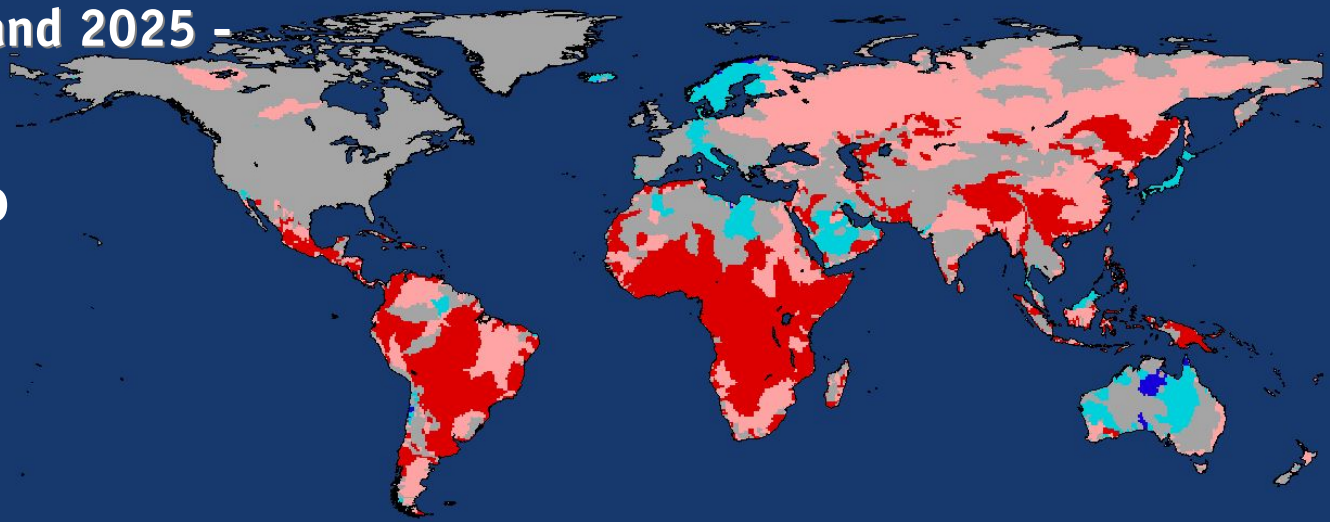
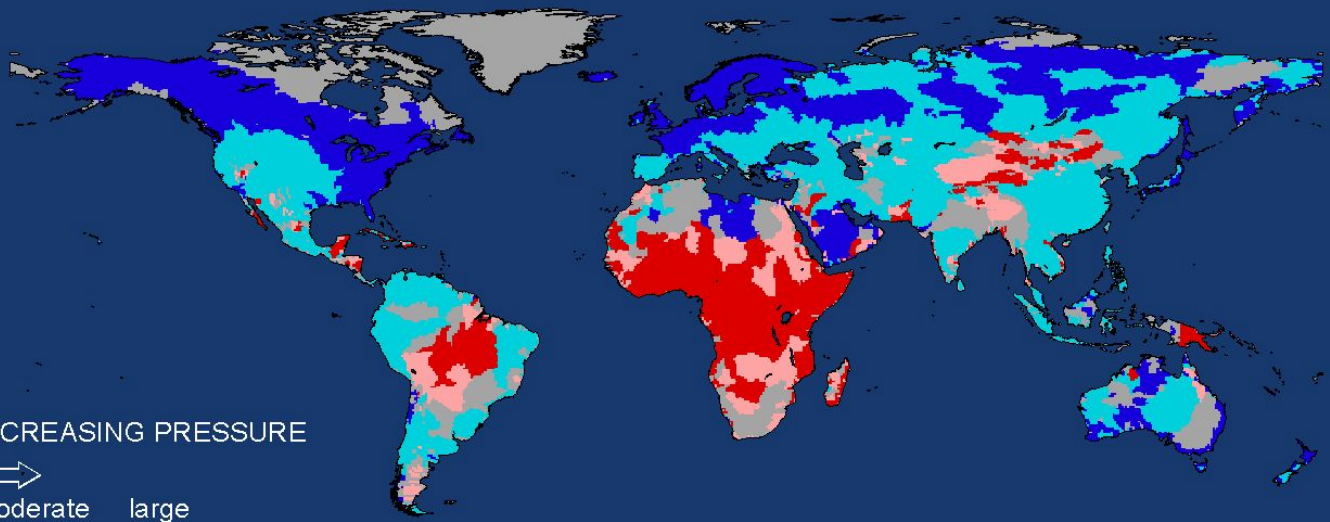


VAL - Scenario



Conclusions

- By Region -

Industrialized Regions: Stable or even strongly reduced withdrawals (and thus less pressure on resources).

Sub-Saharan Africa and Latin America: Strongly increased withdrawals, but no new areas under severe water stress. Feasible to rapidly develop infrastructure?

Asia: Increasing withdrawals and extended severe water stress areas under BAU and TEC -- decreasing withdrawals and pressure on resources in most areas under VAL.

Conclusions

Under current trends, slow improvements in water efficiency do not keep up with increasing water demand.

Areas under "severe water stress" expand and intensify.

The number of people living in areas under "severe water stress" increases from 2.1 to 4.0 billion by 2025.

This continuing "severe water stress" raises the risk that simultaneous water shortages around the world could trigger a kind of global water crisis.

Conclusions

To reduce pressure on water resources we should accelerate improvements in water use efficiency.

Although efficiency improvements are necessary, they are also insufficient to avoid severe water stress.

To translate a water vision into a sustainable water future we will need basic reforms and basic structural changes in the way we use water in household, industry, agriculture.