



Lomonosov Moscow State University
Business School

Global Limits of Economic Growth

*Lomonosov Moscow State University,
Inter-Departmental Course, 2023-2024, Spring Fall*

Course Reader:

Evgeniya Anatolyevna Shvets, PhD.

e.shvec@edu.mgubs.ru

Requirements to Pass the Course

- 1) No less than 50% of sessions are attended (6 out of 12)
- 2) Individual Project is done properly and delivered in time, i.e. before the end of the course
- 3) There are no less than 60% of points for the final course test
 - the test will be in Moodle, logins & passwords will be sent in advance to all subscribed students
 - May, 8th is supposed to be the final course day

General Scheme for Resource Limitations Analysis



Scheme for the Individual Project (1-2 students per 1 project)

Resources	Steps of Analysis					
	Step 1	Step 2			Step 3	Step 4
	Role/ Importance	Limitations produced for			Ways used to overcome existing limitations	Suggestions how to improve these ways of coping with limitations
	World economy	National economy	Industries/ Business			
Unique Resource or Problem selected by you Scale: world or a country or an industry

“Global Limits of Economic Growth”

2023/2024 academic year, spring semester

Module Teacher: [Evgeniya Anatolyevna Shvets, Ph.D.](#)

Module teacher’s contact details: e.shvets.mgubs@gmail.com, also available for consultations on the day of sessions.

Guidelines for Individual Projects

- ✓ Individual Projects can be made by 1 or 2 students.
- ✓ The electronic final version of the presentation should be sent to the teacher. The last day to do it is the last day of the course when there is a final test. Follow this information from Administration announcements at your personal accounts.

Country or Industry Analysis of Economic Growth Limitations

I. Presentation parameters

- Up to 6-10 slides of Power Point Presentation or up to 2 pages A4 of Word. Better to deliver it in PDF format.
- First slide: title of the project, course title, your name, your department
- Make all necessary references and quotes
- Illustrate your presentations with statistical data, diagrams, schemes or pictures

II. Defining a country and resources for the presentation

- Each student (or 2) selects **one country for the analysis** taking into consideration teacher recommendations. Countries should not be repeated among students.
- For the country selected a group defines **4 types of natural resources representing the greatest interest and priority for the country**. The resources types include the following: Ecology, Climate, Energy, Population, Land Use, Agriculture, Food Production, Water and other types of natural resources that were not covered by the course.
- **Put the list of your resource priorities in terms of business growth limitations in accordance with priorities of UN Development Sustainable Goals (DSG) for the specific country/industry.** (<http://www.un.org/sustainabledevelopment/sustainable-development-goals/>).

III. General Presentation Scheme

#	Resources	Steps of Analysis			
		Step 1	Step 2	Step 3	Step 4
		Importance of the resource for a country/industry	Limitations produced	Ways used to overcome existing limitations	Your suggestions how to improve the situation
Resource	

IV. Steps of Analysis for Each Resource Type

Step 1: An economic role/importance of the resource in the economy of the country (... is a unique type of resource for the country because it provides ... (% GDP, % of industrial output ...). Try to find something peculiar about this kind of resource for your country, compare it with the situation of neighbor countries or international standards whether it's appropriate.

Step 2: Different kind of limitations (problems, risks) that are produced or can be produced by these resources on a national level and on a level of different industries that limit economic growth.

Step 3: Ways how countries are overcoming these limitations (public policy: laws, measures, special instruments, regulation forms, what is reflected in different kind of strategies; adaptation or mitigation schemes, risk management).

Step 4: Your suggestions/recommendations how the current country policy about overcoming resources limitations can be improved (see successful stories of other countries and international experience to formulate your suggestions).

V. Suggestions about resources description

- Ecology** (*suggestions:* find some key-information about the ecological situation of the country, pollution level, main sources of pollution, ecological policy, special ecological standards in this country, any ecological ratings in which the country was participating, ecological footprint of the country, ecological catastrophes/disasters on its territory if any, damage evaluation, what was done by the government and companies to minimize this damage, etc.).

Useful links:

- <http://beta.worldbank.org/climatechange/>
- www.footprintnetwork.org
- www.wri.org/publications/ecosystems
- <http://www.carbonfootprint.com>
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>

- Climate** (*suggestions:* show country's position towards Paris Agreement, participation in CO₂-trade, what are recent negative and positive impacts of climate change on economy and on certain industries, examples of business climate adaptation/mitigation strategies)

Useful links:

- <http://beta.worldbank.org/climatechange/>
- http://unfccc.int/kvoto_protocol/items/2830.php
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>

- Energy** (*suggestions:* identify main energy sources for the country; show energy balance for the country using data from the latest *BP Statistical Review of World Energy*; ratios of production to reserves, consumption to imports; energy consumption, energy production, energy dependence, energy crises (if any), energy policy, energy saving and energy efficiency measures adopted in the country).

Useful links:

- www.bp.com (see Statistical Review of World Energy)
- www.eia.doe.gov (U.S. Energy Information Administration)
- www.iea.org (International Energy Agency)
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>

- Population** (*suggestions:* general overview of a population as an economic factor, labor market situation, migration problems, labor mobility, ageing of economically active population, nationality pattern, public health, role of cities in the national economy, etc.).

Useful links:

- www.ilo.org (International Labour Organization)
- www.un.org/popin/ (UN Population Information Network)
- www.gapminder.org (tool similar to WB Data Visualizer)
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>
- <http://www.postcarbon.org/>

- Land Use, Agriculture, Food Production** (*suggestions:* production and import of agriculture food, food security/insecurity level, problem of GMF (if any), use of fertilizers, soil resources, food crises (if any)).

Useful links:

- www.fao.org
- http://www.fao.org/ag/agn/nutrition/profiles_en.stm
- http://www.fao.org/unfao/govbodies/cfs/country_en.htm
- <http://www.fao.org/hunger/en/>
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>
- <http://www.postcarbon.org/>

- Water** (*suggestions:* focus on water resources, water use by sectors, water management, water price for different consumers, etc.).

Useful links:

- <http://www.unwater.org/flashindex.html>
- <http://www.fao.org/nr/water/aquastat/main/index.stm> (and other statistics from this website)
- <http://www.un.org/sustainabledevelopment/sustainable-development-goals>

- Other types of natural resources**

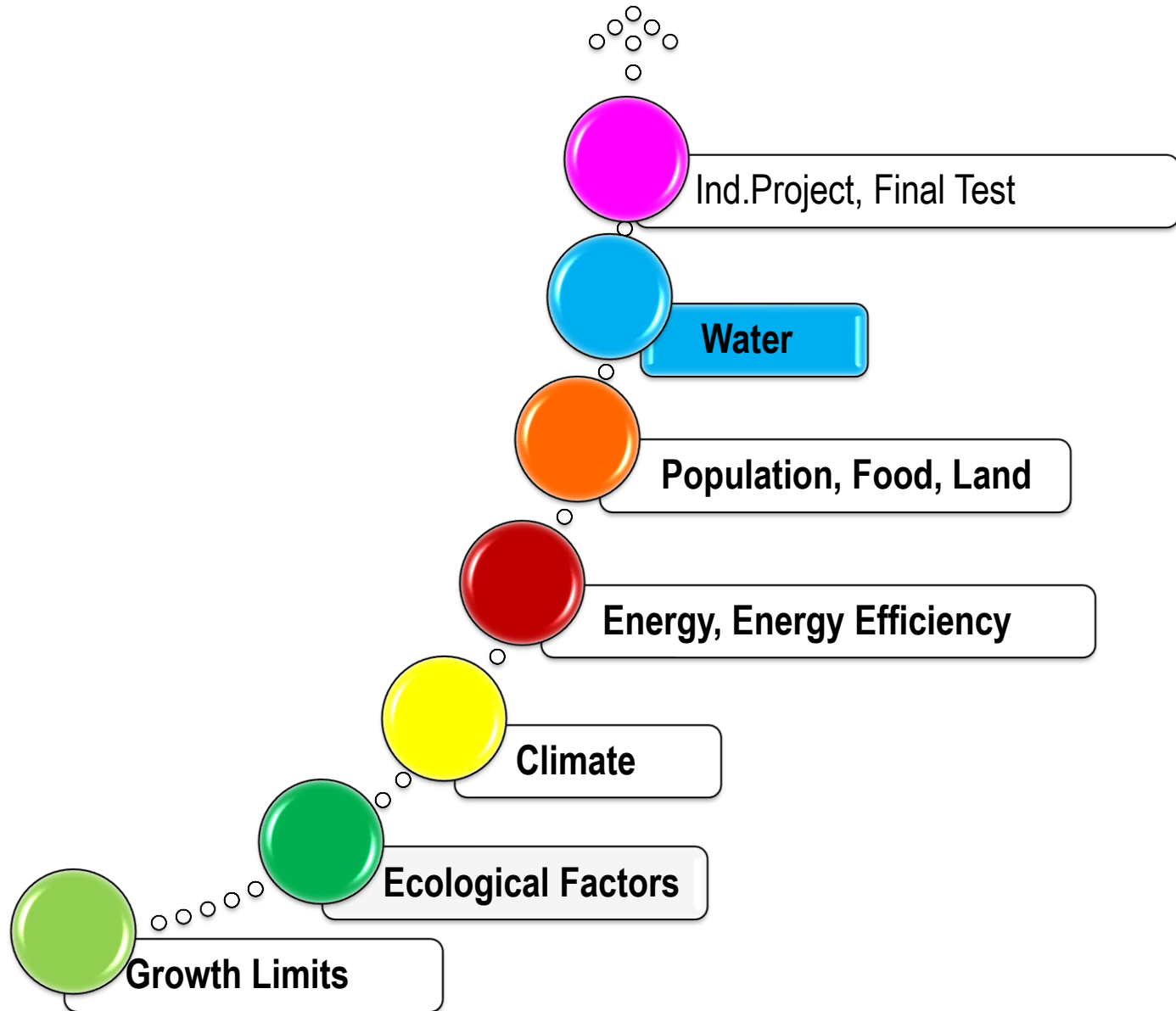
Consult relevant links from the general list of recommended web-sites.

For all resources it is recommended to review documents, publications, regional outlooks/overviews and country profiles of the general list of recommended web-sites.

Learning Schedule

- Our classes will take place on Wednesdays at 15:00 (12 weeks in total)
- Communication with the course reader:
 - During classes
 - Via e-mail: e.shvec@edu.mgubs.ru
- All administrative issues should be addressed via **your Personal Account in the MSU Learning Management System**
- Before each session you will receive Pre-Reading and Food-for-Thought Assignment through your Personal Account

Course Route



Session 11 (for self-study)

Water Resources

2024

Aims

- To identify main limitations produced by water for business (*2 case studies*) and national economic growth (*1 case study*) and to work out ways how to overcome these limitations

Content

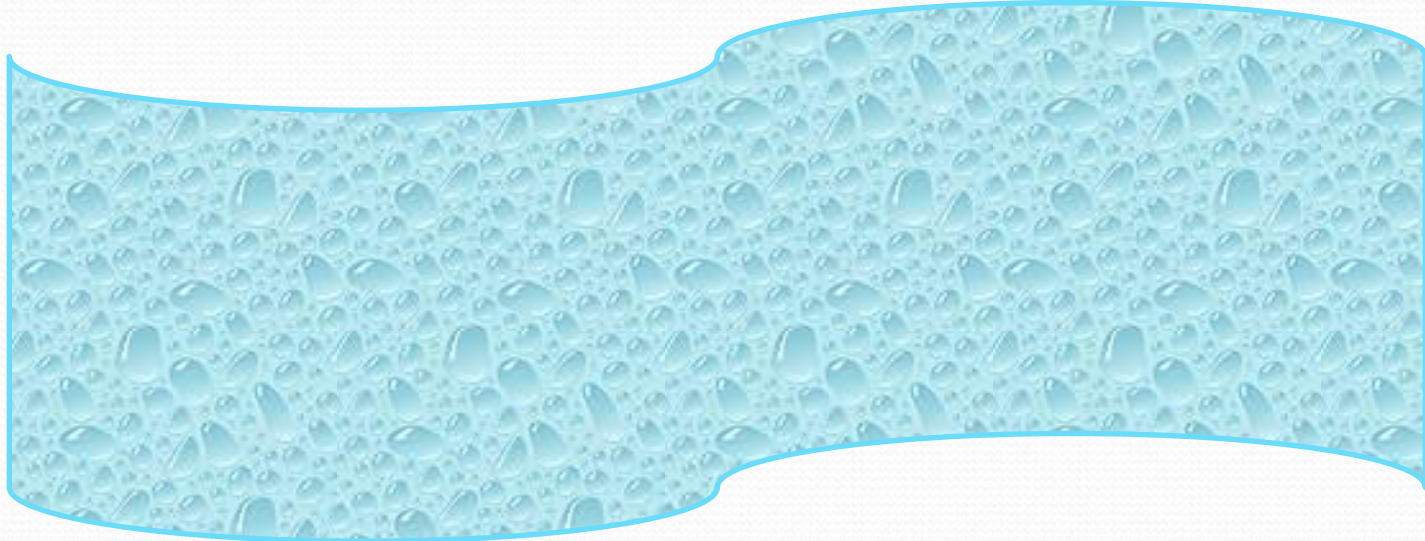
- Water Resources: types, distribution, supply
- Water-Dependent Business
 - Rio Tinto and Nestle cases
- Managing Water Stress
- Water in the Urban Environment
 - Case Study Analysis “Singapore: An Exemplary Case For Urban Water Management”
- International Water Conflicts and Crises
- UN Convention on Law of the Sea

Water Resources



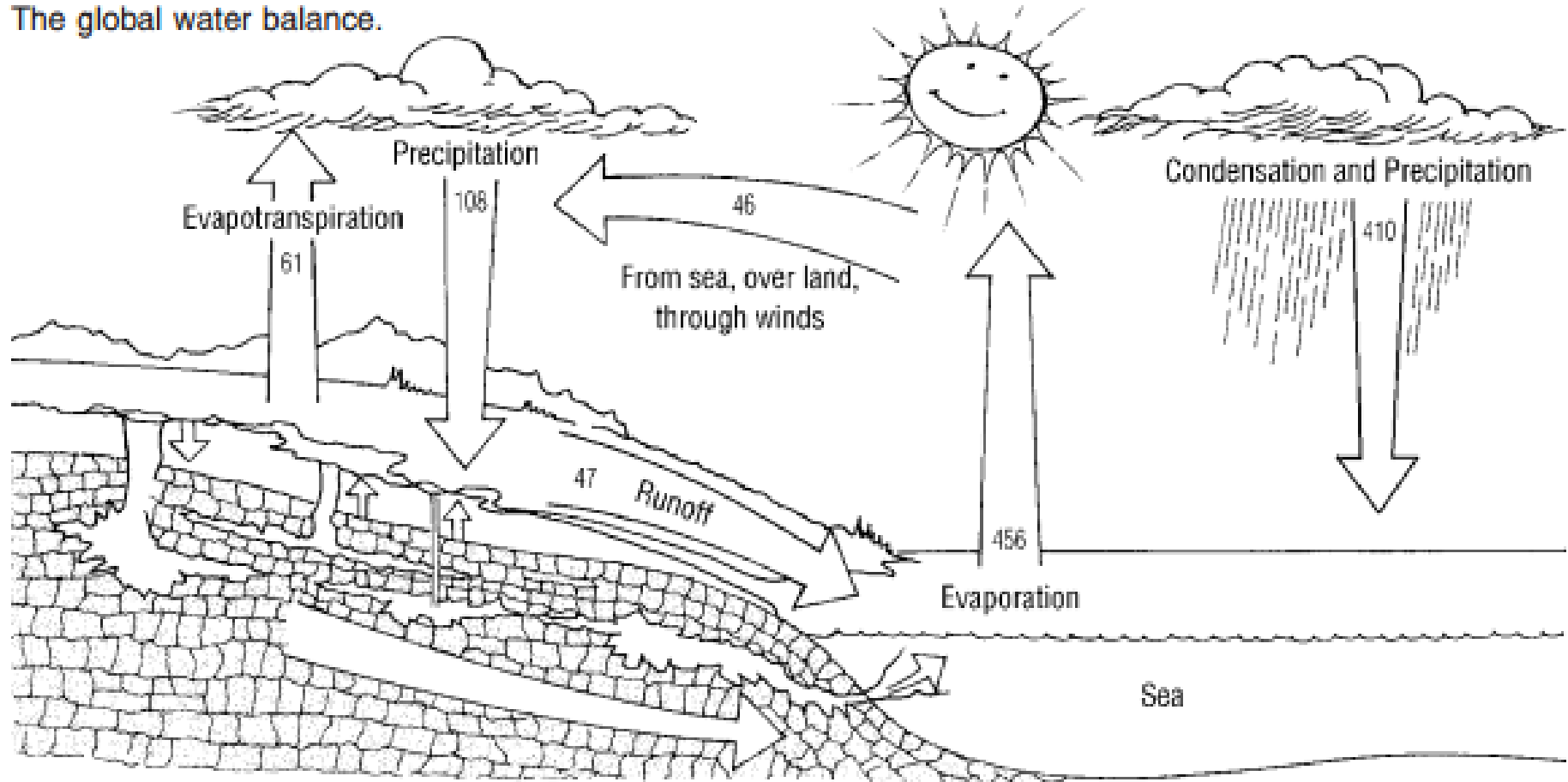
- Water resources are sources of water that are useful or potentially useful to humans
- What kind of water is required for human uses?

What are countries with the largest supply of fresh water in the world?



Is there scarcity of water in the world?

The global water balance.

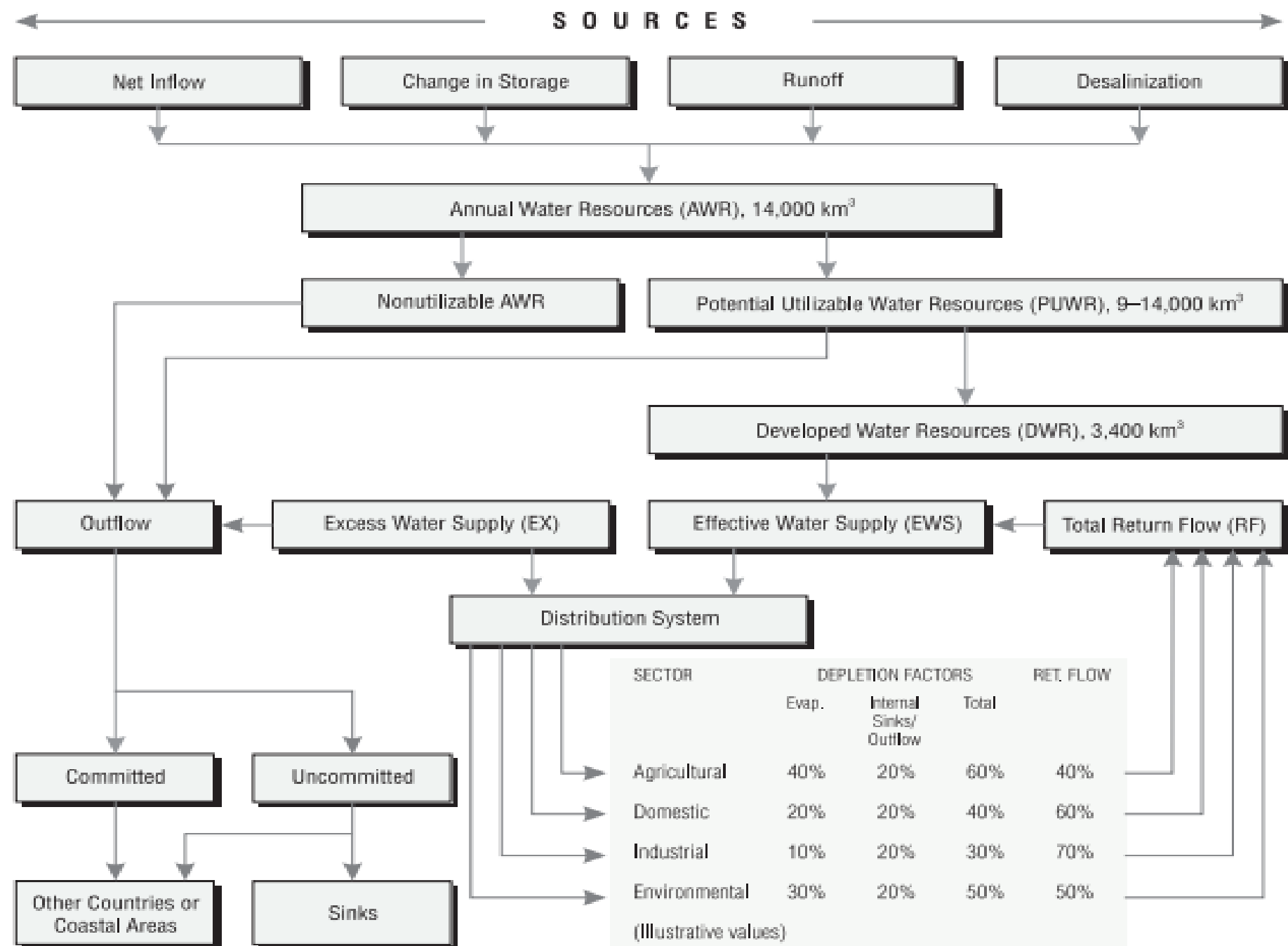


Note: All numbers are in thousands of cubic kilometers of water per year.

Source: Seckler 1993.

Winrock International, 1993

Water balance analysis.



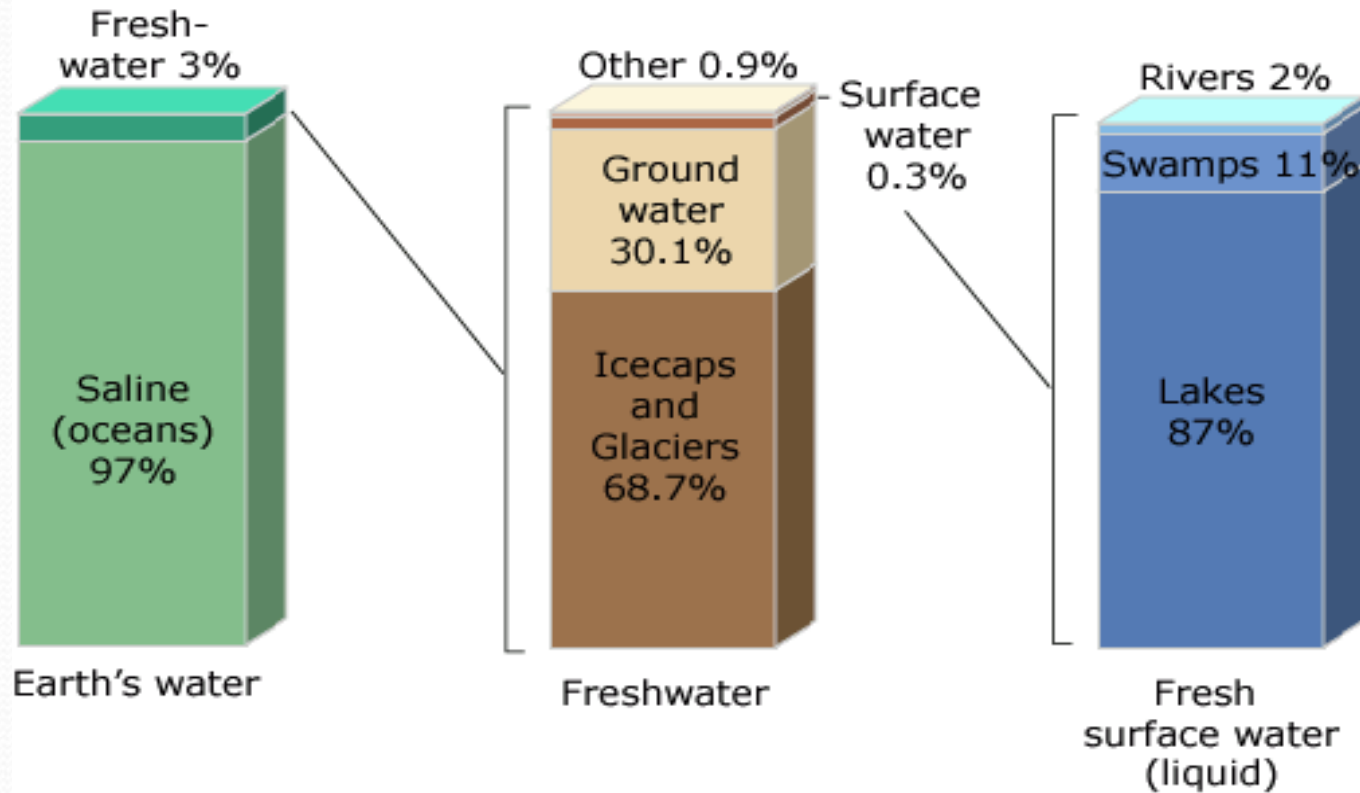
Water supply, distribution and quality

Food and water are two basic human needs

However, of every 10 people:

- 6 are unserved or live without improved sanitation
- 5 have a connection to a piped water supply at home
- 3 make use of some other sort of improved water supply

Distribution of Earth's Water: what are the roots of the problems?



- What is the share (%) of
 - a) surface water in total Earth's water?
 - b) rivers in total Earth's water?

Source: http://en.wikipedia.org/wiki/Water_resources

Ways to Obtain Drinkable Water

- Desalination (desalinization)

- Is expensive compared to most alternative sources of water

<http://www.youtube.com/watch?v=nbPNw3JaL7w&feature=related>



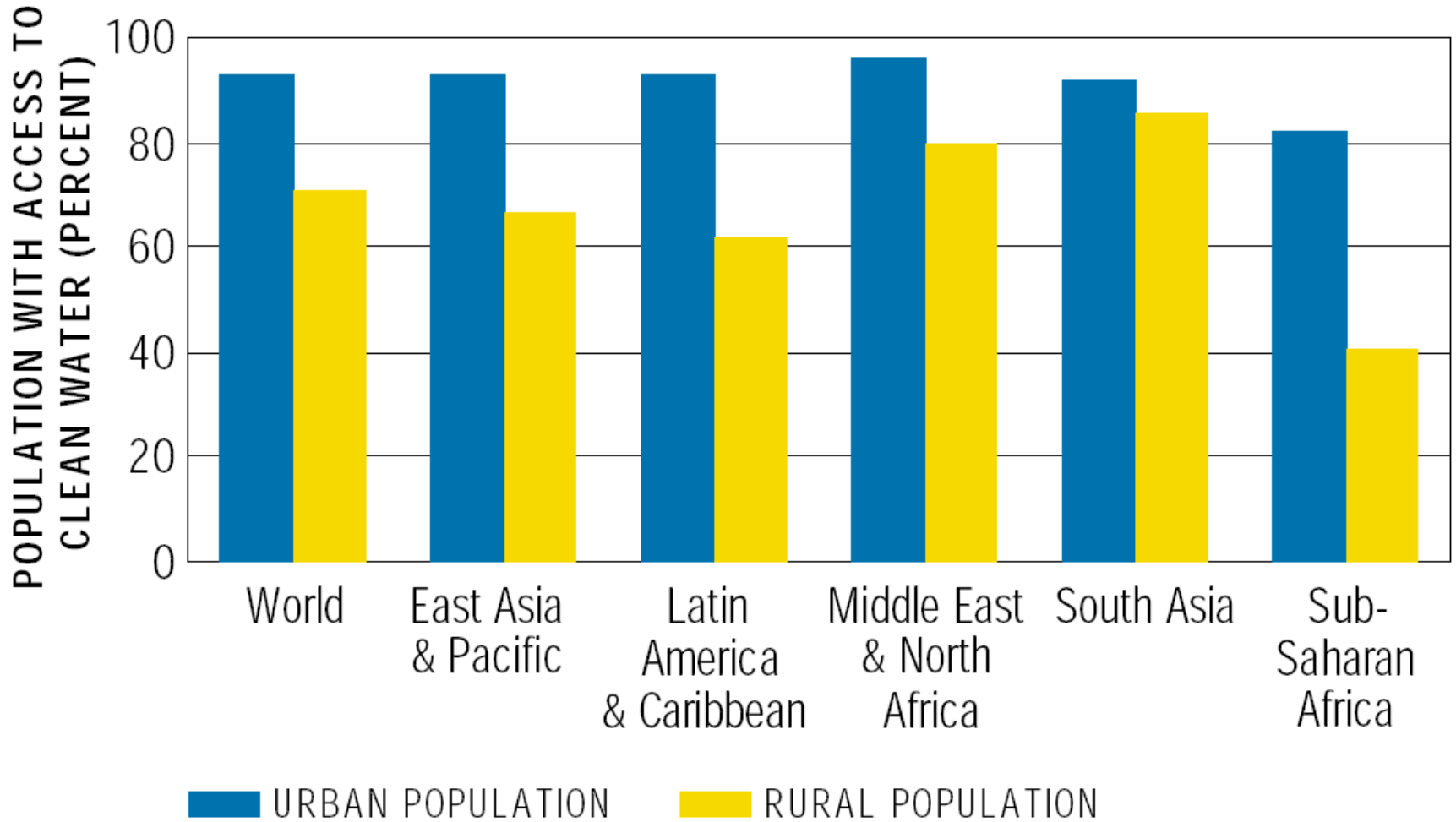
- From frozen water

- Schemes for making use of icebergs as a water source were only done for novelty purposes



Access to Safe Water: Urban VS Rural

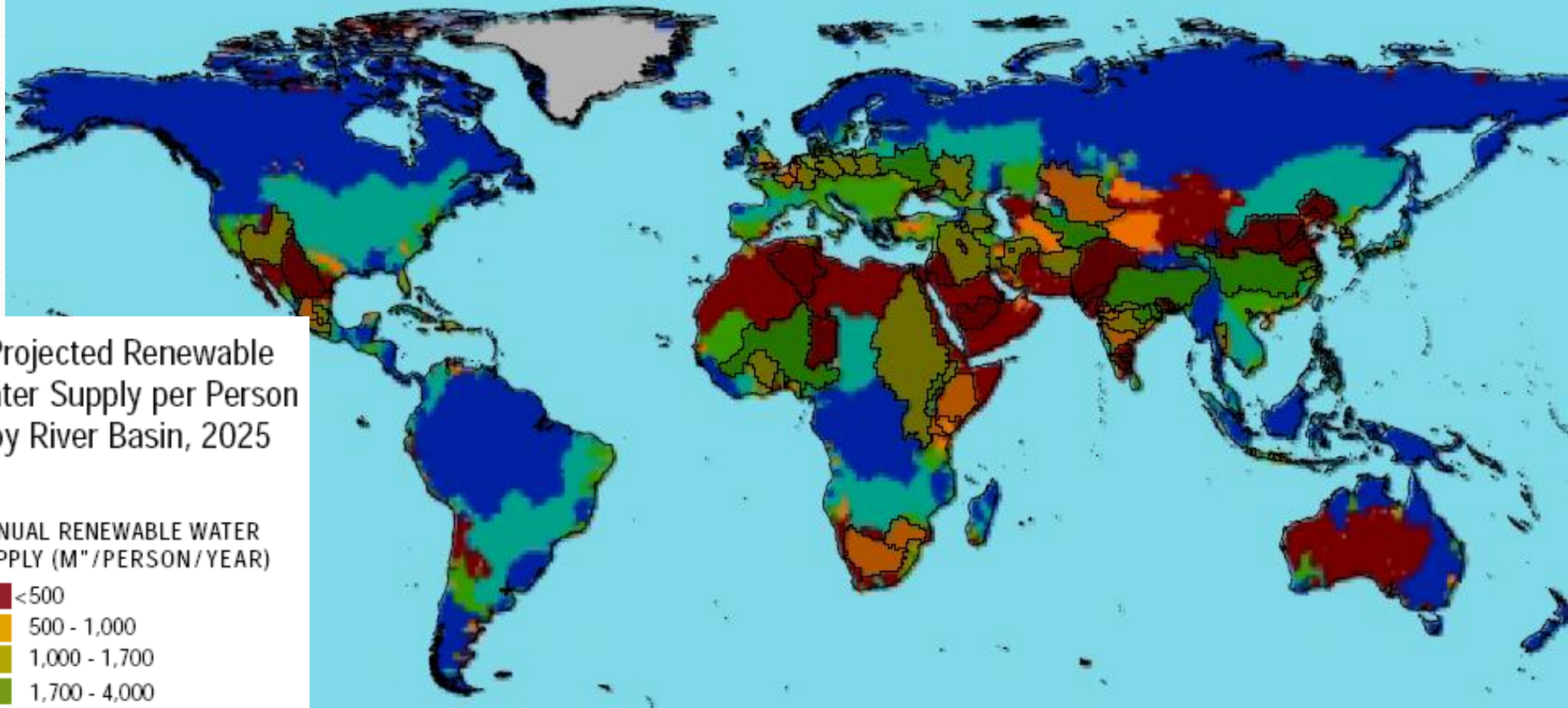
Access to an Improved Water Source, 2000



SOURCE: World Bank, 2001

Water-Scare Regions

40% Of The World Will Live In Water-Scarce Regions By 2025



NOTE: Outlined basins are projected to have a population of more than 10 million people in 2025 and to be in or approaching water scarcity.

Water-Scarce Regions

Will not see a serious threat to water supply by the year 2025

40% Of The World Will Live In Water-Scarce Regions By 2025

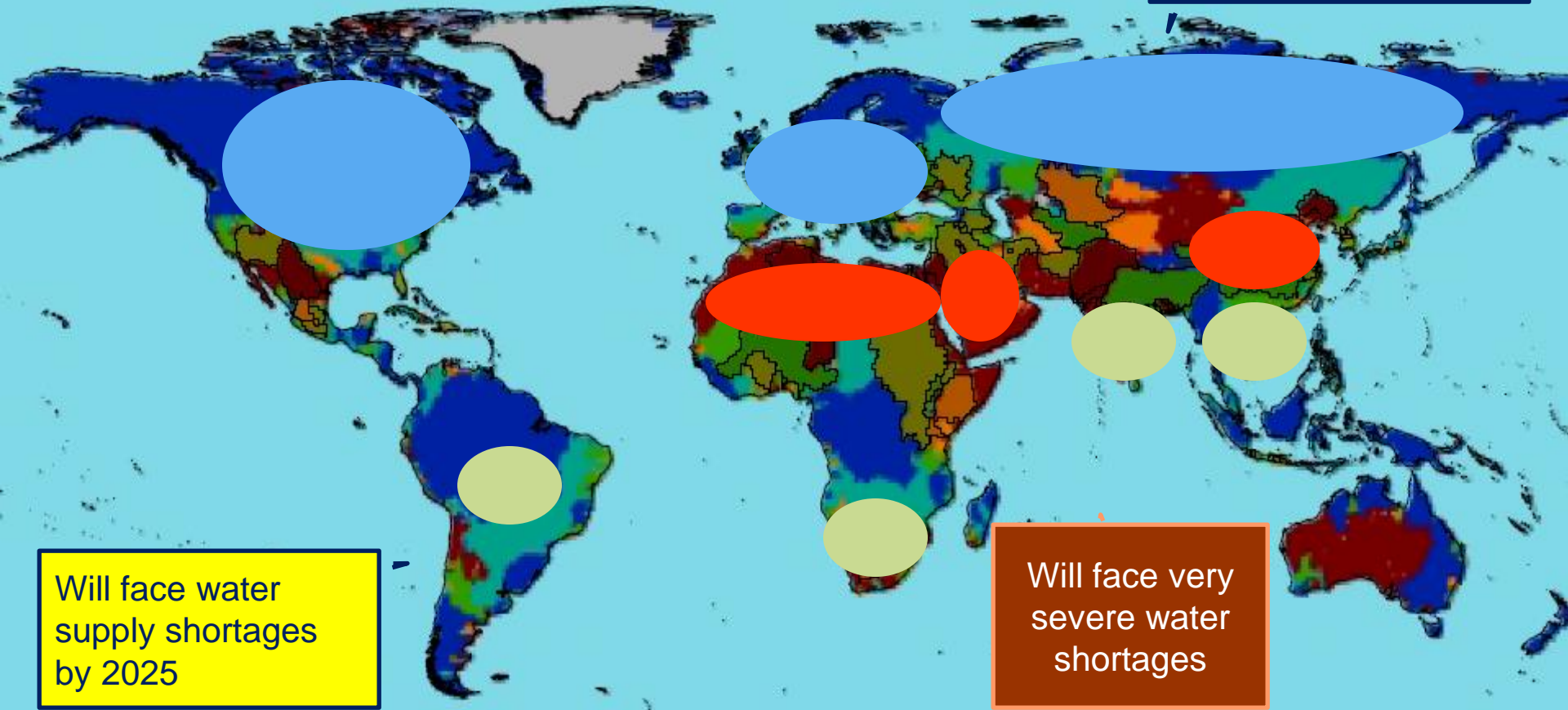


CHART 66: Countries with the highest renewable water resources per capita

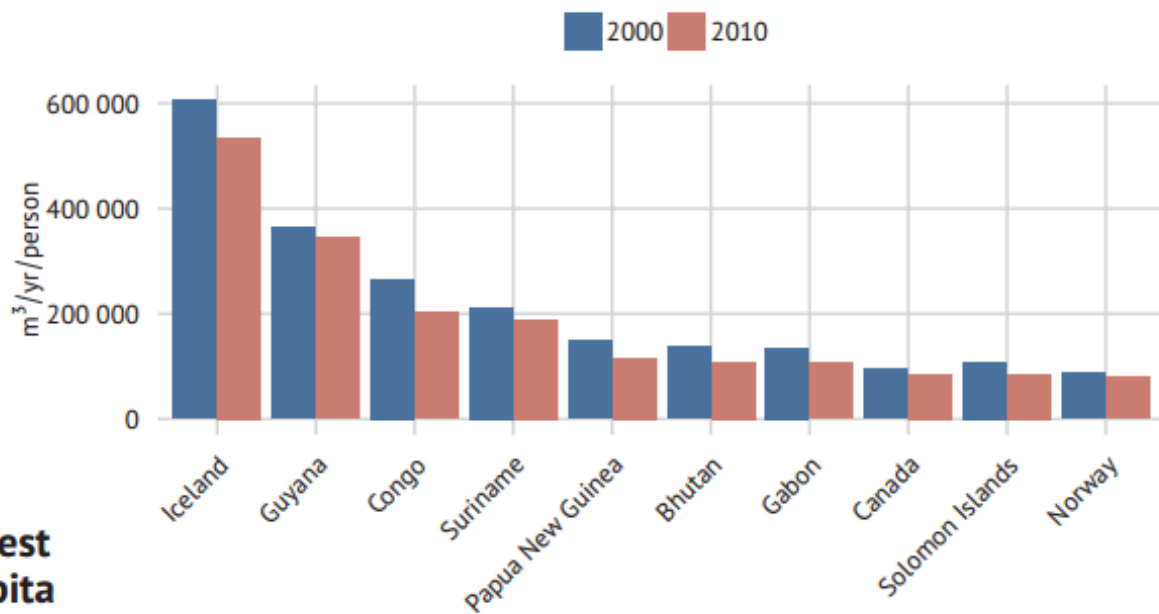
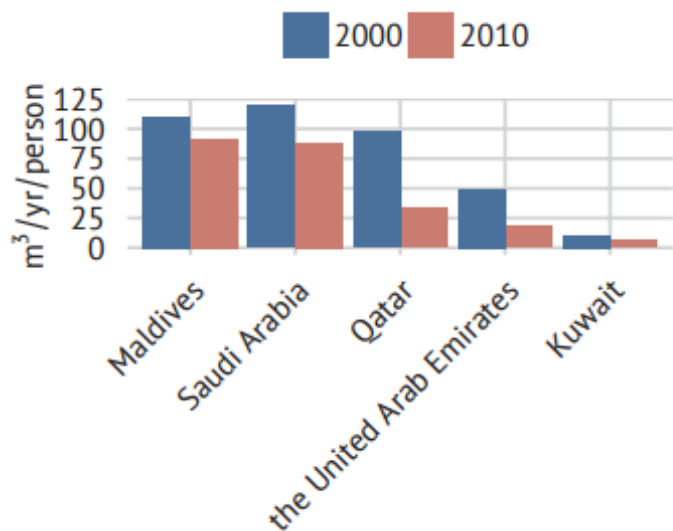


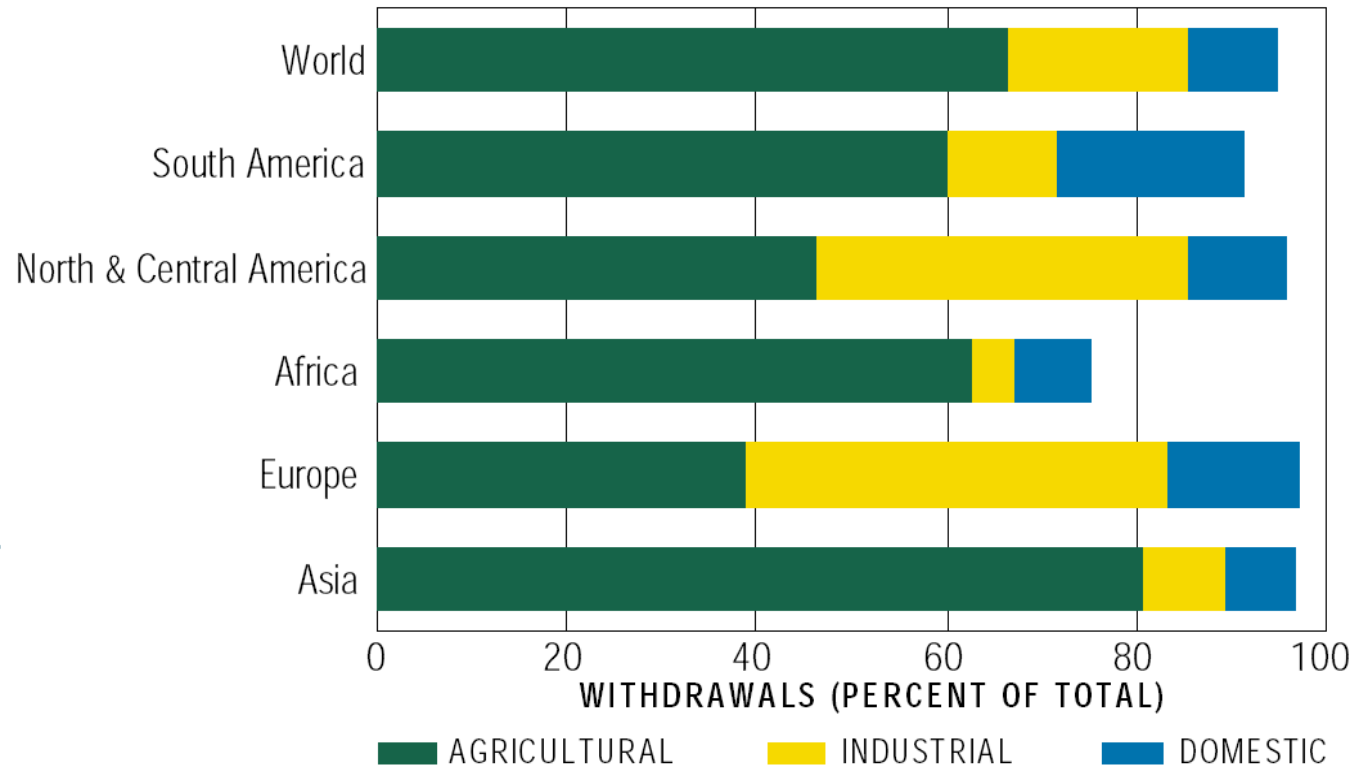
CHART 63: Countries with the lowest renewable water resources per capita



Thirsty Crops Dominate World Water Withdrawal

- 70% of all fresh water withdrawal is for agriculture
- Over 50% of the water withdrawal for irrigation never reaches the target crop. Why?

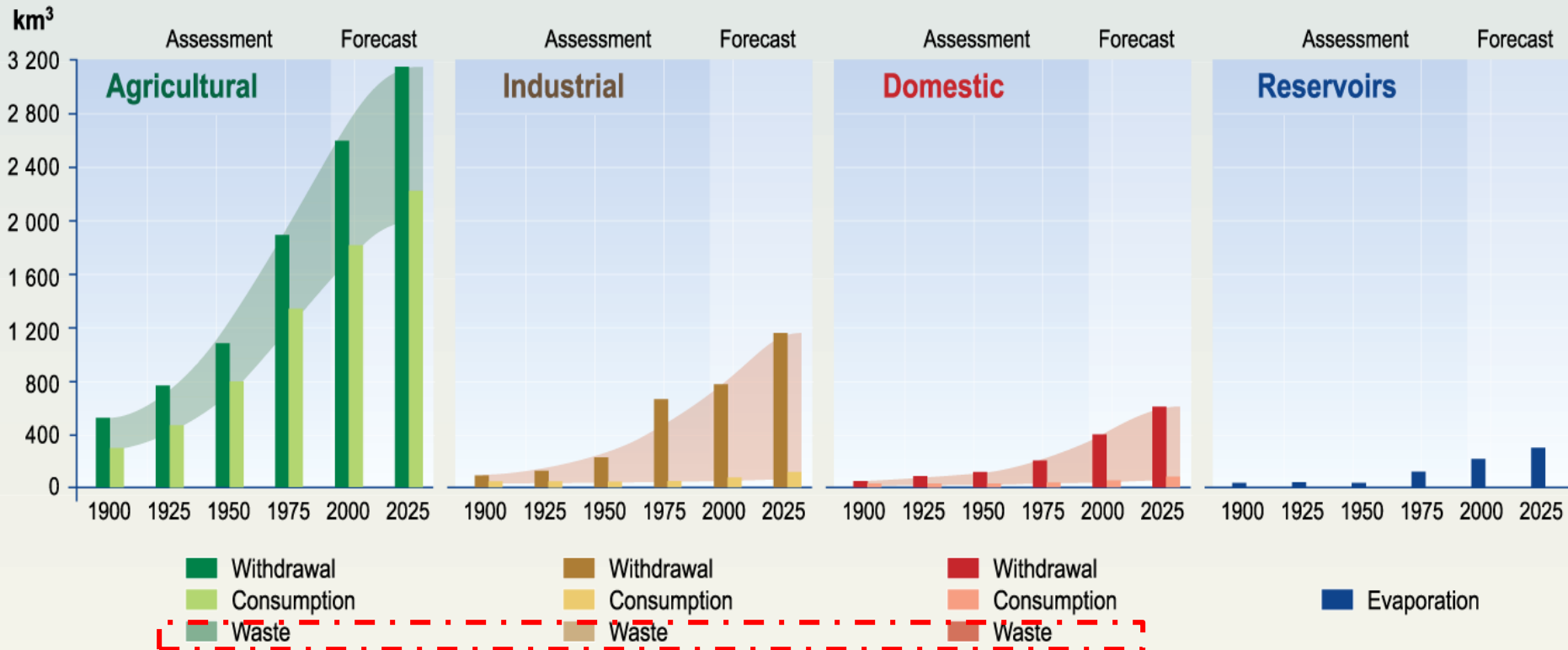
Water Withdrawal by Sector, Various Years, 1982-1997



SOURCE: Shiklomanov, 1997.

Competition for Water

Evolution of Global Water Use Withdrawal and Consumption by Sector



Note: Domestic water consumption in developed countries (500-800 litres per person per day) is about six times greater than in developing countries (60-150 litres per person per day).

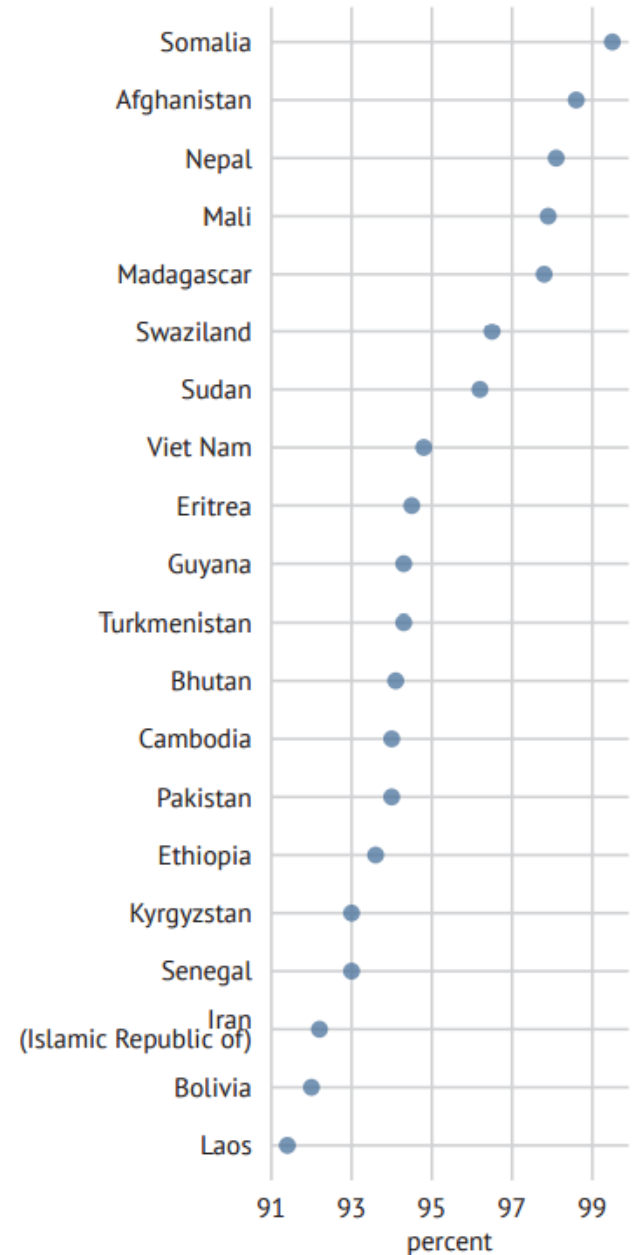
PHILIPPE REKACEWICZ
FEBRUARY 2002



CHART 64: Freshwater withdrawal by industrial sector, share of total, highest 20 (1999 to 2013)



CHART 65: Freshwater withdrawal by agricultural sector, share of total, highest 20 (1999 to 2013)



Water Footprint



Rice
449 gallons

Steak
1,799 gallons

Soybeans
216 gallons

Coffee
880 gallons

Paper
1,321 gallons

Beer
689 gallons

Chicken
468 gallons

Milk
880 gallons

Wheat
132 gallons

Cotton
713 gallons

Chocolate
3,170 gallons

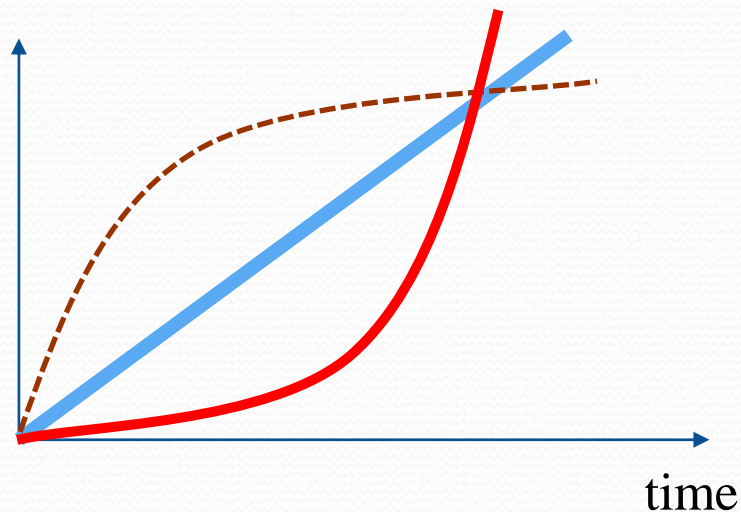
Pork
576 gallons

Wine
1,008 gallons



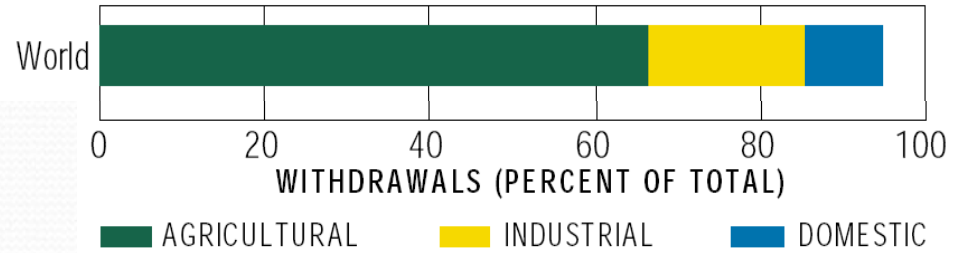
Water Dependent Business: Agricultural

- Approx. 70% of worldwide water use is for irrigation
- Various irrigation methods involve different trade-offs
 - **crop yields** VS **water consumption** VS **capital costs**
 - Show a possible scheme how these trade-offs interfere



Water Dependent Business

Water Withdrawal by Sector, Various Years, 1982-1997



22% of worldwide water use is industrial

- Energy generation
 - power plants (water for cooling)
 - hydroelectric plants (water as a power source)
- Manufacturing plants
 - water as a solvent
 - as a cutting instrument when pressurized
 - cooling of machinery to prevent overheating
 - food processing
 - ore and oil refineries (water in chemical processes), chemical synthesis
- Transport
 - water as a source in water transport

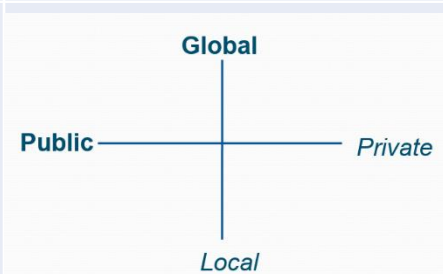
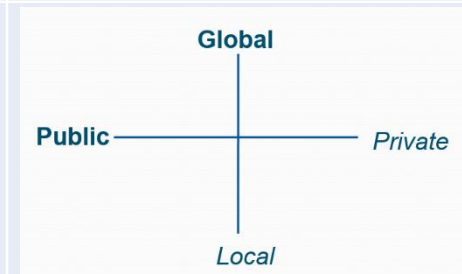
Business on Water and Water Bottles Reuse



- After water consumption plastic bottles usually remain
- What are the ways to reuse and recycle them?



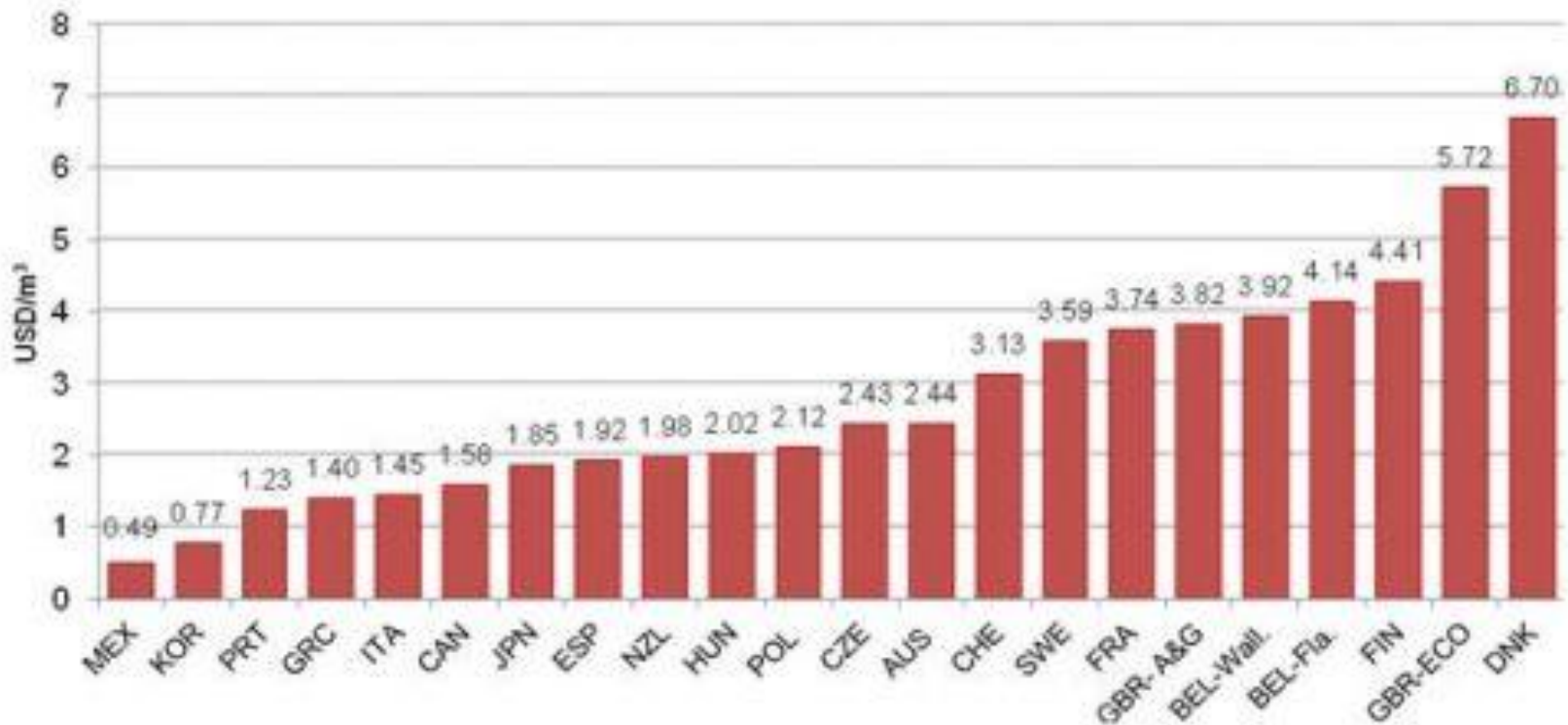
Water as a Scarce Resource: Nestle & Rio Tinto Cases

	Nestle	Rio Tinto
1. Illustrations of water challenges ✓ Water is important in this case because: ✓ What kind of water is needed: ✓ Where and how the company finds the water: ✓ Water problems (scarcity, quality, price, etc.):
2. Steps taken to address water challenges
3. Facts about water economics (investments in water facilities, water price, new business value created, etc.)
4. Best levels of leadership to address water issues		

Water Economics: Pricing the Water

- Households and industry in many countries increasingly pay the true cost of the water they consume
- BUT: there is a great variation through the countries!

Figure 2. Unit price of water supply and sanitation services to households, incl. taxes (USD/m³)



Source: OECD estimates based on country replies to the 2007-08 survey when available, or public sources validated by the countries

Water Access Indicators

- Google such indicators
- Suggest yours

Water Access Indicators

- The indicator **"Reasonable Access to water"** is defined as at least 20 liters per person per day from a source within 1 km of the user's home

Water Stress is a situation when there is not enough water for all uses, whether agricultural, industrial or domestic

- The indicator **"Periodic or Regular Water Stress"** refers to the situation when annual per capita renewable freshwater availability is less than 1,700 cubic meters.

- Below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being

Water Access Indicators

- The indicator **"Reasonable Access to water"** is defined as at least 20 liters per person per day from a source within 1 km of the user's home

Water Stress is a situation when there is not enough water for all uses, whether agricultural, industrial or domestic

- The indicator **"Periodic or Regular Water Stress"** refers to the situation when annual per capita renewable freshwater availability is less than 1,700 cubic meters.
- Below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being

Water Stress Causes

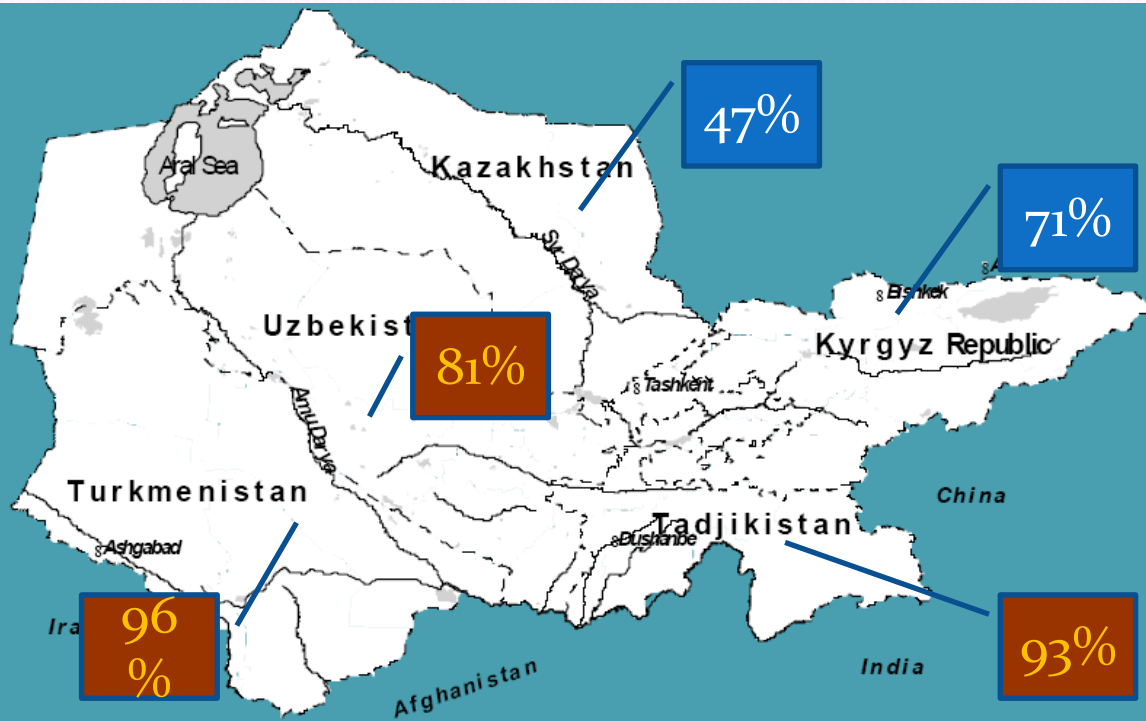
- Population growth:
 - by 2050 there will be additional 3.5 bln people in developing countries facing water stress
- Expansion of business activity
- Rapid urbanization
- Climate Change
- Depletion of aquifers (underground waters)
- Water Pollution

Water Stress Case: Aral Sea Basin

79%



Ratio of actually irrigated area to total cultivates area, % (2000)



Water Stress Case: Aral Sea Basin

1957



The level of the Aral Sea in the late 1950s is customarily used as the reference to see how much water has been lost.

1982



In the early 1980s, the accelerating drop of the sea level is evident. Salinity is rising; fisheries are shrinking.

2000



The Aral Sea splits into North and South. Not only has it lost most of its water, but fishing is also nearly gone. The Kok-Aral Dam begins to allow waters in the North Aral Sea to rise.

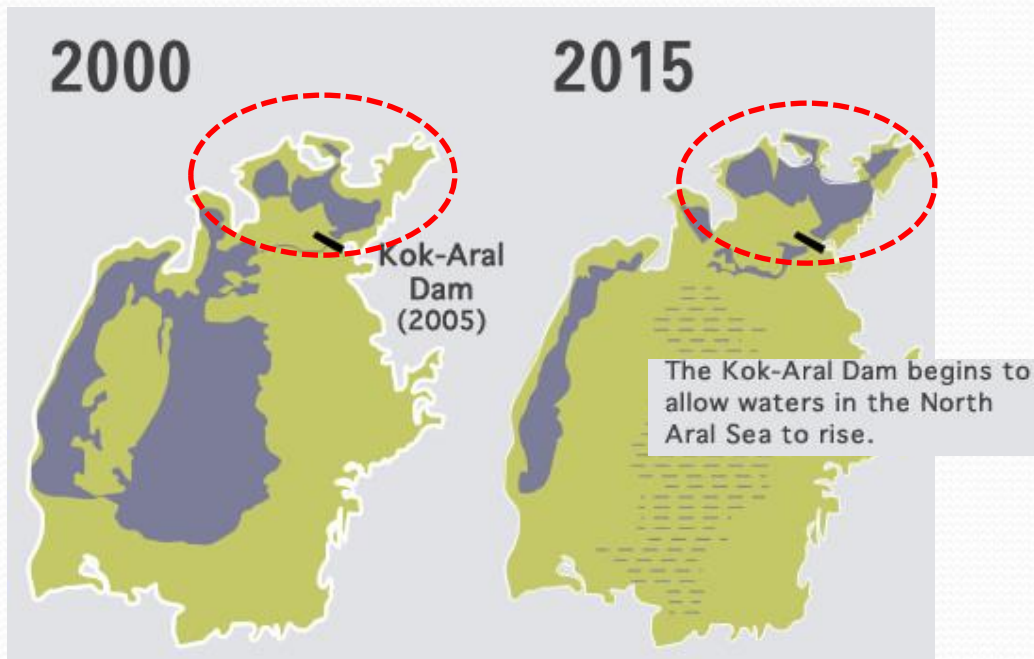
2015



Despite expansion of the North Aral Sea, only some eight percent of the water volume of the late 1950s remains.

Aral Sea: Coming Back to Life?

World Bank and Kazakhstan Plan for Improvements in the Northern Aral Sea Area



Construction of the 13-km Kok-Aral Dam in 2005 brought benefits which exceeded the project expectations:

- the volume of the Northern Aral Sea raised by **68%** as early as by 2008
- increased fish production by more than **3** times
- the return of the local population who started to engage again in income generating activities, mainly fishing
- improved flora and fauna
- reduction of salinity by half

River transfer projects: from North to South

- 1948: the first official project plan
 - 6-7% from Oby river basin to south republics of the USSR

Why didn't it come true?

- Long run consequences for climate are unclear
- There are huge water losses due to 1) evaporation and 2) absorption by the ground
- Deficit water problem in Middle Asia is resolved by increasing water consumption – non-effective water use



The Business Opportunity in Water Conservation

- Many companies are struggling to find the water they need to run their businesses

- In 2004 Pepsi Bottling and Coca-Cola closed down plants in India that local farmers and urban interests believed were competing with them for water

- In 2007 a drought forced the US Tennessee Valley Authority to reduce its hydropower generation by nearly a third. Some \$300 million in power generation was lost.

Business Response to Water Stress

Some conclusions

- Business cannot survive in a society that thirsts
- One does not have to be in the water business to have a water crisis
- Business is part of the solution, and its potential is driven by its engagement
- Growing water issues and complexity will drive up costs

Business Response to Water Stress

Actions

- **AGRICULTURE:** reducing the cost of irrigation due to the transition from surface watering to soil one (drip irrigation)
- **INDUSTRY:** changes in industrial technological cycles toward closed water cycle
- **HOUSEHOLDS:** improvement of plumbing and the introduction of fees for water overuse

Singapore: An Exemplary Case for Urban Water Management

Questions to answer:

- **A.** What are water management problems that Public Utilities Board of Singapore has to resolve? Explain why water resources and water management are of vital importance for Singapore (use some extra information about the population of Singapore, the territory of this country, natural water resources like rivers and lakes, etc.).
- **B.** What were innovative approaches (instruments, measures) used by Public Utilities Board in water supply and demand management and wastewater management? How would you assess the effectiveness of these measures?
- **C.** What are limitations and possibilities of applying the same water management approaches in a country like Russia, Canada or Brazil?

Water Conflicts and Crises

- Water has been the source of various conflicts throughout history
- Conflicts and tensions over water are most likely to arise within national borders, in the downstream areas of distressed river basins
- Water privatization can also cause political tensions, civil protests, and violence of local population

Water Conflicts



Sources: <http://awesome.good.is/transparency/016/016waterfights/index.html>



WATER SOURCE Tibetan Glaciers

COUNTRIES INVOLVED Bangladesh, Bhutan, Burma, Cambodia, China, India, Laos, Nepal, Pakistan, Thailand, and Vietnam

THE CONFLICT Tibet is home to what some scientists call “the Third Pole”: Almost 46,000 glaciers, the runoff from which forms the source of most of the major rivers in Southeast Asia, the Yangtze, the Ganges, and the Mekong among them. Not surprisingly, the glaciers are currently melting at an alarming rate. What China does to protect the glaciers—and what it does with the melting water if it doesn’t—could affect the lives of more than 2 billion people in some of the world’s most overcrowded regions.



[VIEW ALL CONFLICTS](#)

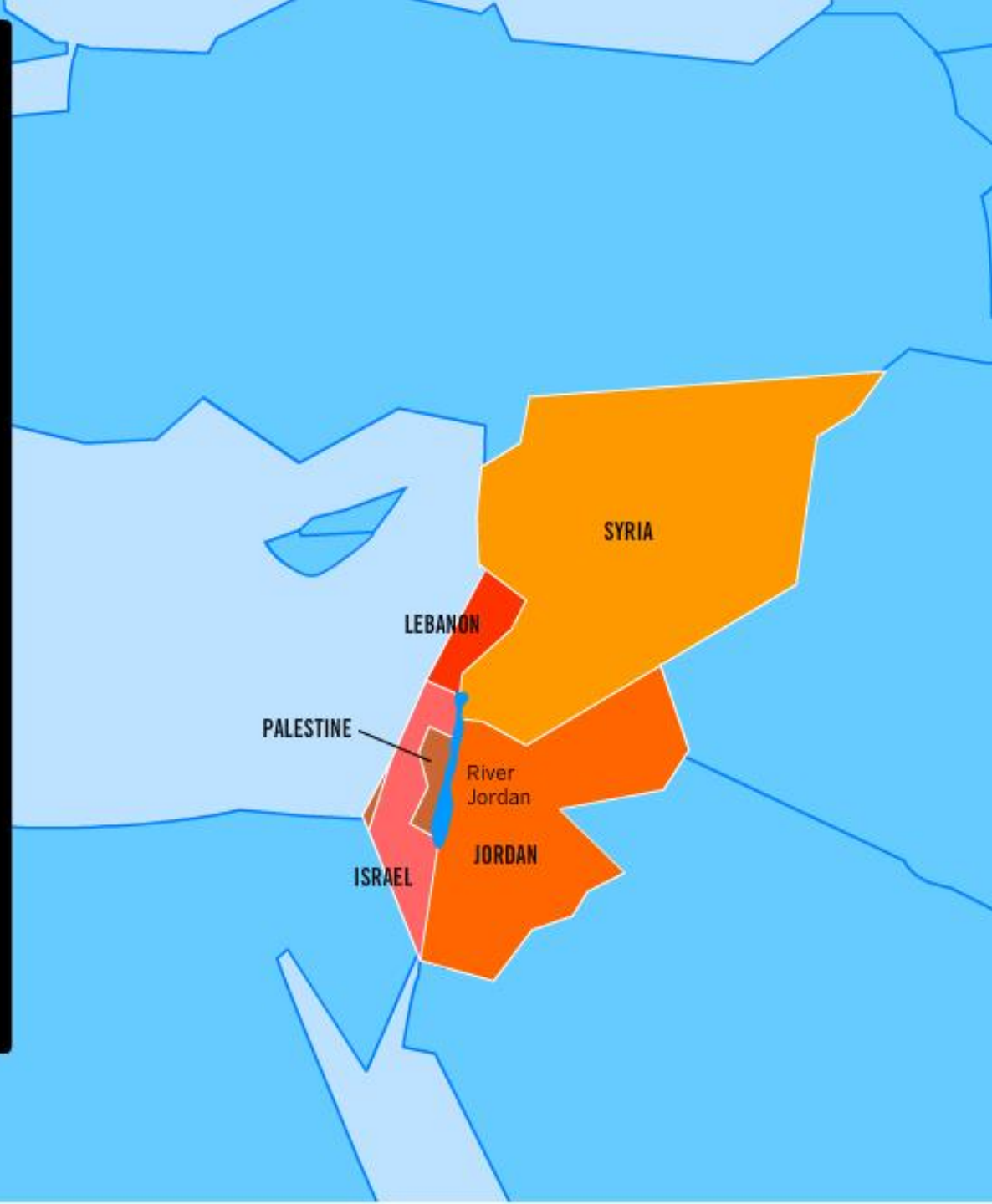


WATER SOURCE Jordan River

COUNTRIES INVOLVED Israel, Jordan, Lebanon, Palestine, and Syria

THE CONFLICT As if they didn't have enough to fight about, everyone in the western Middle East has to get most of their water from one main source: the Jordan River. While Israel and Jordan's peace treaty covers fair water use, Syrian-built dams and reservoirs on one of the tributaries of the Jordan have already sparked conflict (one of Israel's goals in the assault on the Golan Heights was to secure control of water sources). Palestine also chafes at Israel's control of its water (besides the Jordan, there are conflicts concerning the Israel-controlled aquifers under the West Bank and Gaza). Meanwhile, 90 percent of the Jordan's flow is diverted for use in agriculture and homes. More need could force one of the countries to do something drastic.

[VIEW ALL CONFLICTS](#)





WATER SOURCE Colorado River

COUNTRIES INVOLVED Mexico and the United States

THE CONFLICT The Colorado River runs much of its course through five of the driest states before crossing over the Mexican border and emptying into the Gulf of California. Being downstream, Mexico has little chance to also reap the benefits. A 1944 treaty guarantees Mexico rights to some of the Colorado's water, but U.S. plans to put a concrete lining in part of the All-American Canal—which takes water from the Colorado to the farms of Southern California—is causing an uproar. Water seeping out of the unlined canal flowed underground into Mexican farms, and completion of the lining could devastate the region's economy, with potentially dangerous results.



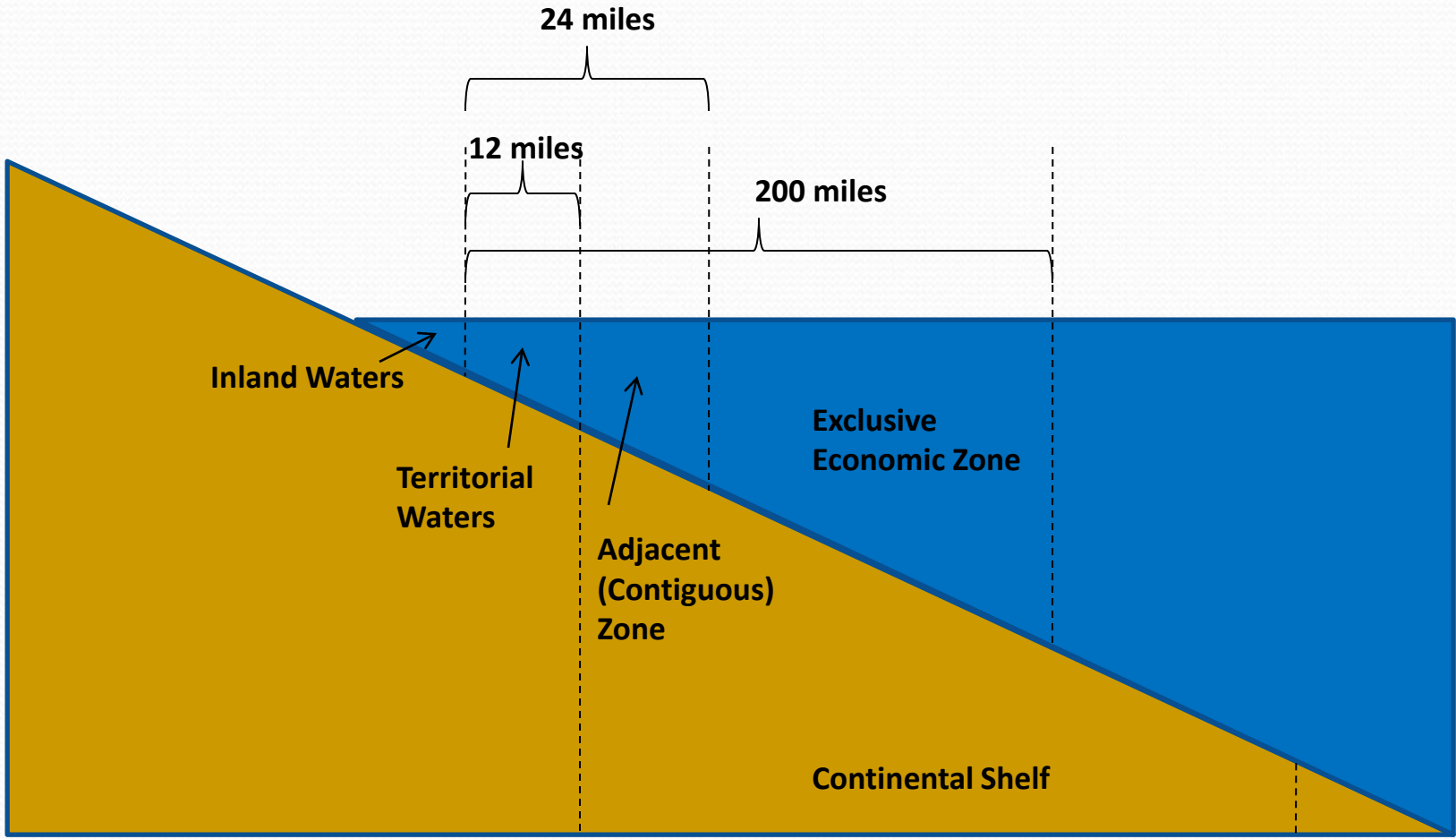
[VIEW ALL CONFLICTS](#)

Water Conflicts and Crises

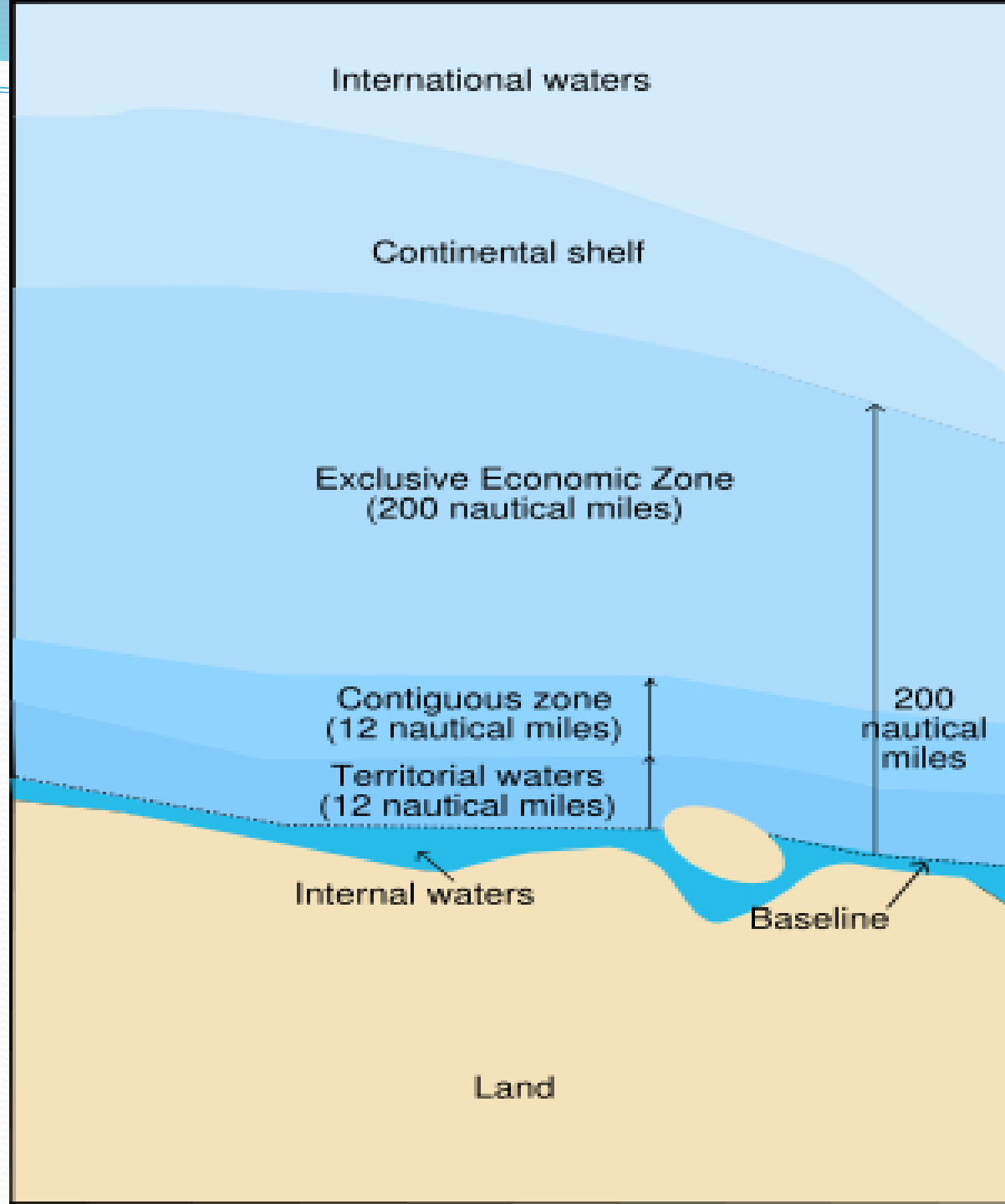
Potential Areas for water conflicts in 2025

- Poorer countries where resources are limited, and population growth is rapid
- Large urban and peri-urban areas requiring new infrastructure to provide safe water and adequate sanitation

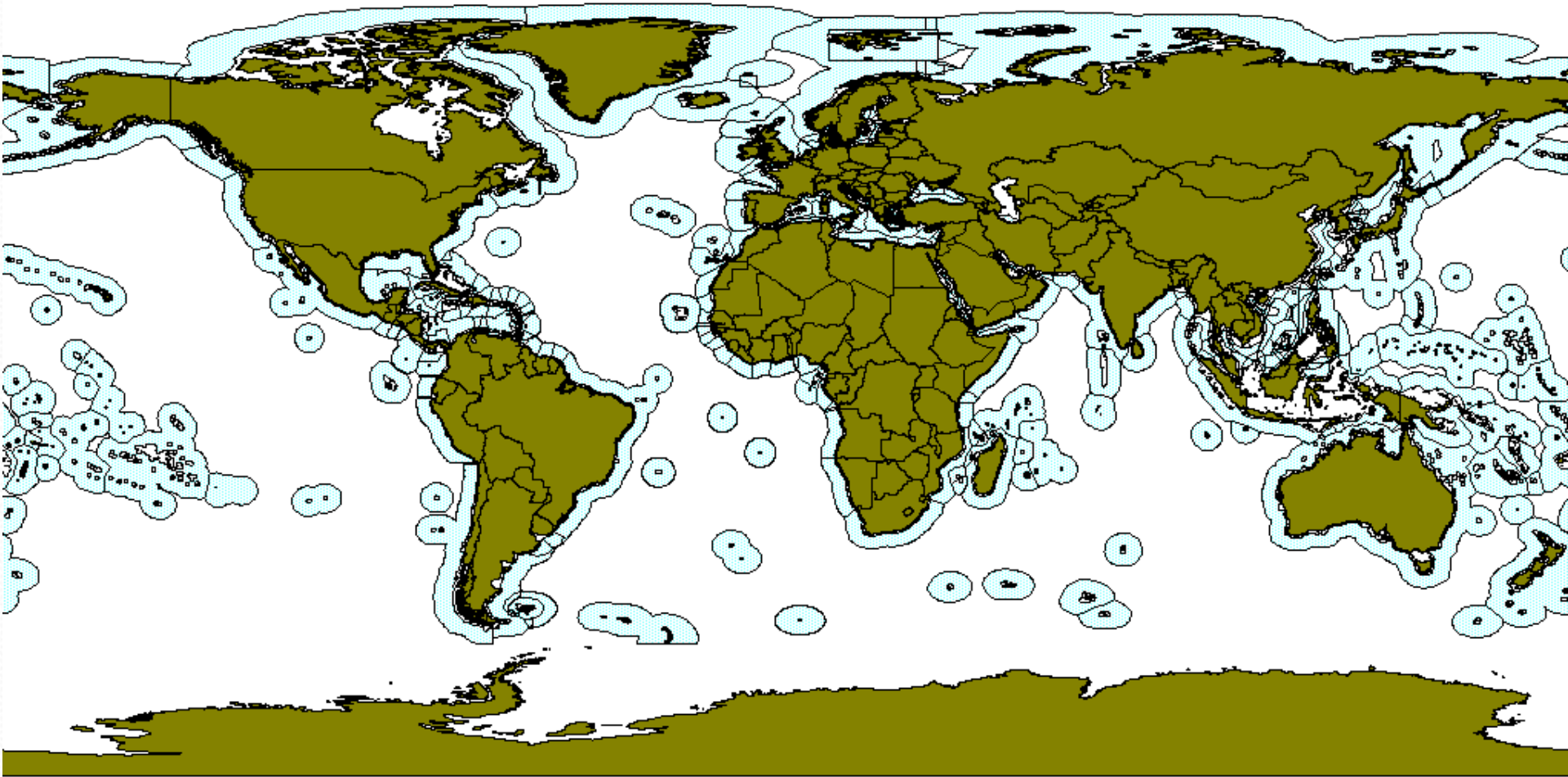
UN Convention on Law of the Sea



UN Convention on Law of the Sea



Sea Exclusive Economic Zones



Source: <http://oceanworld.tamu.edu/resources/oceanography-book/coastalzone.htm>

Sea Exclusive Economic Zones

- The largest Exclusive Economic Zone of the USA

