

**WATER FOR
AGRICULTURE & THE
ENVIRONMENT: THE
ULTIMATE TRADE-OFF**

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Intensifying Water Scarcity

=

f(Population Growth, Economic
Development)

THE GLOBAL WATER SITUATION

GLOBAL POPULATION GROWTH

**** 30% by 2025 ~ 1.6 billion**

**** 50% by 2050 ~ 3.1 billion**

FALKENMARK STRESS INDEX

(in m³/person/year)

**** > 1700 = Self-Sufficient**

**** 1700 > STRESS > 1000**

**** < 1000 = Chronic**

Scarcity

WATER-SHORT COUNTRIES

Status	STRESS	SCARCe	TOTAL
Year 1995	11	18	29
2025	19	29	48

GLOBAL WATER USE

- * **AGRICULTURE = 84%**
- * **DOMESTIC & INDUS = 6.5%**
- * **RESERVOIR LOSS = 9.4%**

**ENVIRONMENTAL
FLOWS**

=

**30-35% OF UNIMPAIRED
FLOW**

WATER FOR AGRICULTURE

GROWTH IN AG WATER DEMAND BY 2050

Rockstrom et al 2007 **5200 km³/yr**

Lundquist, et al 2007 **3300 km³/yr**

IWMI, 2007 **1800 km³/yr**

Rockstrom, et al, 2008 **1700 km³/yr**

SUPPLEMENTAL WATER?

- 1. Acquire Additional Green Water**
- 2. Harvest Rainwater**
- 3. Increase Water/Crop Productivity**
- 4. Import Food – Virtual Water**

**BLUE WATER = Run-off &
accessible ground water**

**GREEN WATER = Soil
moisture**

PROJECTED SHORTAGES 2050

GREEN BLUE	GREEN SHORT $< 1300 \text{ m}^3/\text{person}/\text{year}$	GREEN FREE $> 1300 \text{ m}^3/\text{person}/\text{yr}$
BLUE SHORT $< 1000 \text{ m}^3/\text{person}/\text{yr}$	Iran, Pakistan, Jordan, Egypt, Ethiopia, India, China	Kyrgistan, Czech Rep., Lesotho, South Africa,
BLUE FREE $> 1000 \text{ m}^3/\text{person}/\text{yr}$	Japan, Bangladesh, Togo, N & S Korea, Nigeria	Zimbabwe, Ghana, Angola, Botswana, Chad, Kenya, Mali, Sudan

AGRICULTURAL WATER

**** w/o MORE, INSUFFICIENT FOOD**

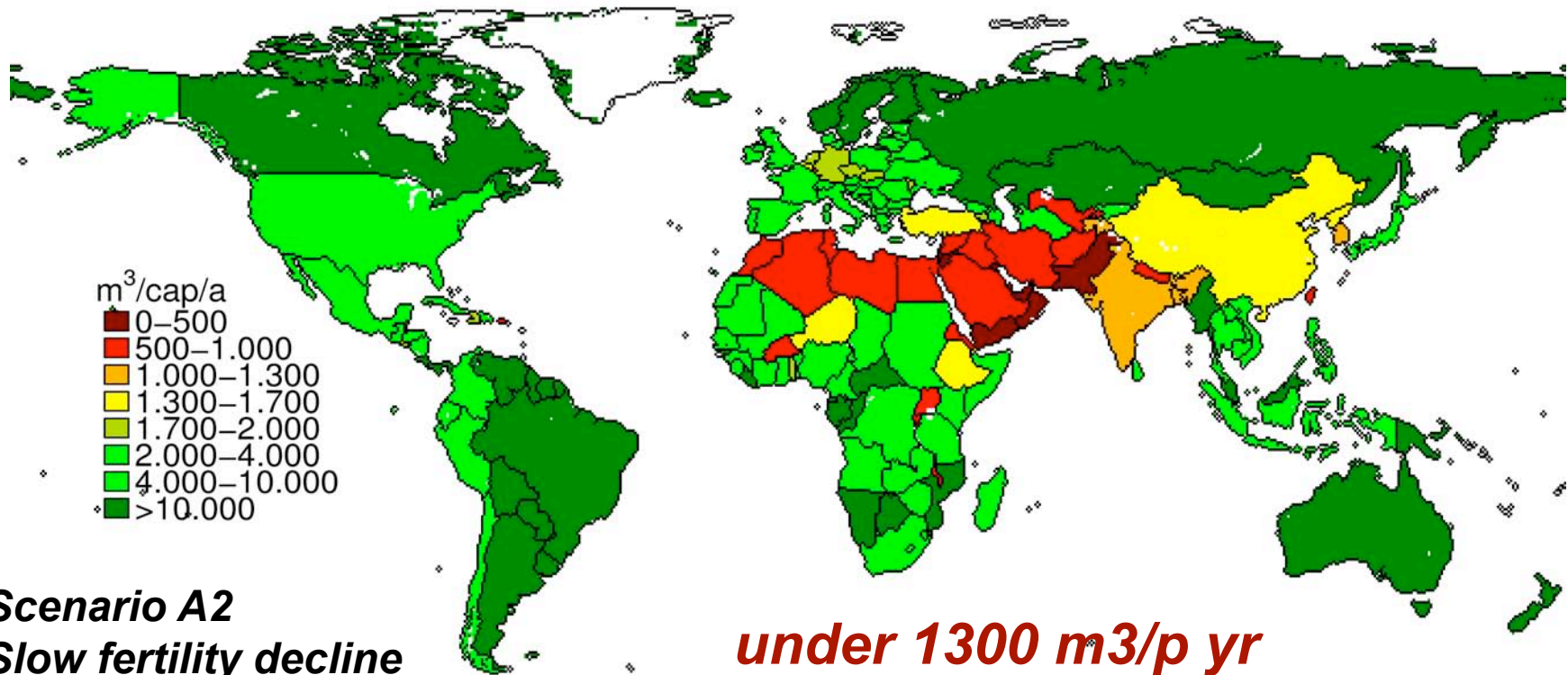
AGRICULTURAL WATER

**** w/o MORE, INSUFFICIENT FOOD**

**** DEFICIENT COUNTRIES**

2050: Total water availability

Blue + green water



AGRICULTURAL WATER

- ** w/o MORE, INSUFFICIENT FOOD**
- ** DEFICIENT COUNTRIES**
- ** AFRICA LOOKS BETTER**

WATER FOR THE ENVIRONMENT

SUPPLIER OF LAST RESORT?

Environmental Uses

OR

ENVIRONMENTAL SERVICES

PROVISIONAL SERVICES

**** FOOD**

**** FRESH WATER**

**** WOODFUEL**

**** TIMBER**

**** FIBER**

**** BIOCHEMICALS**

**** GENE RESOURCES**

REGULATING SERVICES

- ** CLIMATE REGULATION**
- ** DISEASE REGULATION**
- ** FLOOD REGULATION**
- ** WATER PURIFICATION**

CULTURAL SERVICES

**** SPIRITUAL**

**** INSPIRATIONAL**

**** AESTHETIC**

**** EDUCATIONAL**

**** RECREATIONAL**

SUPPORTING SERVICES

- ** SOIL FORMATION**
- ** SOIL CONSERVATION**
- ** NUTRIENT CYCLING**
- ** PRIMARY PRODUCTION**
- ** BIODIVERSITY**

CONCERN For FUTURE

**** Loss of biodiversity**

CONCERN For FUTURE

**** Loss of biodiversity**

**** Existence of
thresholds**

CONCERN For FUTURE

**** Loss of biodiversity**

**** Existence of
thresholds**

**** Dryland vulnerability**

ENVIRONMENTAL WATER
IS
WATER FOR PEOPLE

CONCLUSIONS

THE BIG TRADE-OFF

**** Significant levels of
starvation**

OR

**** High cost environmental
instability**