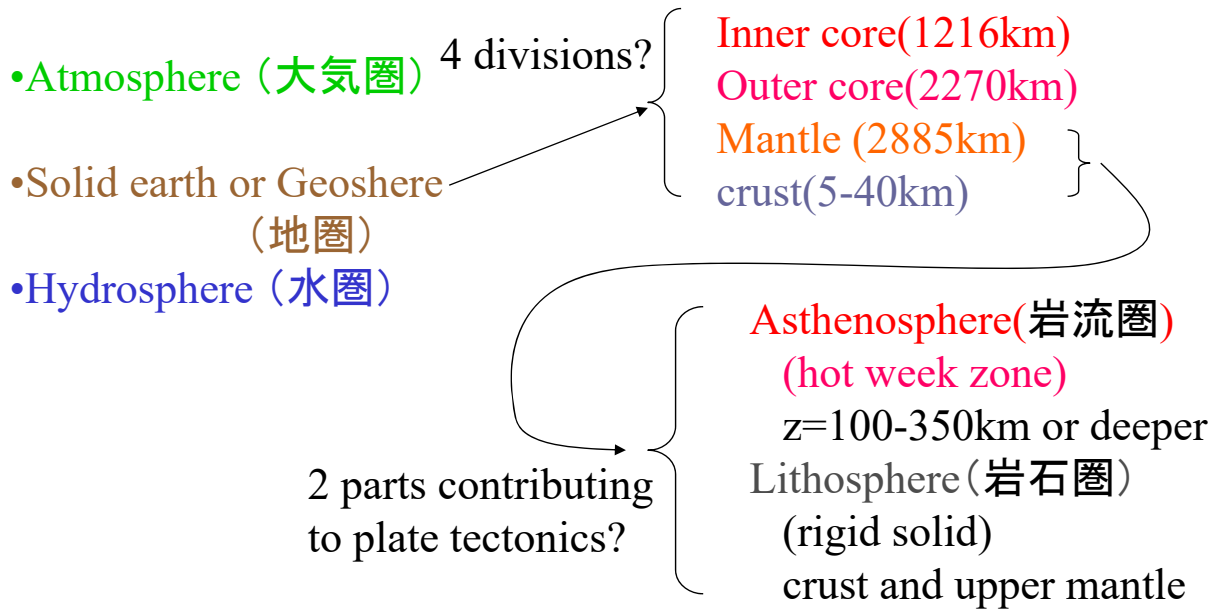


# Fundamental Knowledge on Earth Science

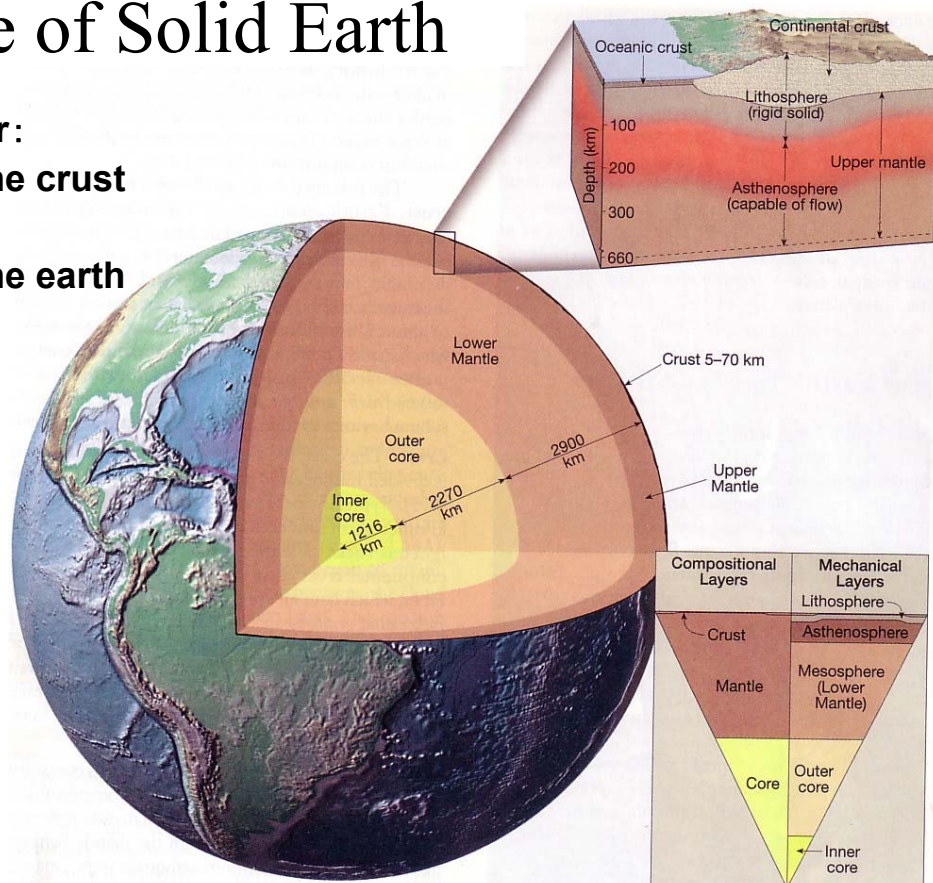
Earth mainly consists of three major parts (spheres)??



## Structure of Solid Earth

**Geotechnical layer:**  
thin surface of the crust

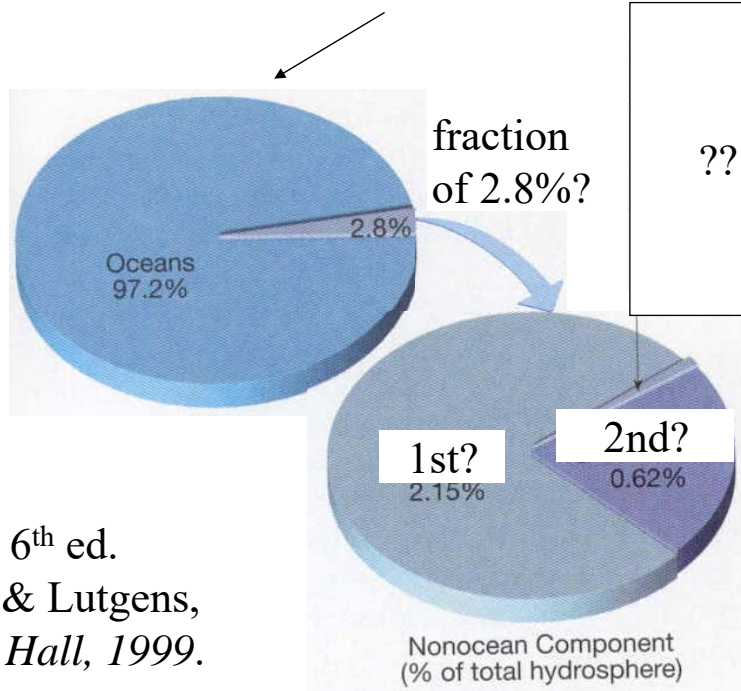
**Crust:**  
thin surface of the earth



# Hydrosphere??

How much is total volume? **1.36 Bkm<sup>3</sup> (13.6億km<sup>3</sup>)**

## Fraction of ocean and non-ocean water?



Average sea water depth=3729m  
Sea area 361.06Mkm<sup>2</sup> (71%),  
Land area: 148.89km<sup>2</sup>



Radius of the Earth: 6370km

“Earth” 6<sup>th</sup> ed.  
Tarbuck & Lutgens,  
Prentice Hall, 1999.

## Fresh water of Hydrosphere

Parts of hydrosphere	Volume of fresh water (km <sup>3</sup> )	Share of total volume of freshwater (%)	Average rate of water exchange
Ice sheets and glaciers	24,000,000	84.945	?? years
Ground water	4,000,000	14.158	?? years
Lakes and reservoirs	155,000	0.549	7 years
Soil moisture	83,000	0.294	1 year
Water vapor in the atmosphere	14,000	0.049	9.9 days
River water	1,200	0.004	11.3 days
<b>total</b>	<b>28,253,200</b>	<b>100.000</b>	

(source: “Earth” 6<sup>th</sup> ed., J.Tarbuck & F. K. Lutgens, Prentice Hall)

What does it mean??



What does it affect in ground water contamination??

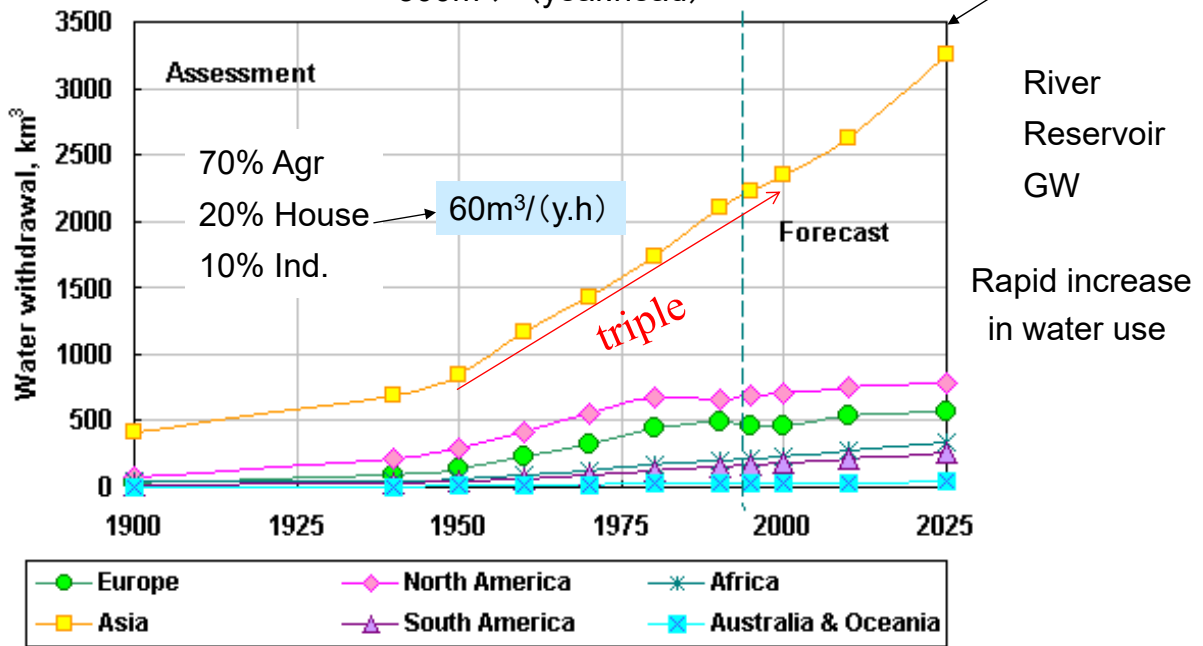
# Use of water in the world

Annual water withdrawal => actual use about the half

1995: 3800km<sup>3</sup> withdrawal, 2000km<sup>3</sup> in use

300m<sup>3</sup> / (year.head)

5200km<sup>3</sup>

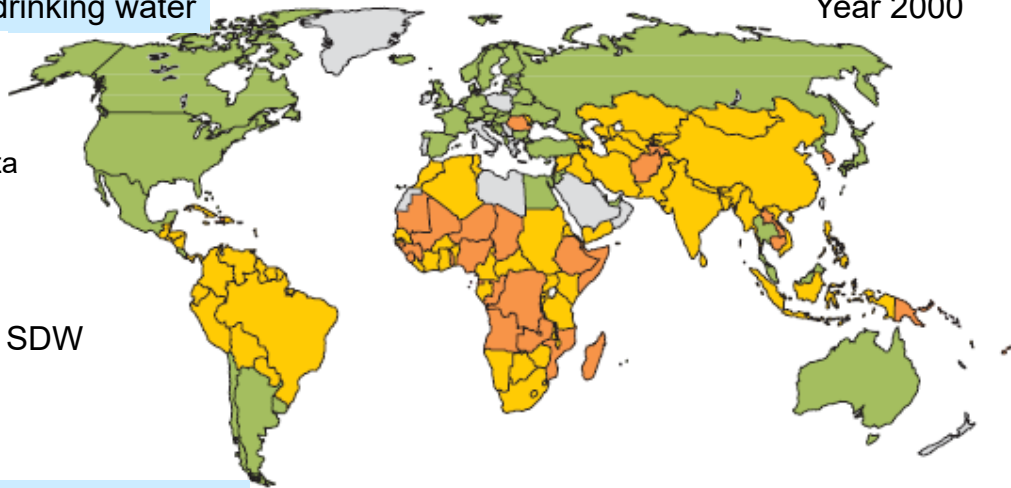


[http://webworld.unesco.org/water/ihp/db/shiklomanov/summary/html/figure\\_8.html](http://webworld.unesco.org/water/ihp/db/shiklomanov/summary/html/figure_8.html)

## Access to safe drinking water

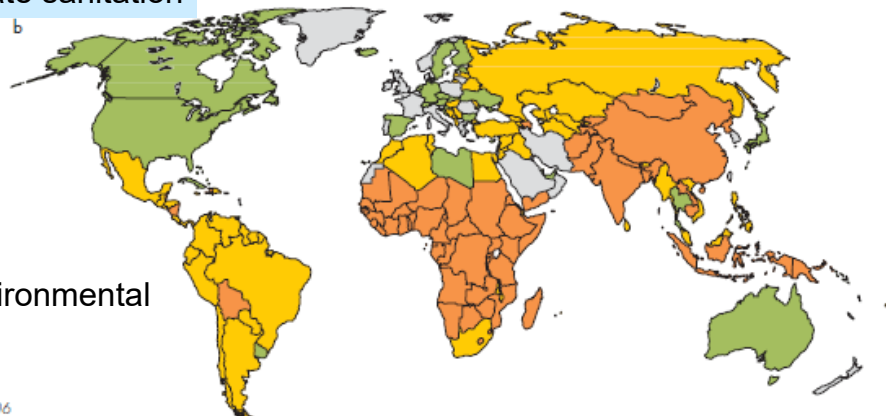
- <95%
- 60-95%
- 60%<
- Insufficient data

1.1B / 6.0B  
not access to SDW



## Access to appropriate sanitation

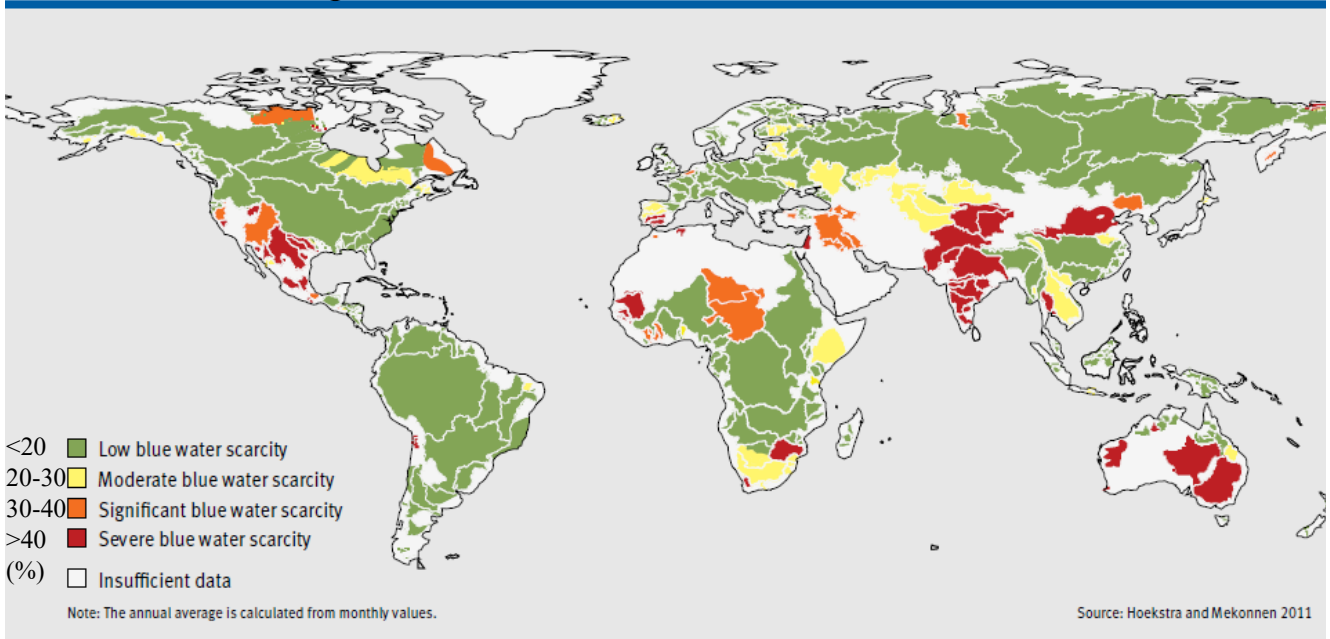
2.4B / 6.0B  
not access to AS



GEO-4: Global Environmental  
Outlook 4, UNEP

# Annual average blue water scarcity in major river basins, 1996–2005

FI

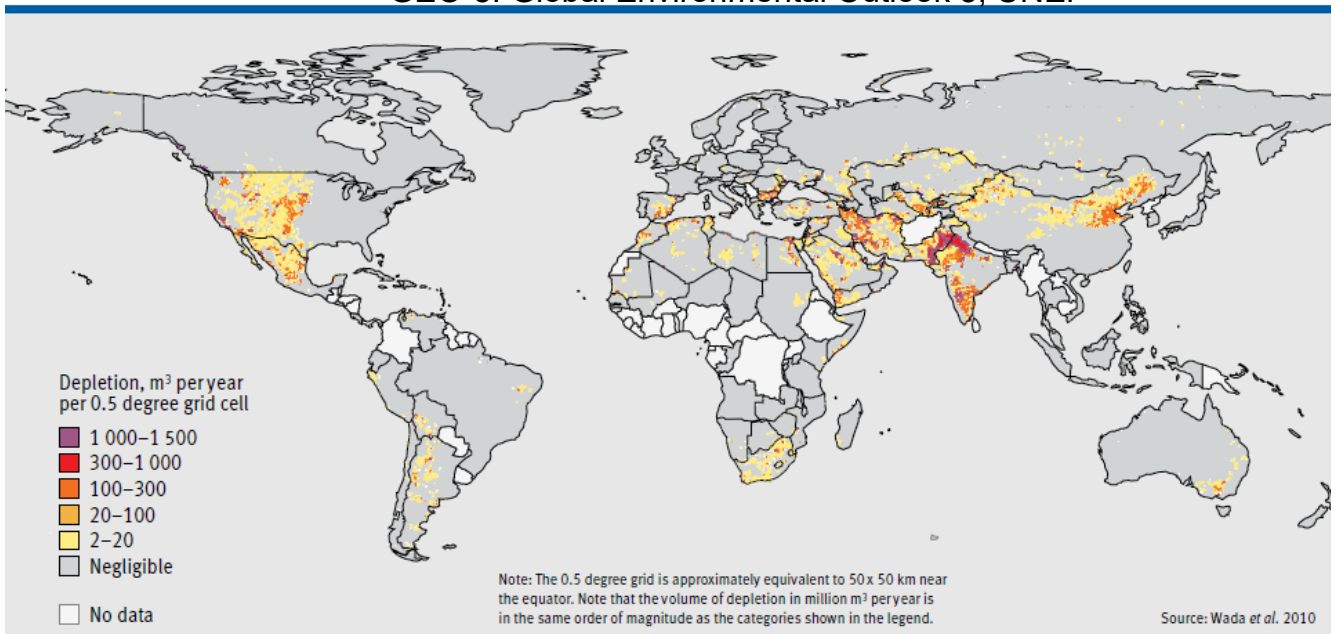


GEO-5: Global Environmental Outlook 5, UNEP

$$\text{blue water scarcity} = \frac{\text{blue water footprint}}{\text{blue water availability}}$$

# Global annual groundwater depletion, 2000

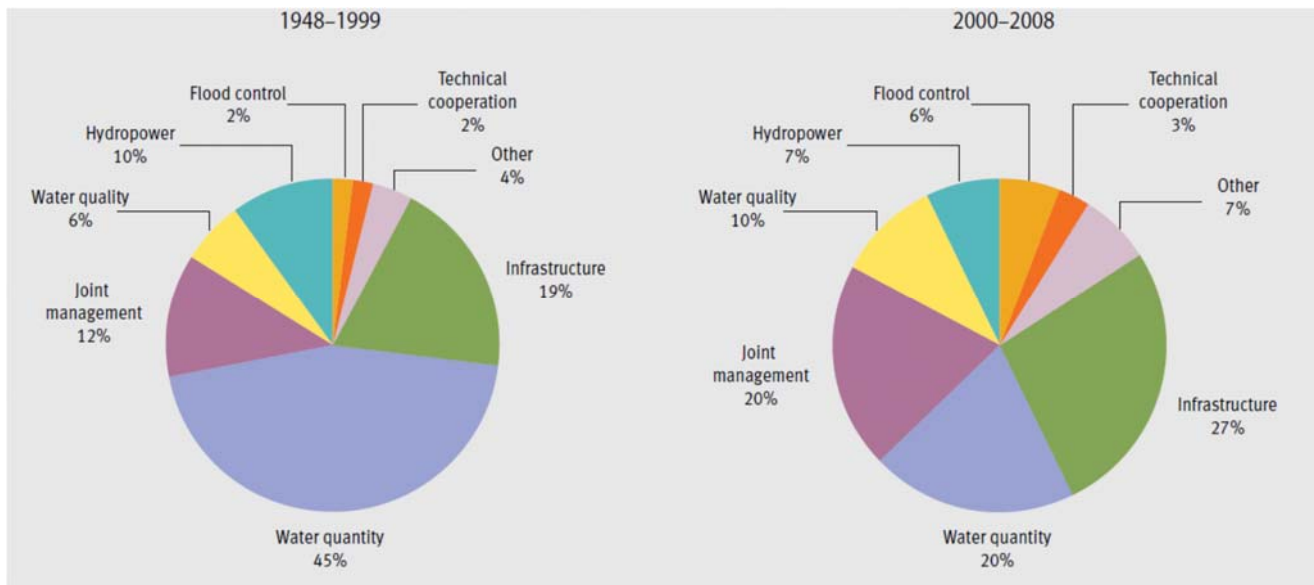
GEO-5: Global Environmental Outlook 5, UNEP



				Cf: Total :3831
	1960		2000	2010
Global GW withdrawal:	312km <sup>3</sup>	=>	734km <sup>3</sup>	1,000km <sup>3</sup>
global GW depletion:	126km <sup>3</sup>	=>	283km <sup>3</sup>	



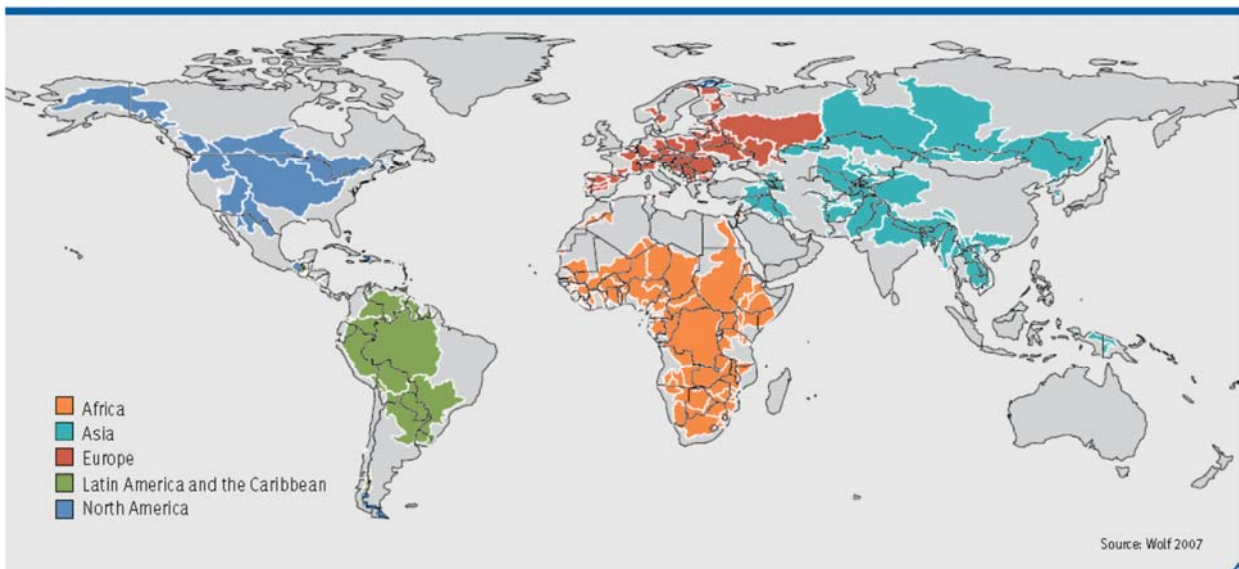
# Distribution of Freshwater Conflicting Events by Type of Issue



出典: Global Water Challenges based on GEO-5 Water Chapter

# International river basins

Figure 4.21 International river basins, 2000

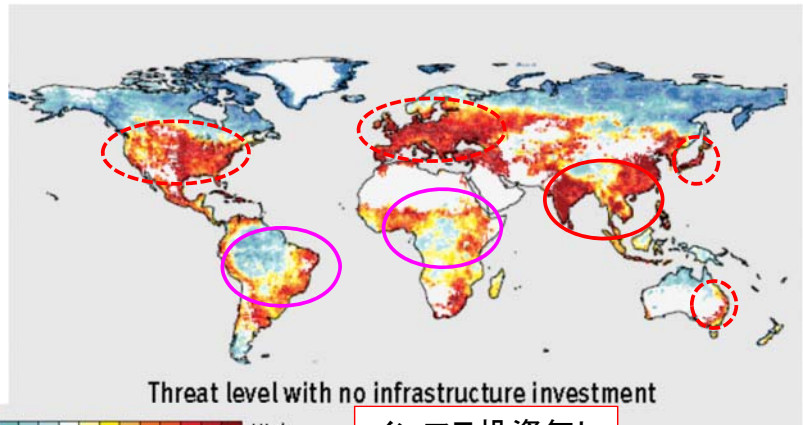


出典: Global Water Challenges based on GEO-5 Water Chapter

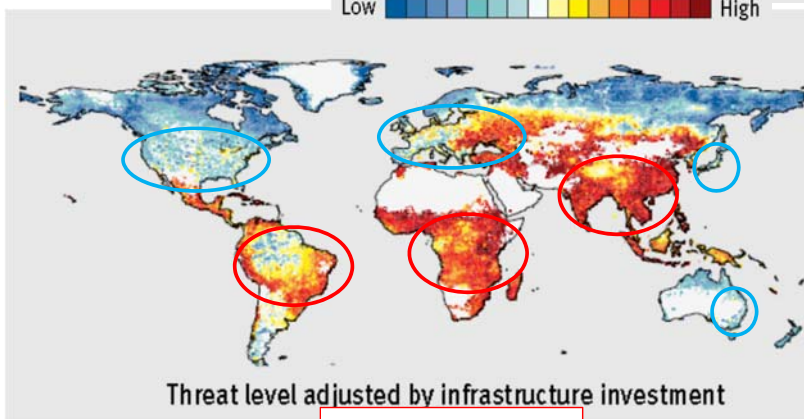
# 水不足危険度

## Threats to water security with and without infrastructure investment, 2000

*What can you interpret from the two figures?*



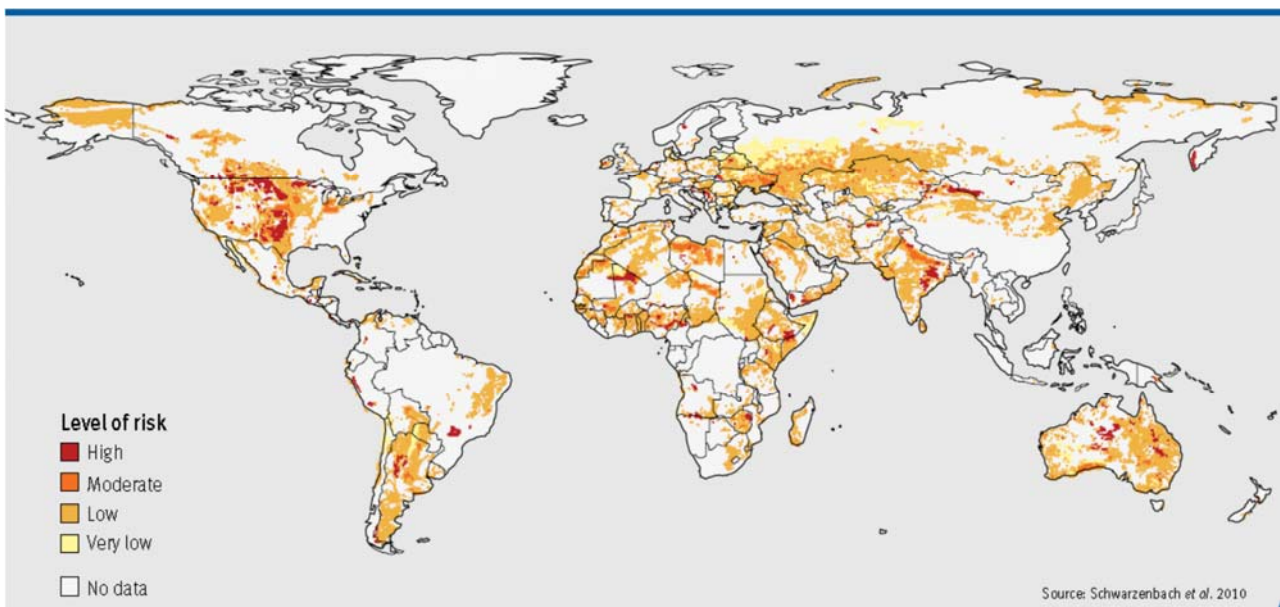
インフラ投資無し



インフラ投資有り

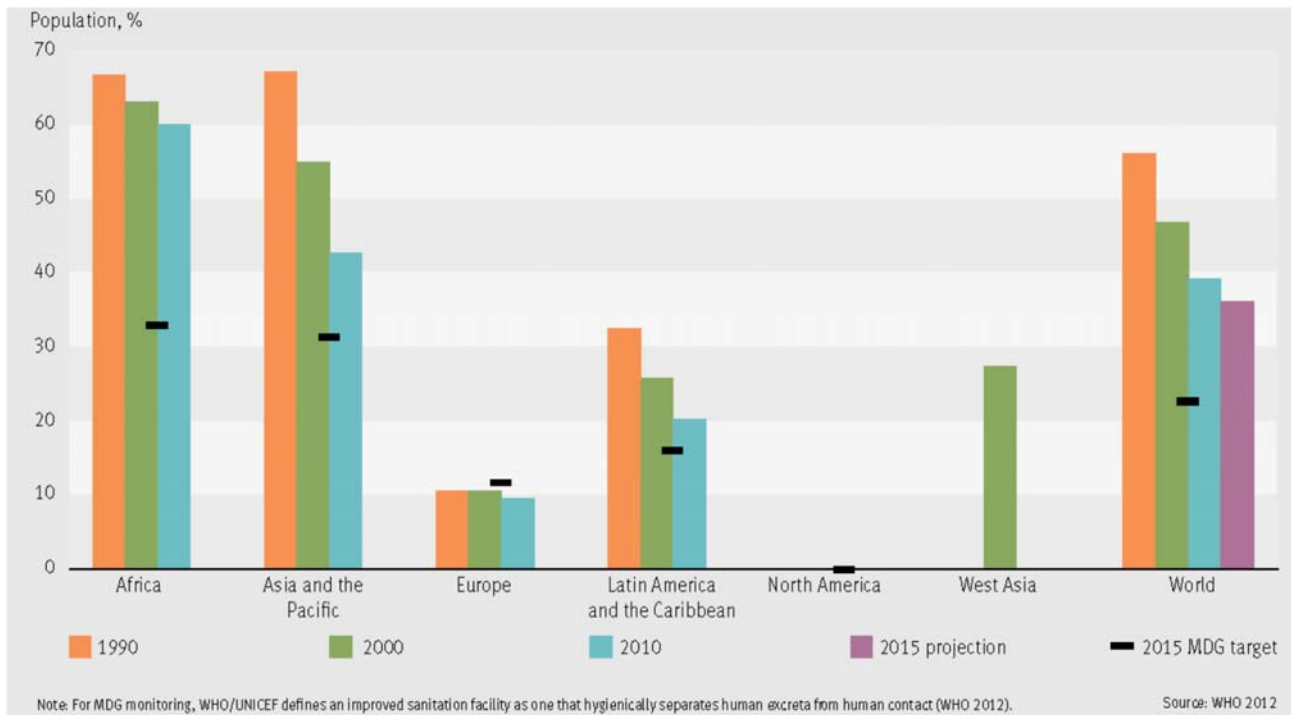
出典: GEO-5 Water Chapter

## Estimated risk of arsenic in drinking water, based on hydrogeological conditions



出典: GEO-5 Water Chapter

## Percentage of Population without Access to Improved Sanitation, Compared to MDG Goal



GEO5

13

## 2030 Agenda for Sustainable Development by UN General Assembly on Sep 25, 2015

### SUSTAINABLE DEVELOPMENT GOALS 17 GOALS TO TRANSFORM OUR WORLD

