FEEDING THE WORLD - - OR - - DAMNING THE DAMS.. HARD CHOICES AND DIFFICULT DECISIONS AHEAD..!

By

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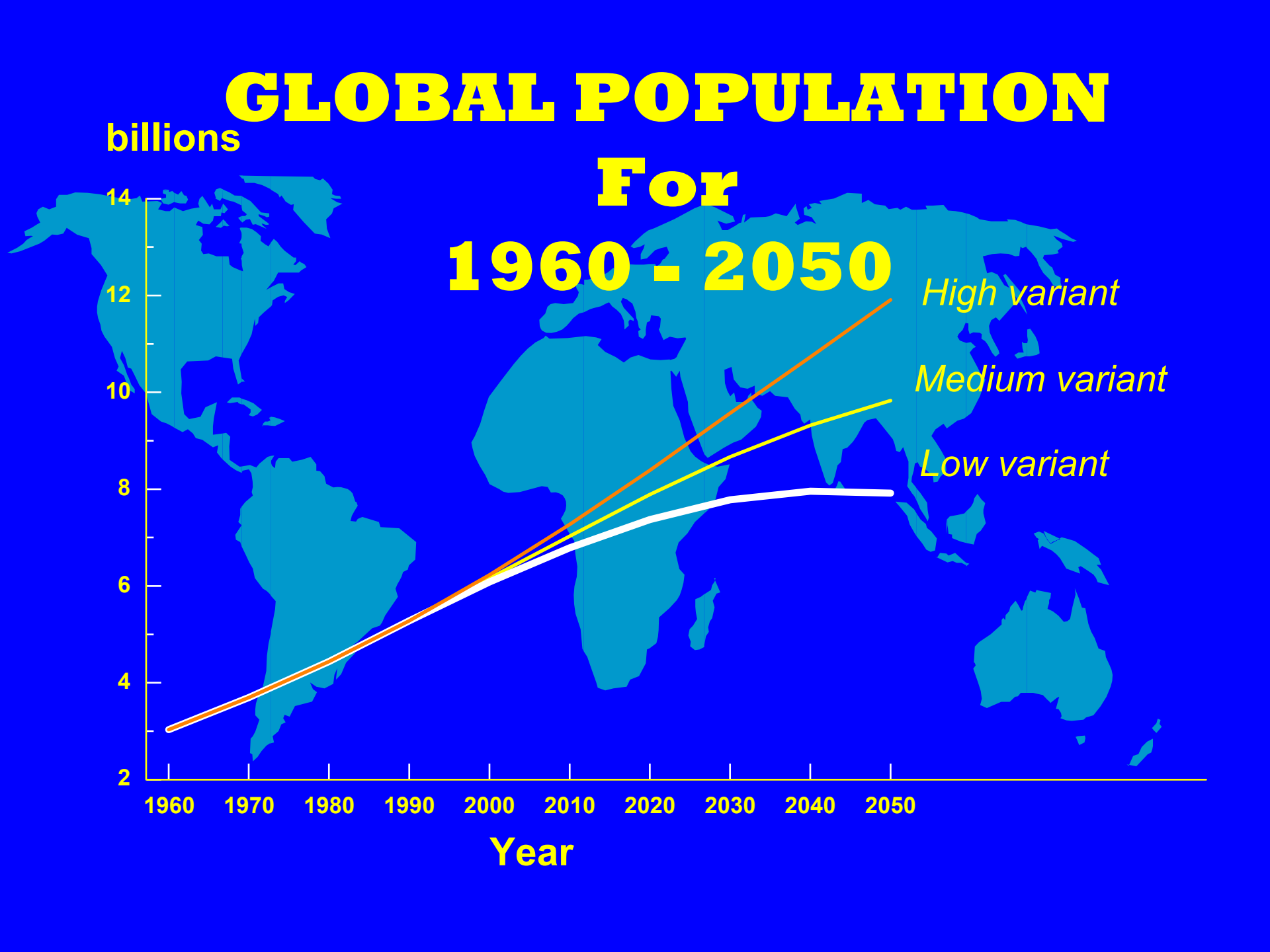
Canadian International Development Agency | Agence canadienne de développement international | Canada

OUTLINE

- World Food , Hunger and Poverty Outlook
- Land Resources, Use and Prospects
- World Water and Future Challenges
- World Energy Outlook
- Water Storage : Issues and Case Studies
- Where to Go From Here?
- Q&A's

GLOBAL POPULATION For 1960 - 2050



World Food , Water, Trade and Poverty

Facts and Figures

- 1 Billion are living on less than 1 $/Day.
- 2-3 Billion are living on less than 2 $/Day.
- 840 Million sleep hungry every night.
- 1.2 Billion lack access to clean drinking water and 2.4 Billion lack access to adequate sanitation.
- Only less than 8% of world cereal production is traded.
- 92% of cereals are consumed where they are produced.

UN Millennium Development Goals (MDG)

By the year 2015, all 191 United Nations Member States have pledged to meet these goals

1. Eradicate extreme poverty and hunger.
2. Achieve universal primary education.
3. Promote gender equality and empower women.
4. Reduce child mortality.
5. Improve maternal health.
6. Combat HIV/AIDS, malaria and other diseases.
7. Ensure environmental sustainability.
8. Develop a global partnership for development.

Key Targets of MDGs

Goal #1

- Reduce by half the proportion of people living on less than a dollar a day
- Reduce by half the proportion of people who suffer from hunger

Goal#7

- Integrate the principles of sustainable development into country policies and programmes; reverse loss of environmental resources.

- Reduce by half the proportion of people without sustainable access to safe drinking water and sanitation.

- Achieve significant improvement in lives of at least 100 million slum dwellers, by 2020.

F

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FOOD PRODUCTION

Land Resources

Water Resources

Energy

Capital

Labour

FOOD PRODUCTION

Land Resources

World Land Resources

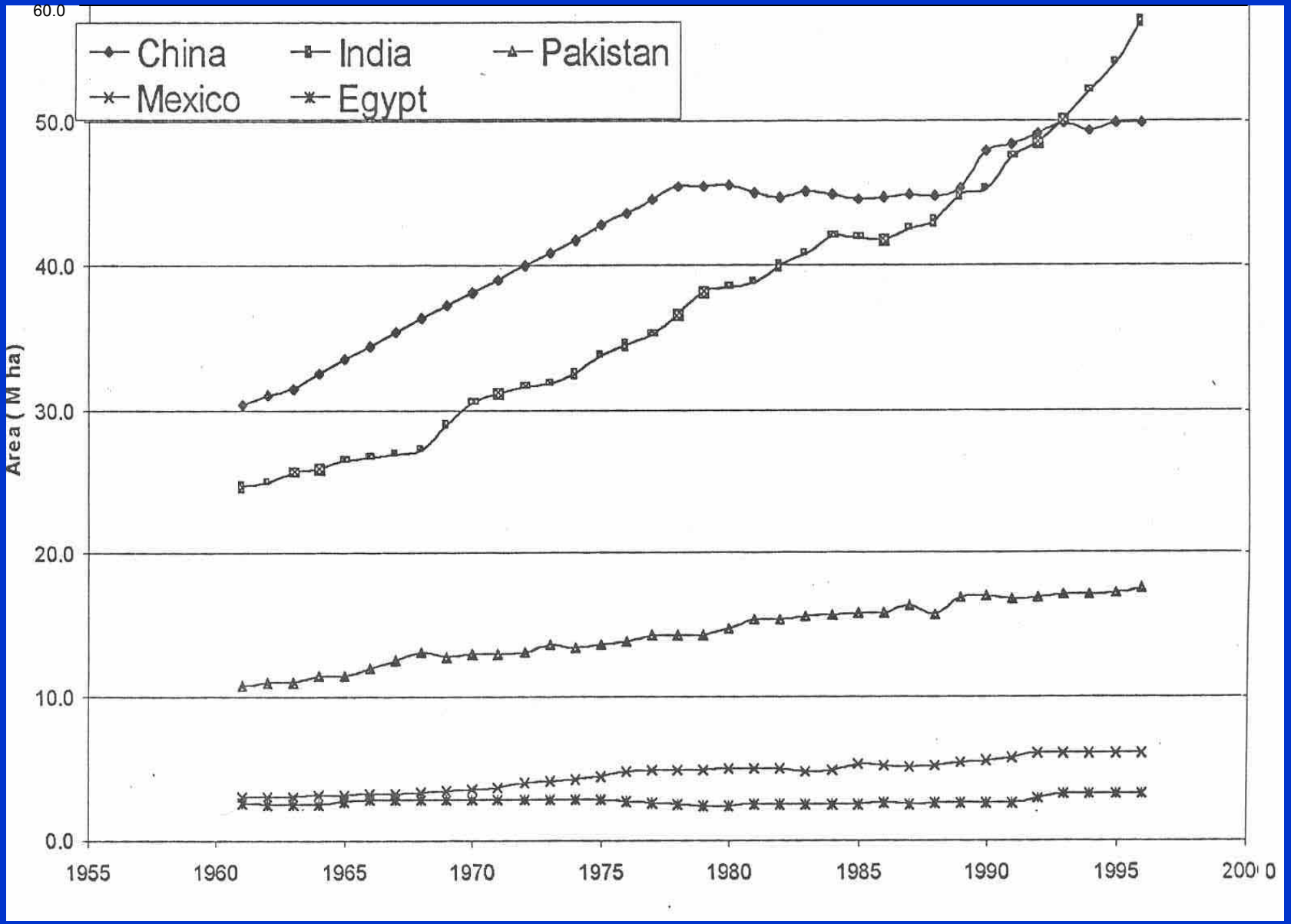
Type of Land Use	Area in 1000 Sq Km	Area in M Ha	% of Total
Total Land Area	130,505	13,050	100
Perennial Crops	1,324	132	1
Permanent Pasture	34,590	3,459	26.5
Annual Crops	13,691	1,369	10.5
Total Agr. Lands	49,613	4,961	38.0
Forest and Woodlands	41,724	4,172	32.0
Non-Arable Lands	39,168	3,917	30.0

260 M ha Irrigated

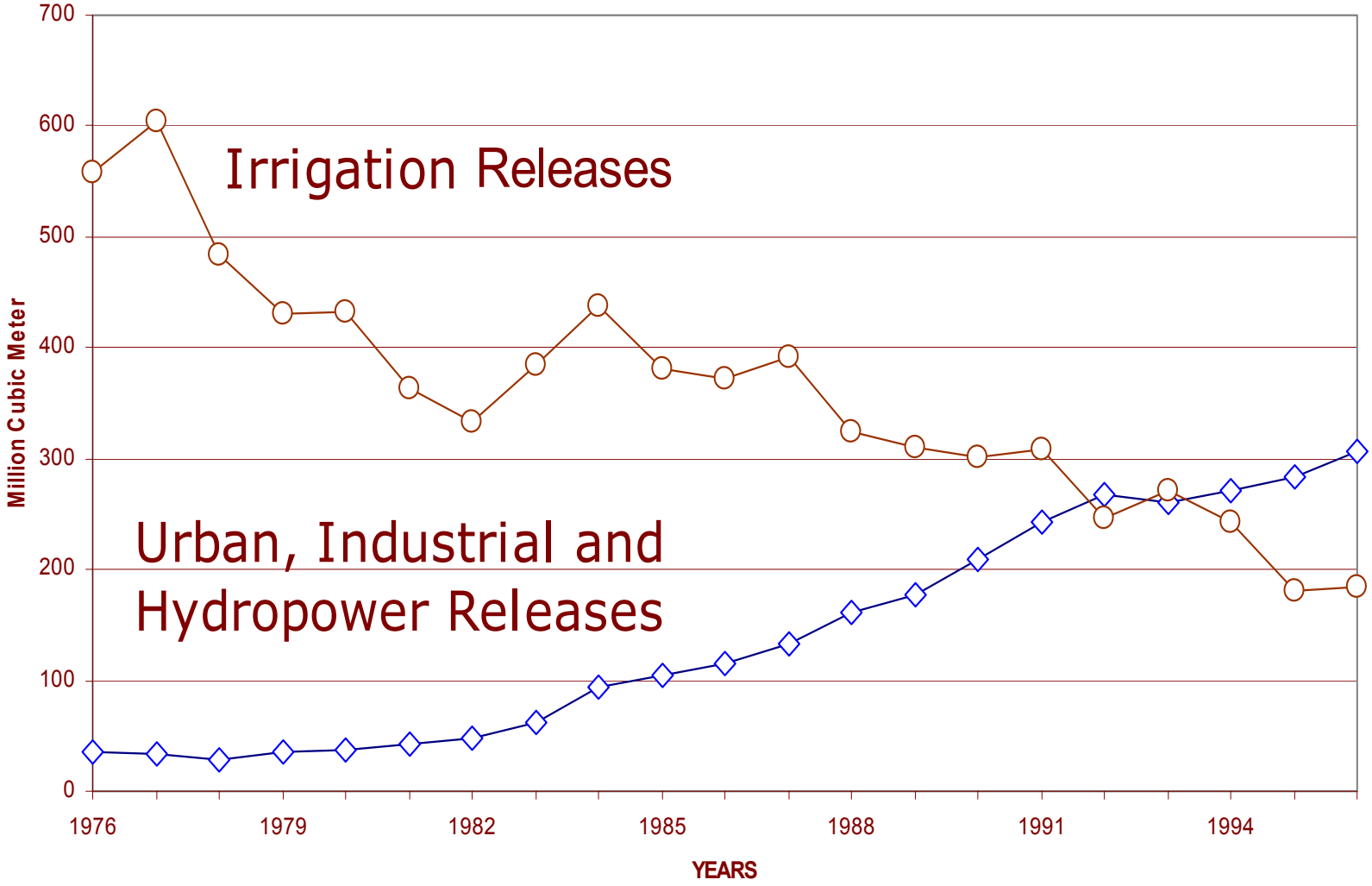
- Irrigation accounts for 70% of the world freshwater withdrawals, of which 93% is consumed by plants to produce 40% of the world's agricultural production on 17% of the world's agricultural land employing 2 billion of of the rural poor.

- Agricultural output per unit of water on irrigated croplands is twice the output on rainfed croplands.

Net Irrigated area of China, India, Pakistan, Mexico and Egypt



Zhang He Reservoir, China



Arable lands: Challenges

(a) Much of the world's arable land is already under cultivation

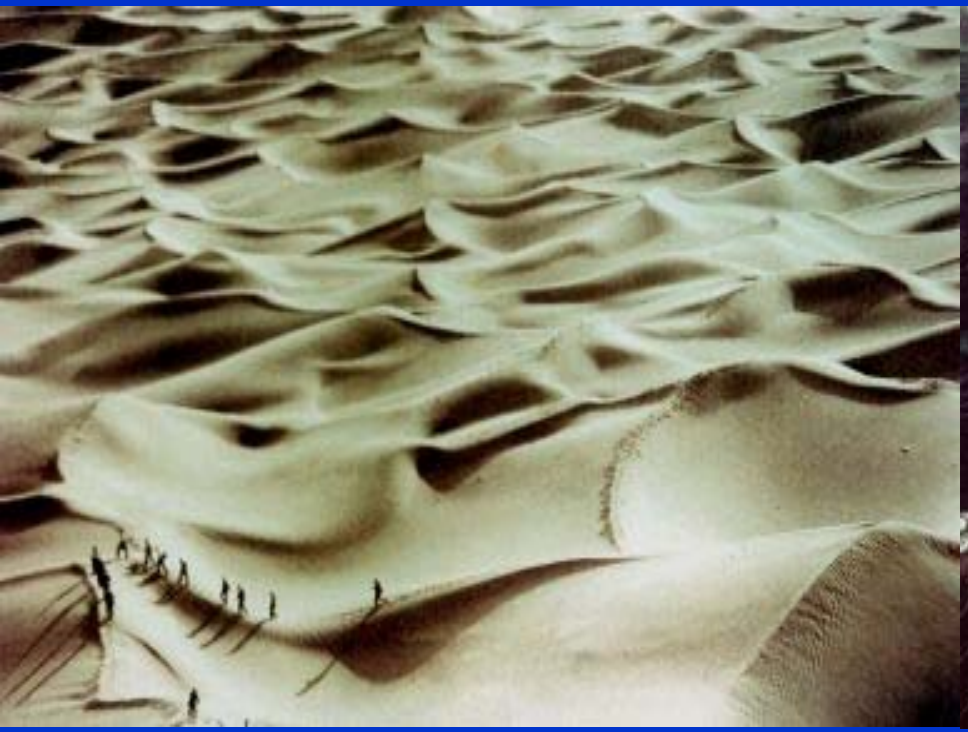
(b) Much good quality land is unproductive due to flooding, waterlogging and soil salinity

Land Resources

Land use and food crops - Summary

- Most of irrigation is for rice , a wetland crop in Asia.
- Most other grain crops are grown in the semi arid climate.
- No food crops are grown in tropical forests.
- Negligible food crops are grown on wetlands.
- About one third of the lands on Earth is suitable for agriculture : crops and livestock grazing.
- One third is in forest with poor soils.
- One third is unproductive : too cold , too high or too dry to support plant growth of any type.

Where can Agriculture go?
To the mountains or to the desert!



FOOD PRODUCTION

Water Resources

Water Resources

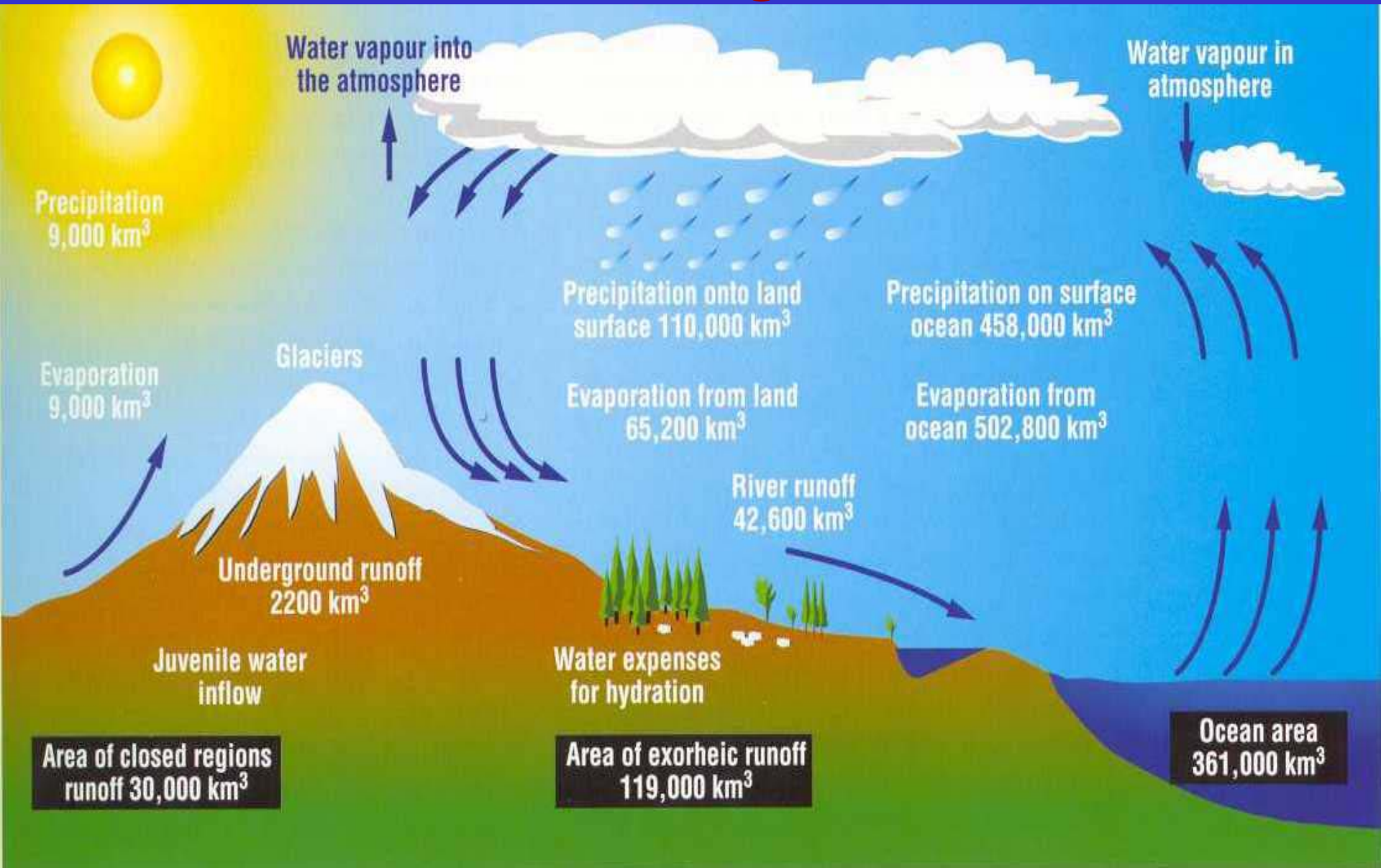
THE BLUE PLANET

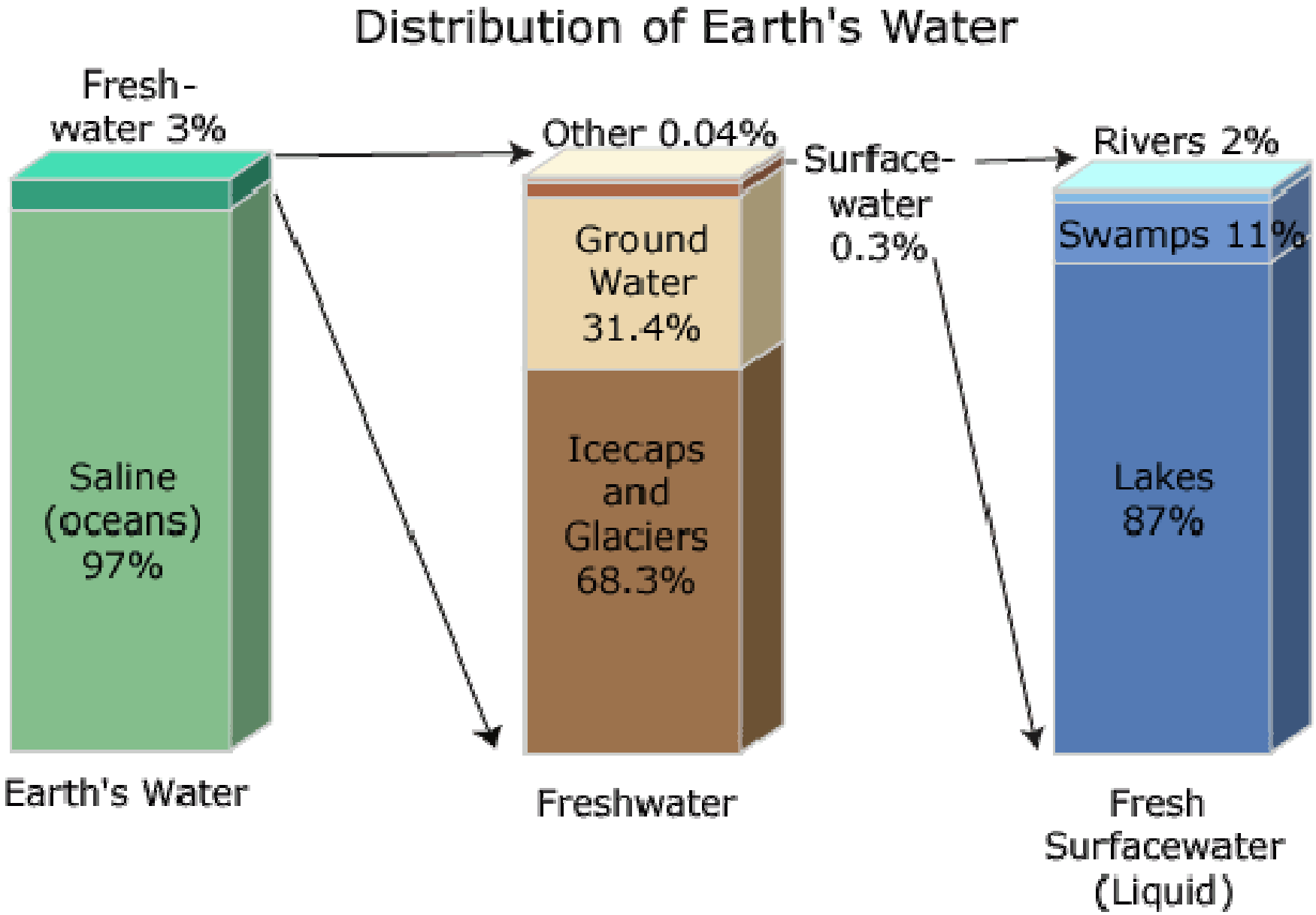
THE EARTH

Fresh Water in Numbers

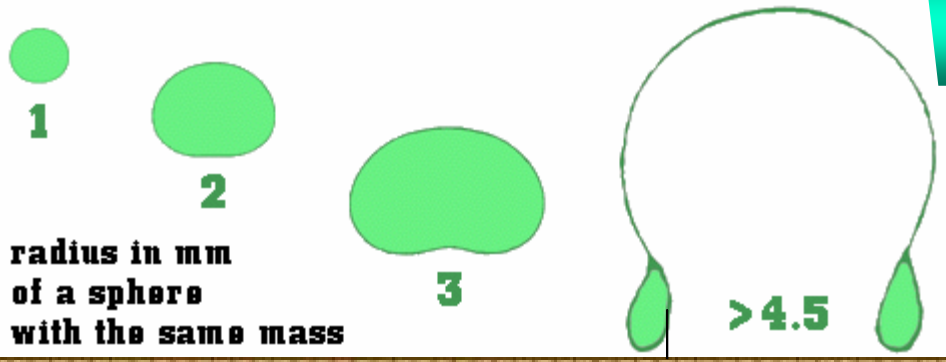
Water Resources

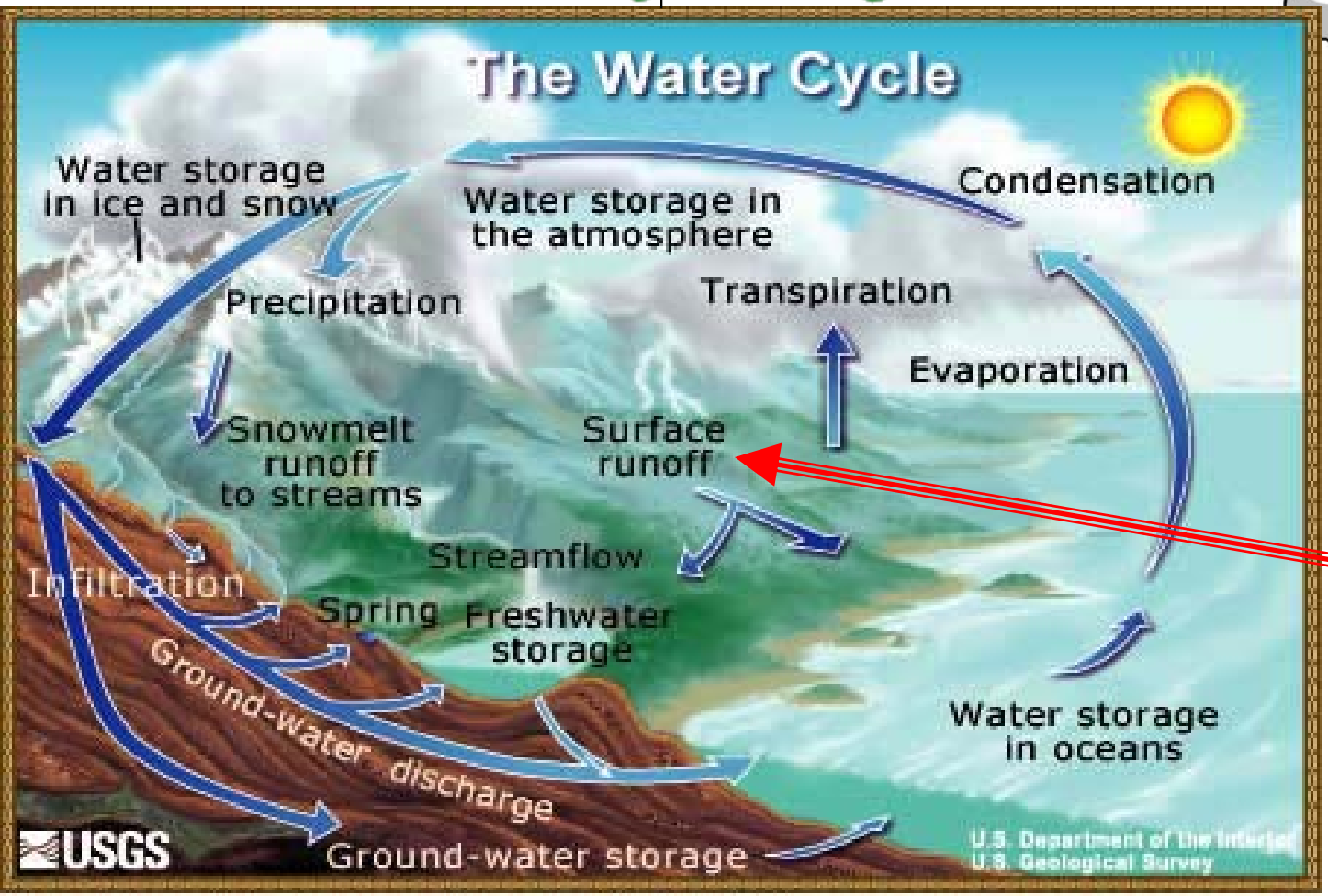
The Hydrologic Cycle




Distribution of Earth's Water
Fresh-
water 3%
Other 0.04%
Surface-
water
0.3%
Rivers 2%
Ground
Water
31.4%
Swamps 11%
Saline
(oceans)
97%
Icecaps
and
Glaciers
68.3%
Lakes
87%
Earth's Water
Freshwater
Fresh
Surfacewater
(Liquid)

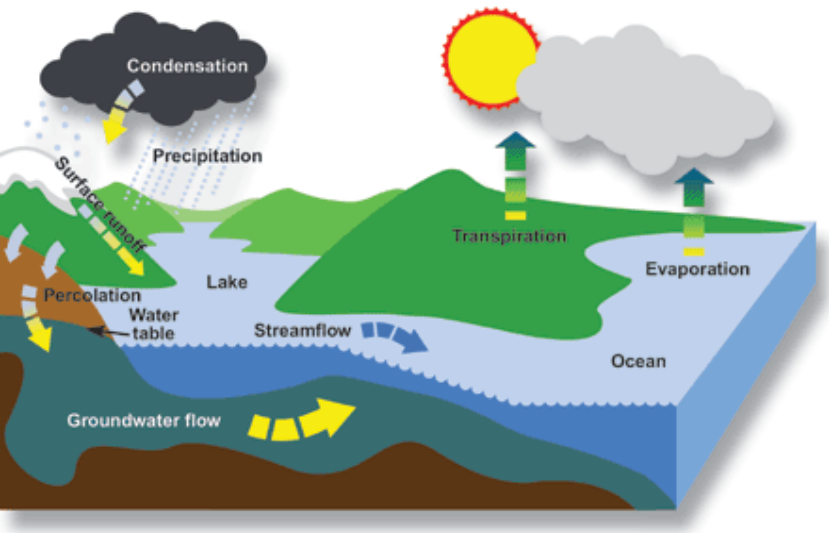
Water Resources

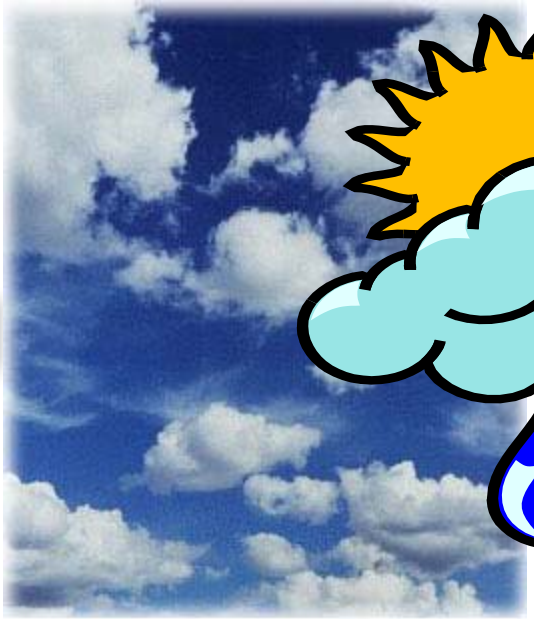




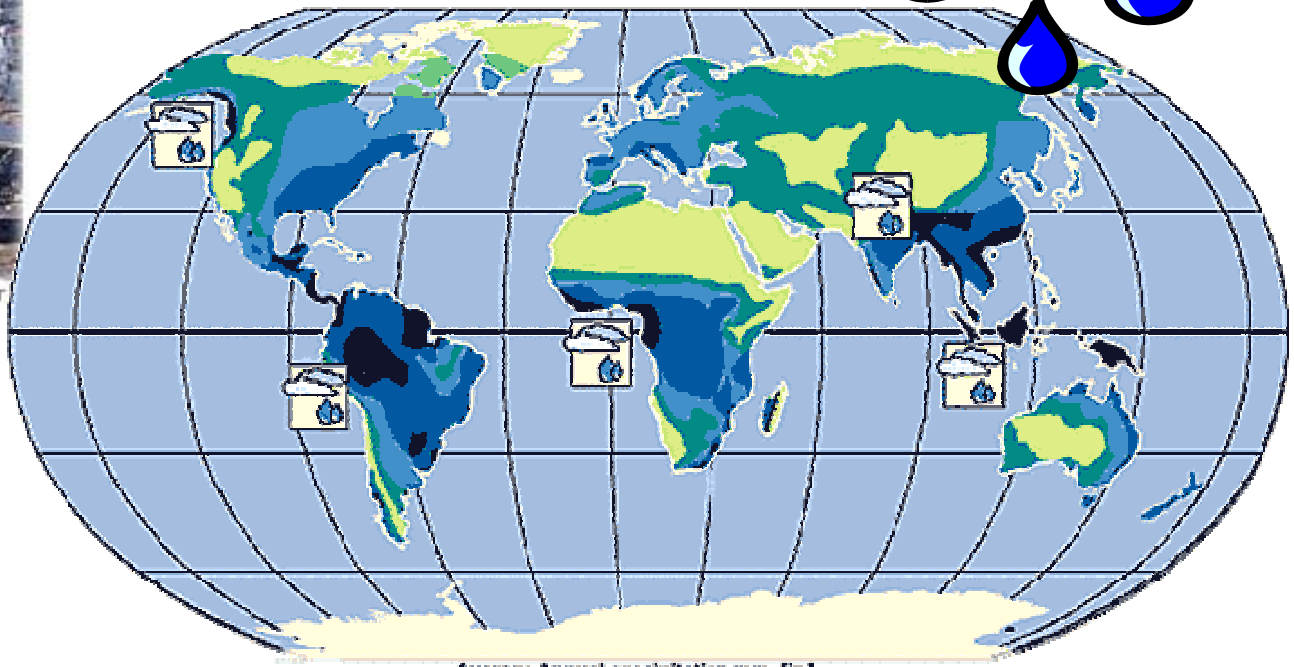
Storage

Illustration by John M. Evans, Colorado District, USGS





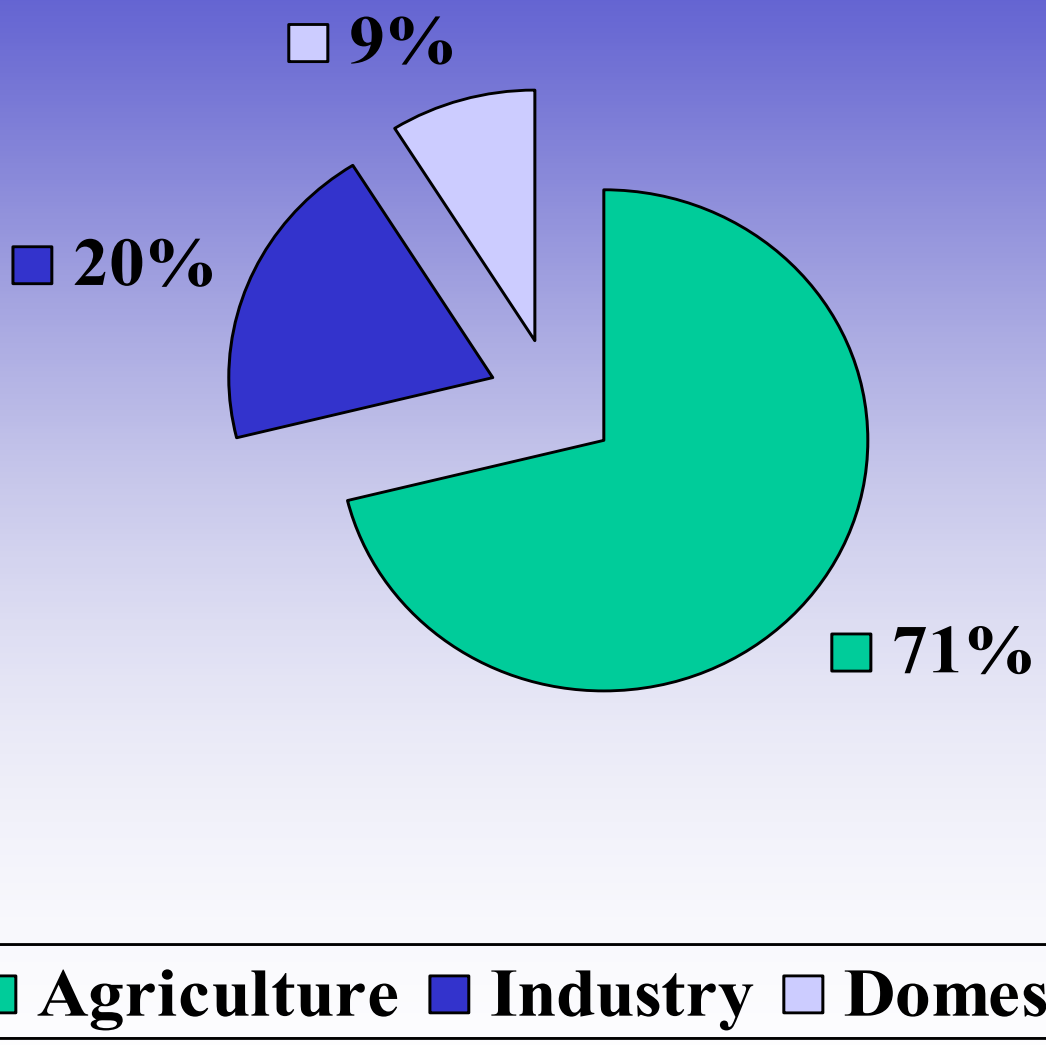
Evaporation cools hot water produced by power plants.



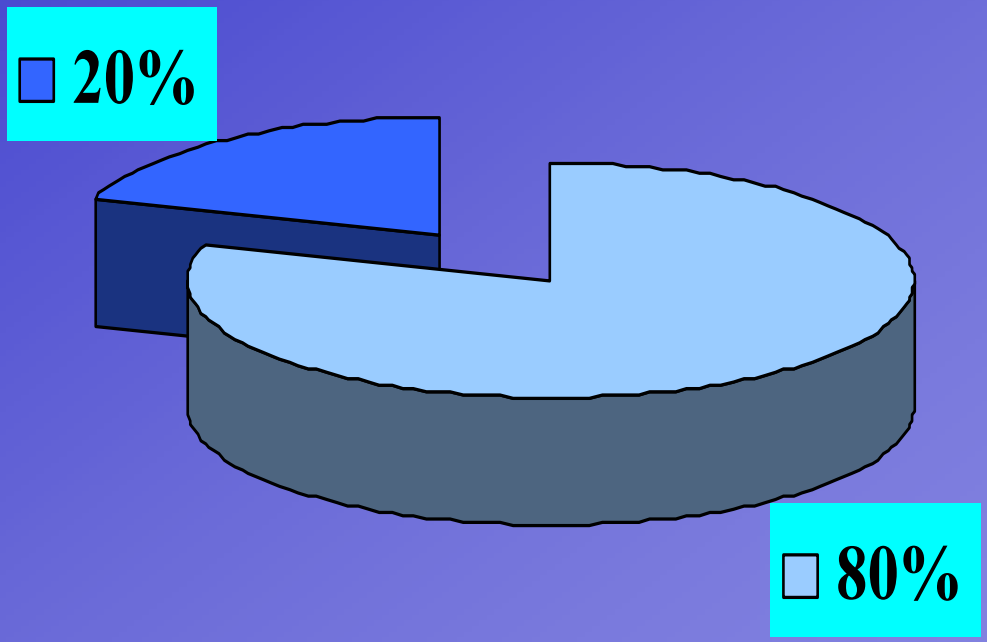
Credit: Earth Forum, Houston Museum of Natural Science

Uneven temporal and spatial distribution of precipitation

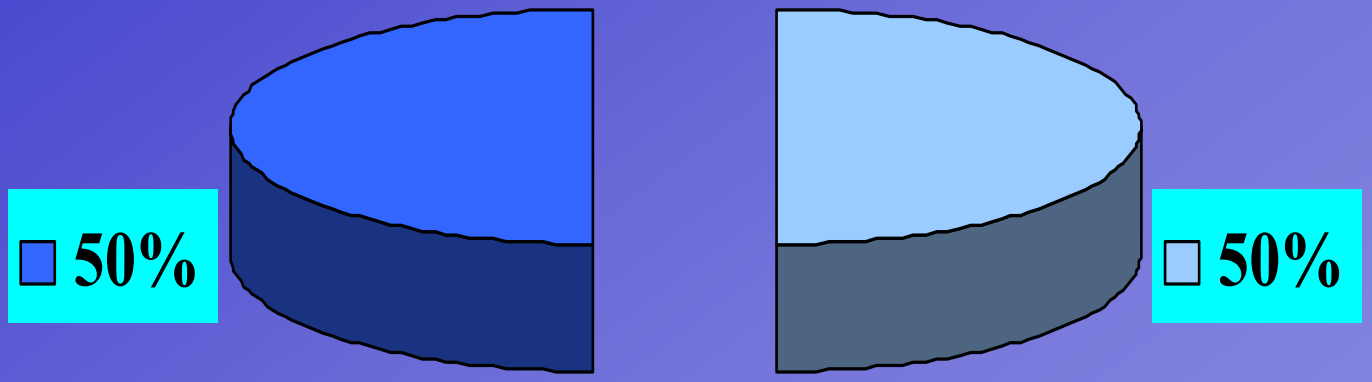
Water use by sector,2000



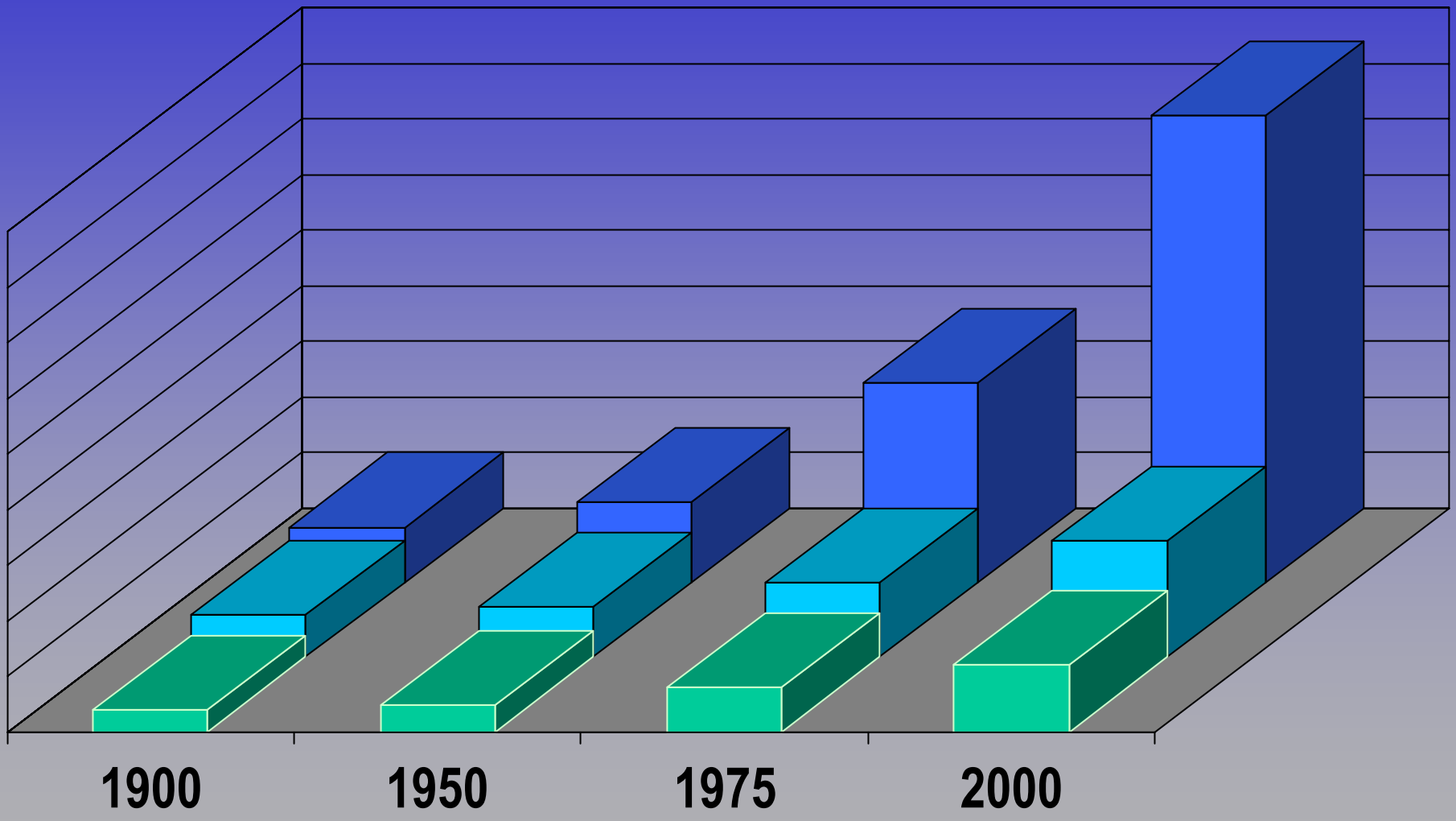
Water for human consumption



Water for human sanitation



Global Water Use Trends 1900-2000



How much water is left for the ecosystem?

Answer : the total available less the amount withdrawn.

The Arithmetic:

Total precipitation on land 110,000km3 -

Total withdrawal for irrigation 3,300 km3 =

The surface run-off to oceans and seas 42,000 km3 +

Utilization by forests and land based vegetation 61,900 km3 = 103,900 km3 or 94.5% of total available.

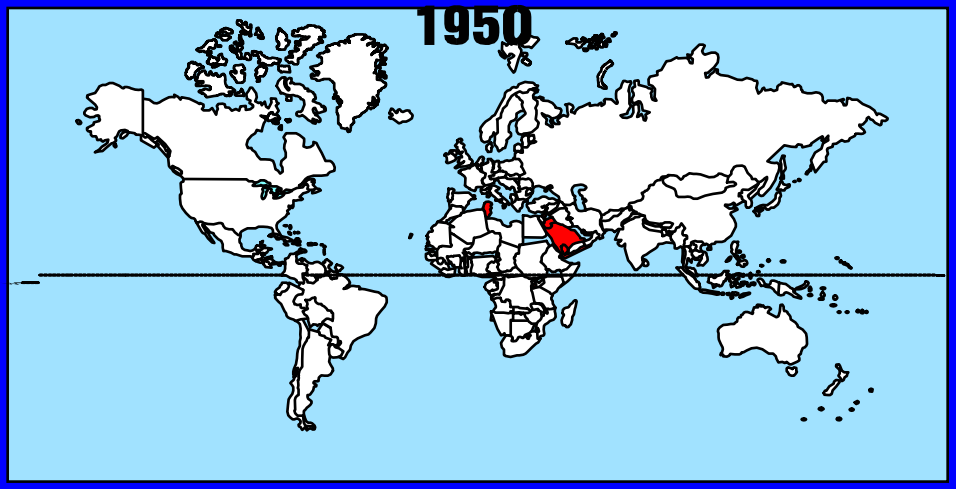
World Water Challenges

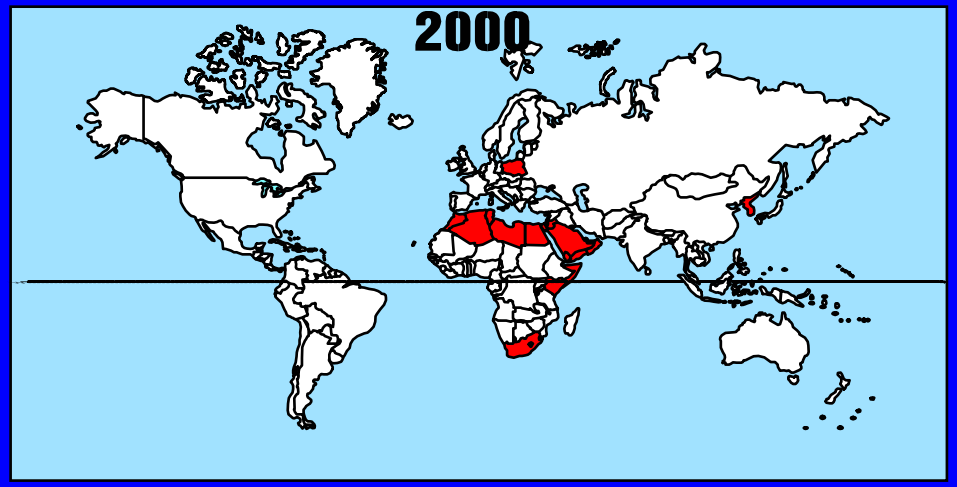
a) Water Scarcity
b) Lack of accessibility
c) Water quality deterioration
d) Fragmentation of water management
e) Decline of financial resources
f) Lack of awareness by decision makers
g) Endangering world peace and security

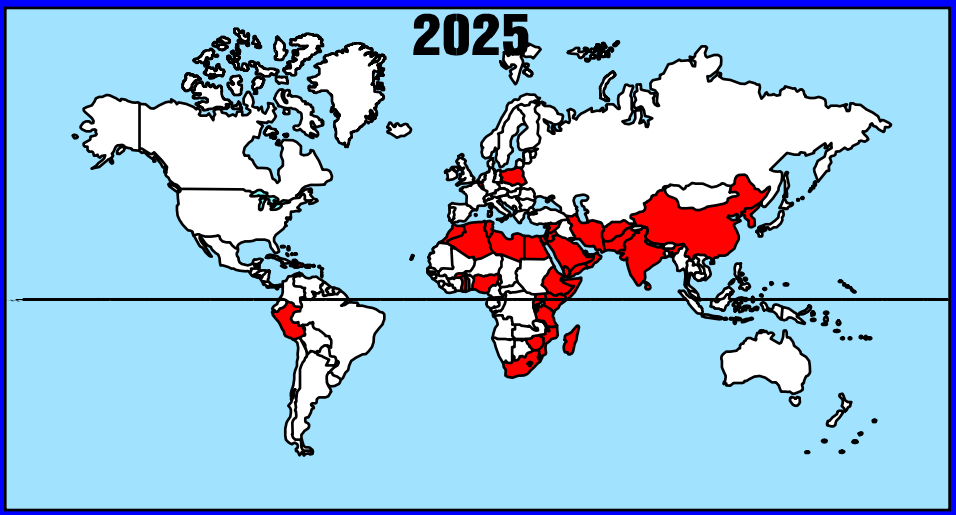
WORLD WATER CHALLENGES

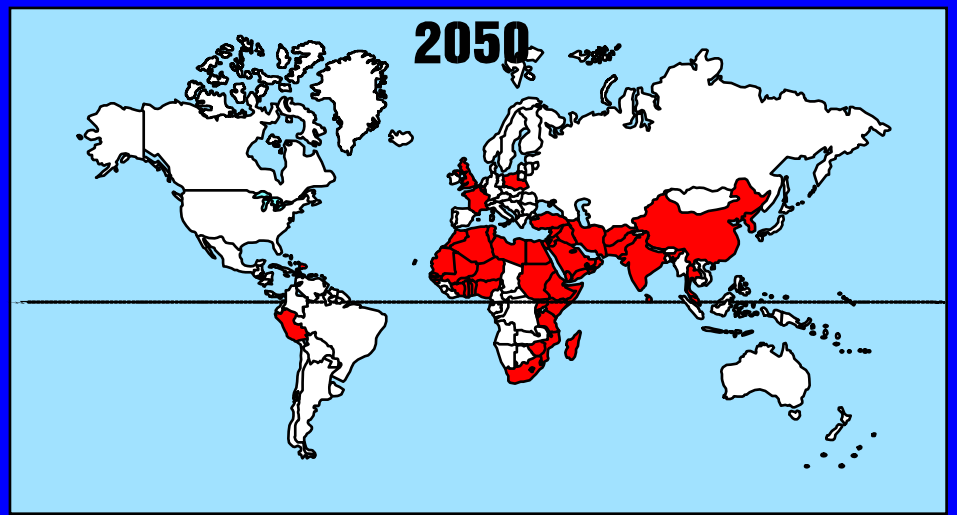
a) Water scarcity

Evolution of water shortages in 100 year

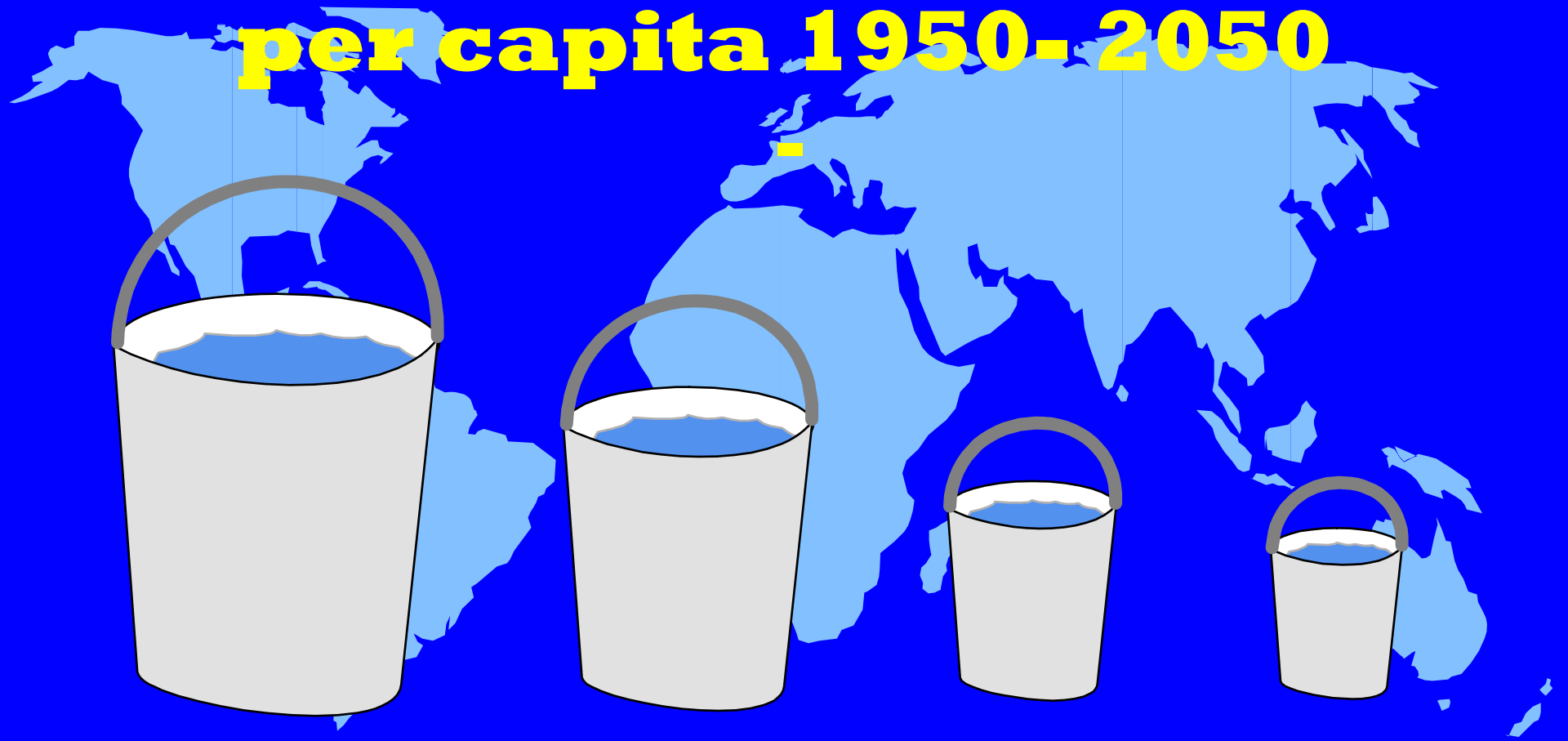








Freshwater availability per capita 1950- 2050



1950	2000	2025	2050
12,050 m^3	7,310 m^3	5,120 m^3	4,580 m^3

WORLD WATER CHALLENGES

b) Lack of accessibility

1.2 Billion lacked access to clean drinking water

2-3 Billion lacked adequate sanitation

4.0 Billion without sewerage service

5-10 Million death per year

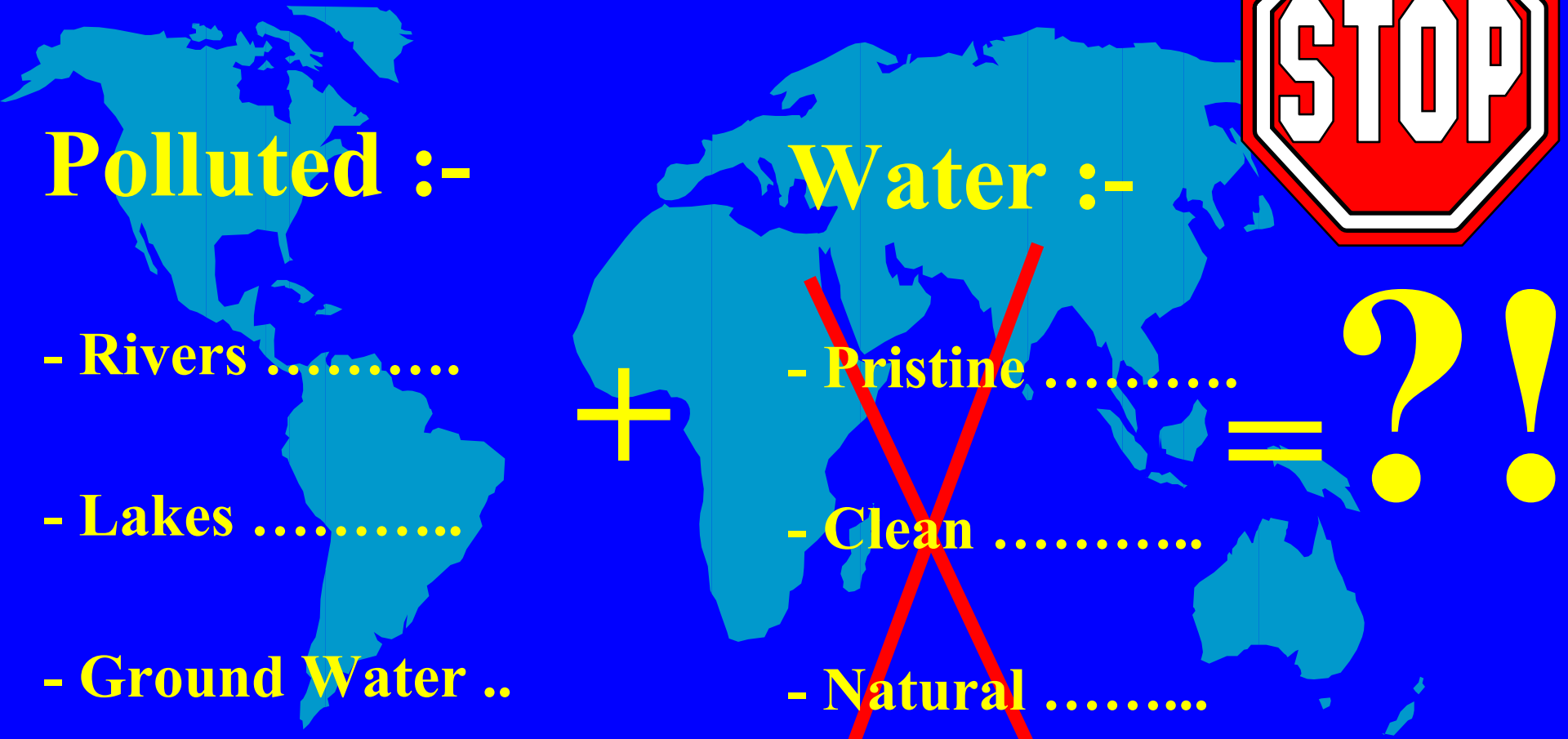
The world, with its richness and mightiest of technology, is failing to meet one of the basic human needs of its population today , a shameful fact of the twentieth century

The rest have to walk for hours to get their daily supply carried on their heads

The lucky ones get their water supply trucked in.

WORLD WATER CHALLENGES

c) Water quality deterioration



Polluted :-

- Rivers ……
- Lakes ……..
- Ground Water ..

+

Water :-

- Pristine ……
- Clean ……..
- Natural ……..

= ?!

WORLD WATER CHALLENGES

d) Fragmentation of water management

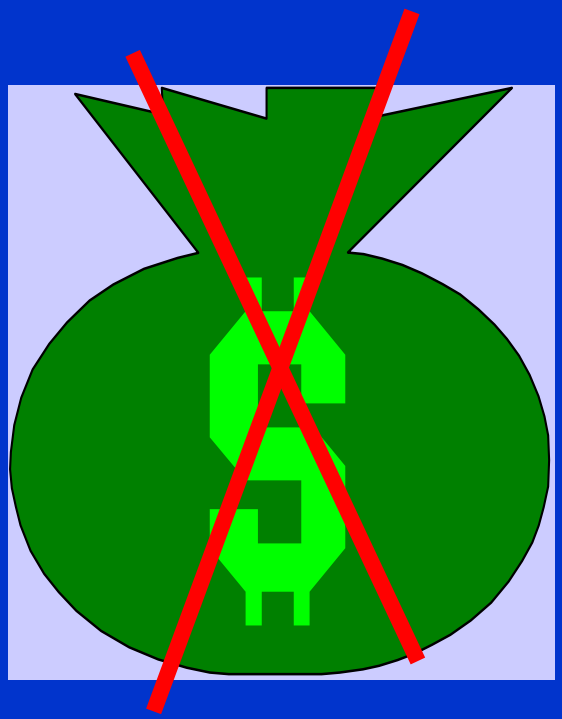
National **Regional** **International**

Institutionally , a *vacuum* characterizes the world water at the apex while at the base there is *confusion*

WORLD WATER CHALLENGES

e) Decline of financial resources

No Money ------ No Water ------- No Life



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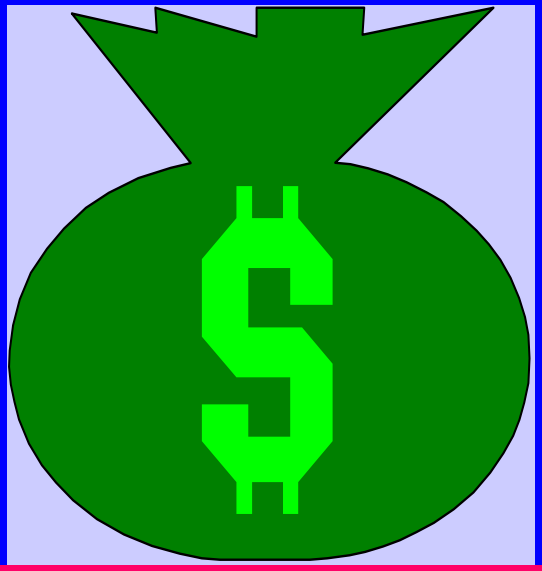
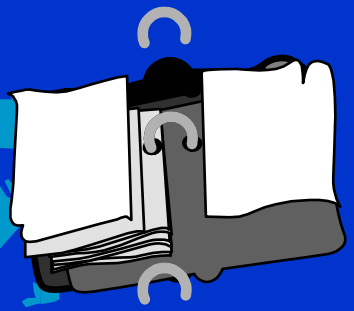
How Much Money is Needed ?



$100 Billion from Users and Private investment
$ 60 Billion from Public Institutions
$ 20 Billion from ESA

WORLD WATER CHALLENGES

f) Lack of awareness by decision makers



The Sustainability of the planet *is being threatened* due to water crisis and the world is not being made fully aware of it or the *consequence of inaction*

WORLD WATER CHALLENGES

g) Endangering world peace and security

- Millions Farmers sharing canal water
- Millions of Communities of users
- 263 shared international river basins
- Continents of have and have-not

Dam sites being guarded

3 killed in police firing

Villagers agitating against water proposal turn violent

Flare-up was over sharing dam water with Jamnagar

EXPRESS NEWS SERVICE
RAJKOT, DEC 14

Farmers win water war

Dams being guarded

Judicial probe into Gujarat 'water riots

The Times of India News Service

Agitation turns violent

Patel has announced Rs 2 lakh in compensation to the families

Sub-inspector J. Patel has lodged a complaint against

Generator set ablaze; alert in Jamnagar

ISRO survey may tap water resources

3 killed in Jamnagar

Police opens fire as dispute over

THE HINDU

Online edition of India's National Newspaper on indiaserver

Saturday, December 25, 1999

Regional | Previous | Next

Water riots a new worry in Gujarat

Police preventing a self-immolation bid by two activist of Sankalp Seva Samiti at the east zone office compound of Ahmedabad municipal corporation in Rakhiyal area on Thursday over water supply problem
Newsline Photo

International Drainage Basins

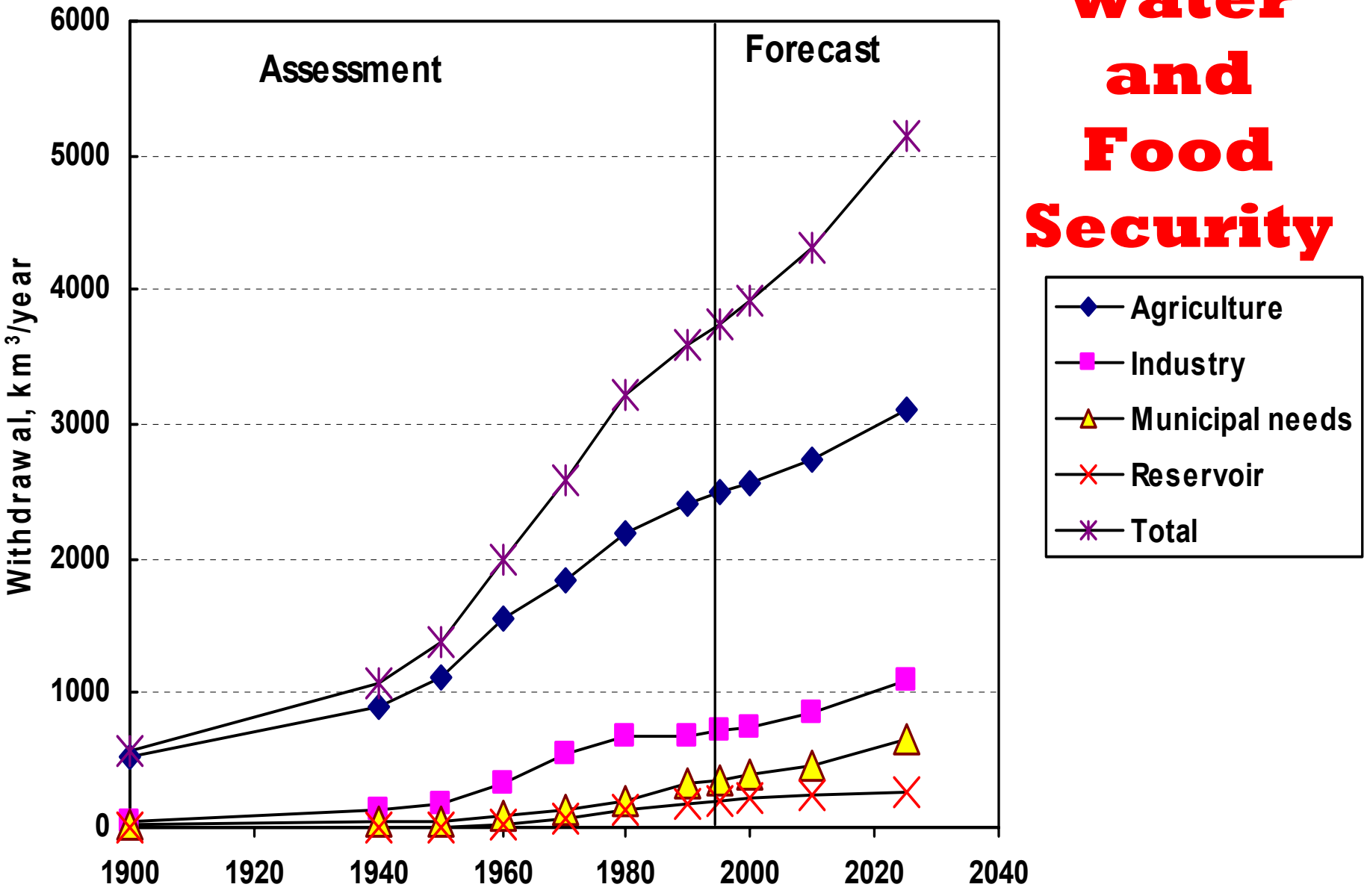
- 200 treaties
- 1225 Cooperative actions
- 507 Conflicts

In 50 years

263 shared basins

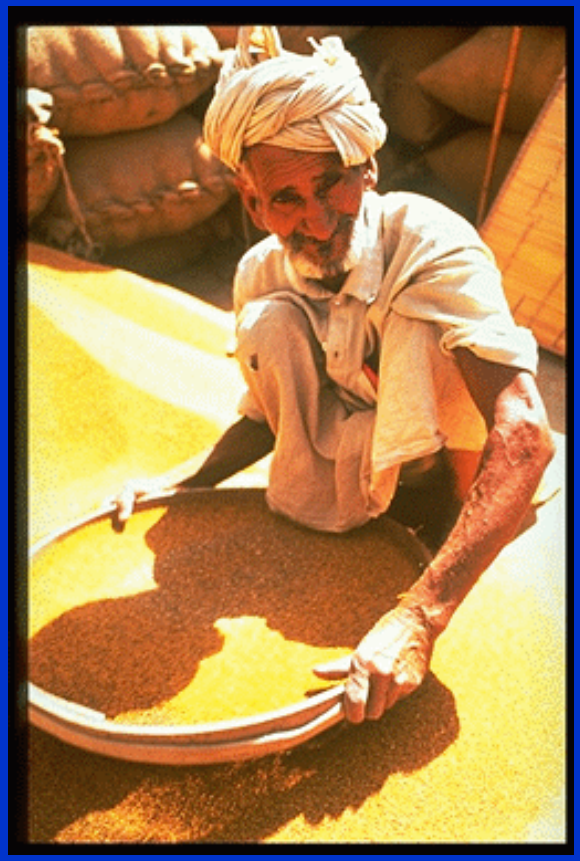
WWAP-UNESCO

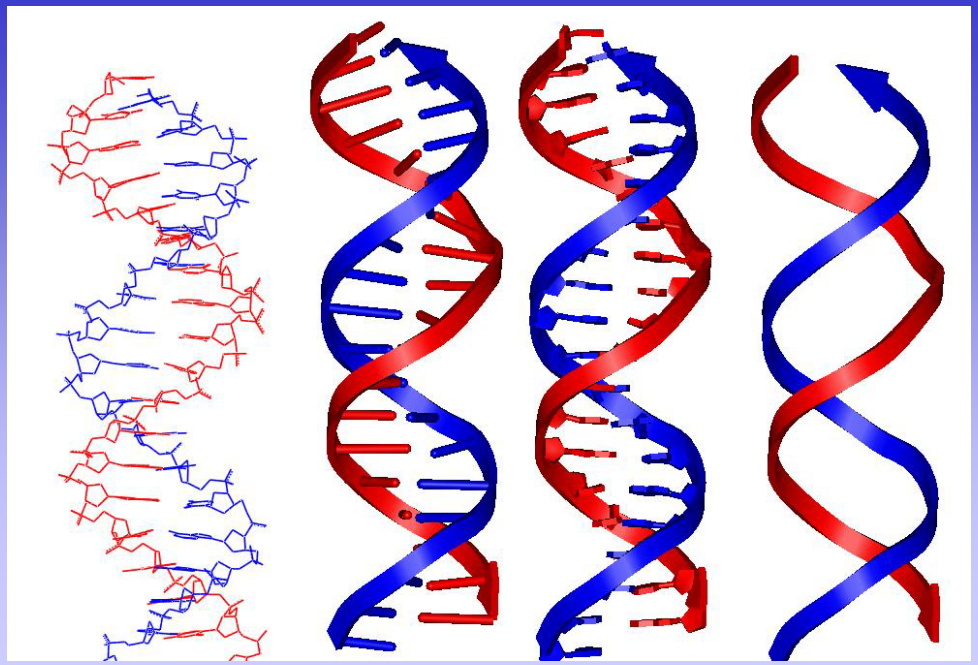
Water and Food Security



THE PRODUCTION FUNCTION

- Unit Crop per Unit of Water
- Consumed product per Unit of Water





Explore the Frontiers and Potentials of Biotechnology,

To generate new plant treats conducive to save water , increase yields of the main food crops safely and on a sustainable basis.

Labor intensive back-breaking agriculture

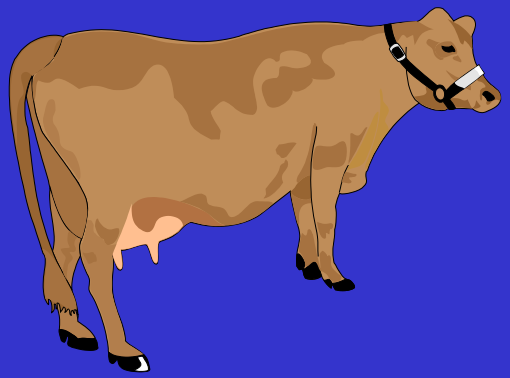
Food Production

Machine intensive agriculture

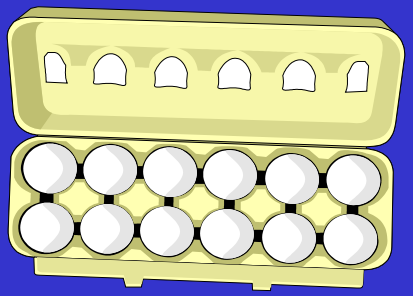
Water and Food Security

- How Much water is needed to produce food ?

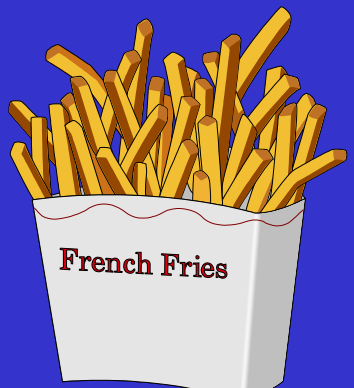
Water to produce various consumables...

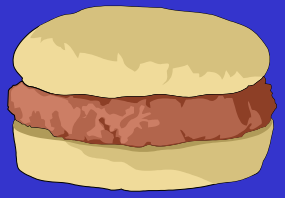


1 kg beef: 44,000 litres



1 doz eggs: 8,400 litres

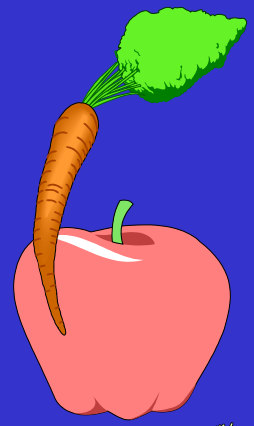




1 burger & fries: 7,900 litres

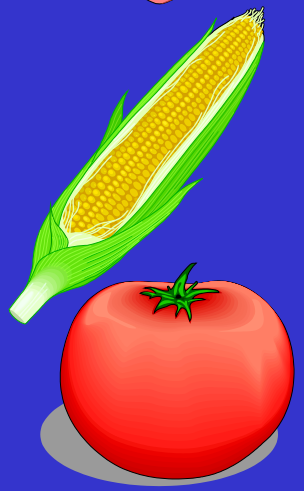
Water to produce various consumables…

(per kg)



Carrots 420 litres

apples 600



corn 1000-1800

tomatoes 280

potatoes 500-1500