Water availability & Water uses in the world

Based upon UNDP Human Development Report 2006 and UNEP Vital Water Graphics, An Overview of the State of the World's Fresh and Marine Waters – 2008

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Update 2021

ENPC, Ecole des Ponts ParisTech
LEESU, Laboratoire Eau Environnement et Systèmes Urbains

Water resources

Availability
- Water scarcity
- Global changes

Uses
- Supply
- Sanitation
- Virtual water /water footprint

Transboundary water

2

Water scarcity

"You ain't gonna miss your water until your well runs dry"

Bob Marley

A boy looking at a wooden boat in the middle of a drought

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10 The United Nations World Water Development Report 2019

The issue of scarcity…

- Viewed at the global level, there is more than enough water to go around and meet everyone's needs

So why does scarcity remain a problem?

- Because water is unequally distributed in space and time
- Because scarcity in many cases has been induced by policy failures

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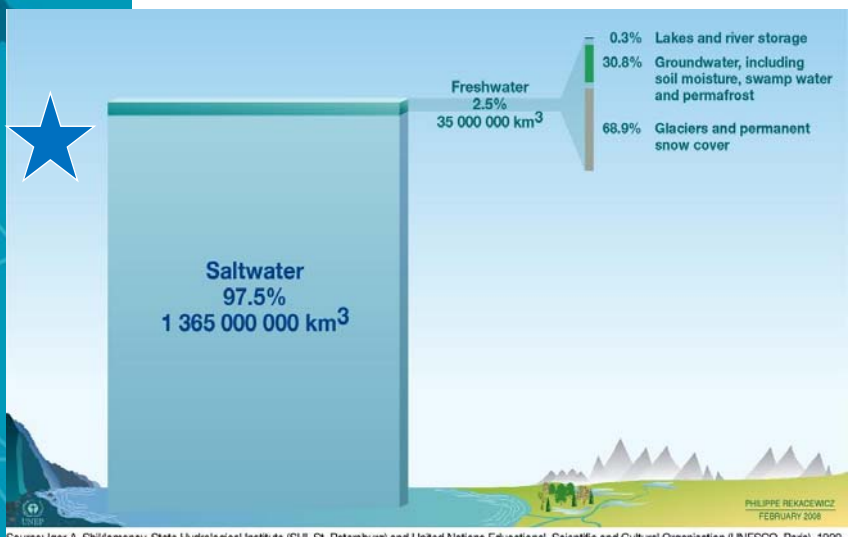
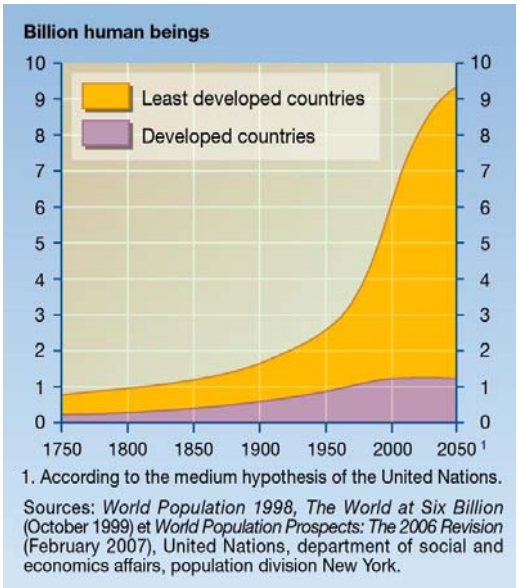
The issue of scarcity…



Source: Igor A. Shiklomanov, State Hydrological Institute (SHI, St. Petersburg) and United Nations Educational, Scientific and Cultural Organisation (UNESCO, Paris), 1999.

6

DCs >> ICs



1. According to the medium hypothesis of the United Nations.

Sources: *World Population 1998, The World at Six Billion* (October 1999) et *World Population Prospects: The 2006 Revision* (February 2007), United Nations, department of social and economics affairs, population division New York.

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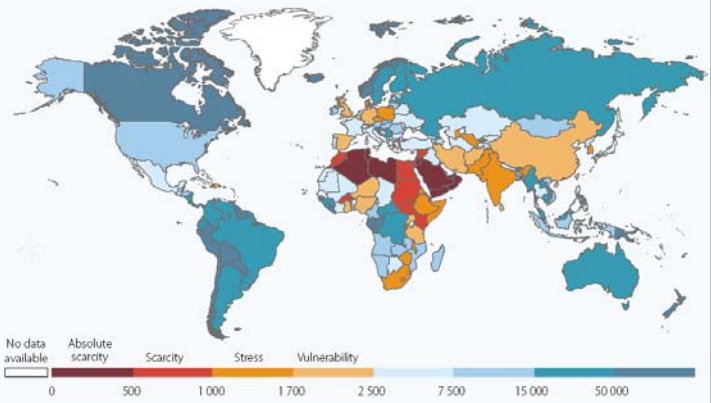
Water availability

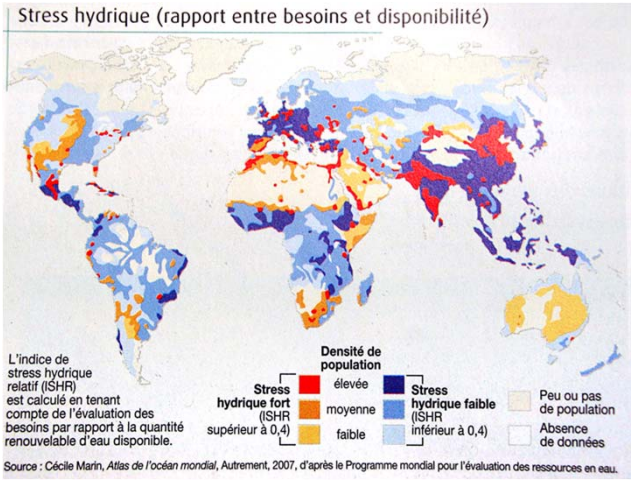
FIGURE 1.1 **Total renewable water resources per capita (2013)**



Note: The figures indicate total renewable water resources per capita in m³.
Source: WWAP, with data from the FAO AQUASTAT database, (http://www.fao.org/nr/water/aquastat/main/index.stm) (aggregate data for all countries except Andorra and Serbia, external data), and using UN-Water category thresholds.

8

Water stress and water scarcity



Source : Cécile Marin, *Atlas de l'océan mondial*, Autrement, 2007, d'après le Programme mondial pour l'évaluation des ressources en eau.

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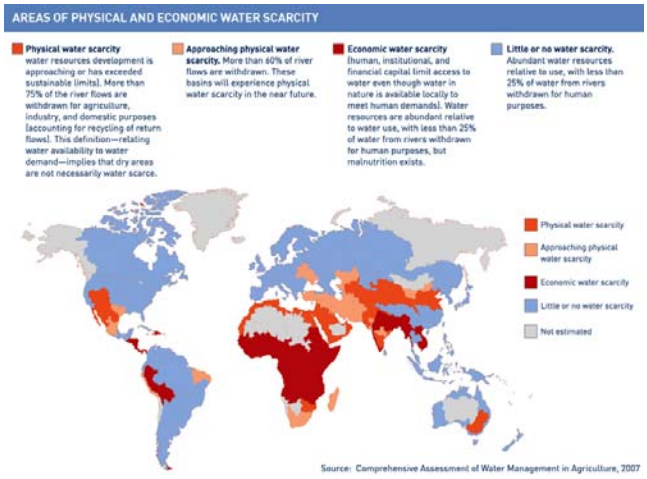
Type of scarcity



Source: Comprehensive Assessment of Water Management in Agriculture, 2007

10

Some facts…

- By 2025 more than 3 billion people could be living in water-stress countries – and 14 countries will slip from water stress to water scarcity.
- The share of the population of Sub-Saharan Africa living in water stress countries will rise from 30 to 85%

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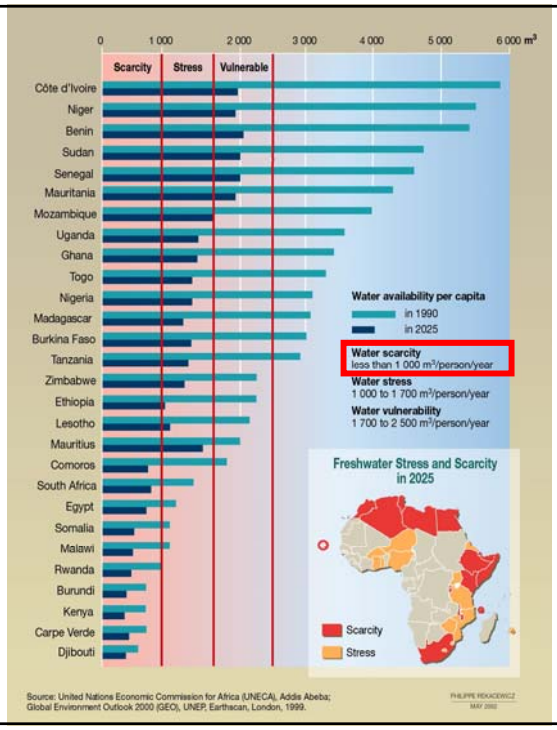
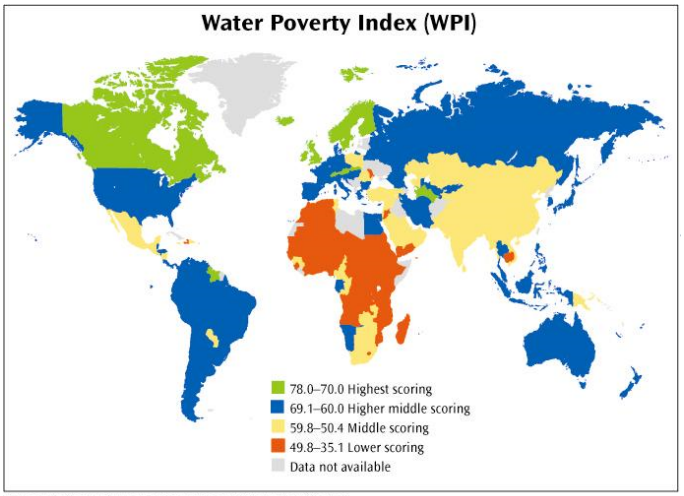


Domestic use EU=
200 l/pers/d =
5 m3/pers/year =
10% total use

12

The Water Poverty Index (WPI) captures the characteristics that link water and poverty.



Source: The Centre for Ecology & Hydrology of the United Kingdom

www.nerc-wallingford.ac.uk/research/WPI

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The Water Poverty Index (WPI) captures the characteristics that link water and poverty.

Table 1: Structure of Index and Data Used

WPI Component	Data Used
Resources	• internal Freshwater Flows • external Inflows • population
Access	• % population with access to clean water • % population with access to sanitation • % population with access to irrigation adjusted by per capita water resources
Capacity	• ppp per capita income • under-five mortality rates • education enrolment rates • Gini coefficients of income distribution
Use	• domestic water use in litres per day • share of water use by industry and agriculture adjusted by the sector's share of GDP
Environment	indices of: • water quality • water stress (pollution) • environmental regulation and management • informational capacity • biodiversity based on threatened species

www.keele.ac.uk

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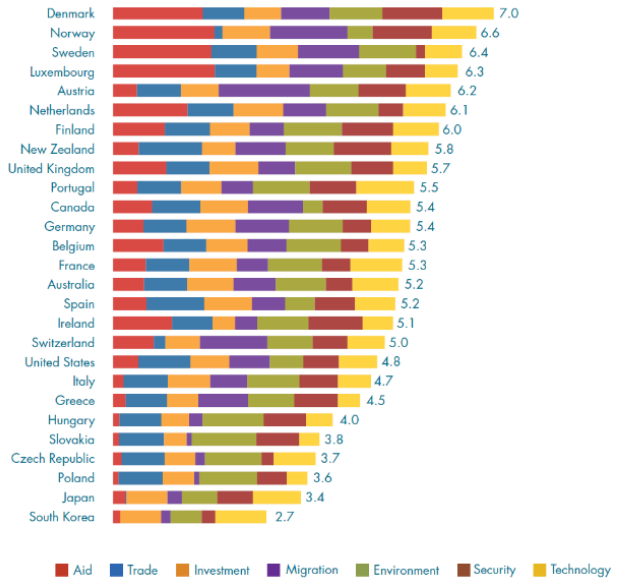
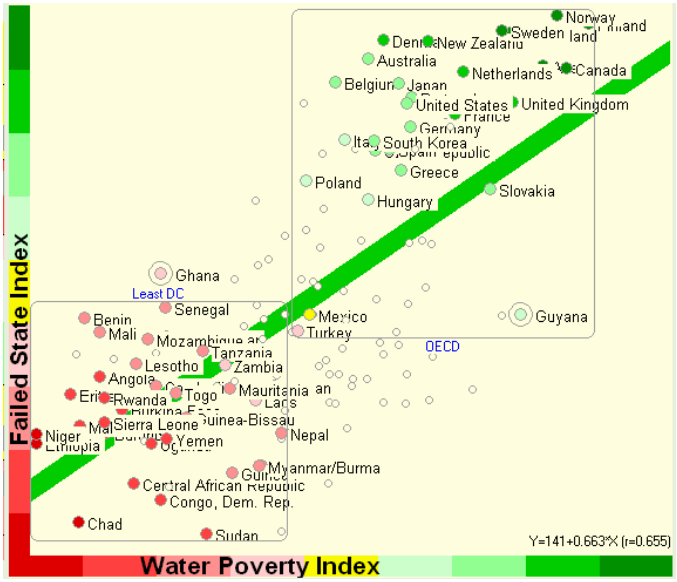
The Water Poverty Index (WPI) captures the characteristics that link water and poverty.



http://www.humanosphere.org/2012/10/global-report-card-how-well-rich-countries-do-at-fighting-poverty-overseas/ 15

The Water Poverty Index (WPI) captures the characteristics that link water and poverty.



http://esl.jrc.ec.europa.eu/dc/fsi_2008/fsi_fvm.htm 16

Global changes

- Climate
- Demography
- Technology

M.Seidl 2010

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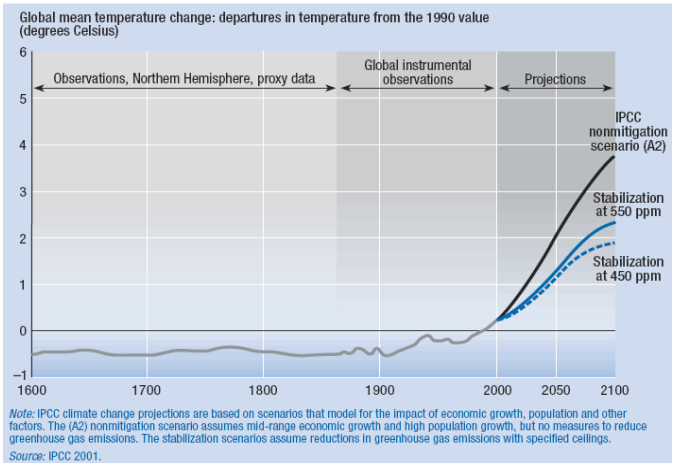
The challenge of climate change

Figure 4.9 **Our world will get much warmer in the next century**



Note: IPCC climate change projections are based on scenarios that model for the impact of economic growth, population and other factors. The (A2) nonmitigation scenario assumes mid-range economic growth and high population growth, but no measures to reduce greenhouse gas emissions. The stabilization scenarios assume reductions in greenhouse gas emissions with specified ceilings.

Source: IPCC 2001.

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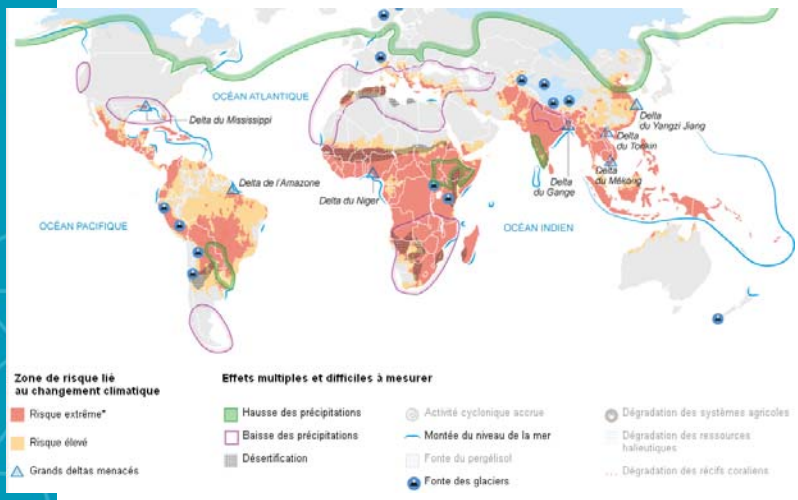
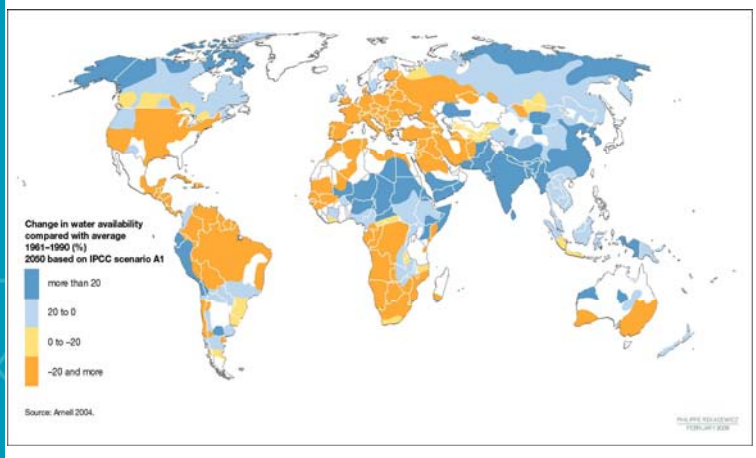
The challenge of climate change



http://www.lemonde.fr/planete/visuel_interactif/2013/09/27/la-carte-des-impacts-du-rechauffement-climatique_3486190_3244.html

Contribution of climate change to declining water availability



http://www.lemonde.fr/planete/visuel_interactif/2013/09/27/la-carte-des-impacts-du-rechauffement-climatique_3486190_3244.html

Global Warming – the predictable emergency

- For a large share of the world's poor people climate change projections point to less secure livelihoods, greater vulnerability to hunger and poverty, worsening inequalities and causing more environmental degradation.
- Water insecurity linked to climate change threatens to increase malnutrition by 75-120 million people by 2080..
- Mitigation through incentives to clean technology and financing technological transfer is an imperative.
- Very few countries have included in their PRSPs or IWRM documents provisions to face up to the challenges caused by climate change.

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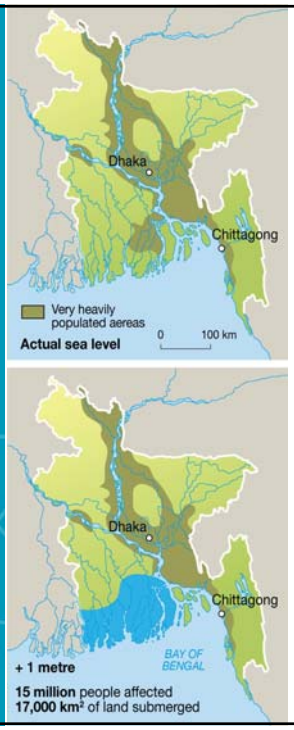
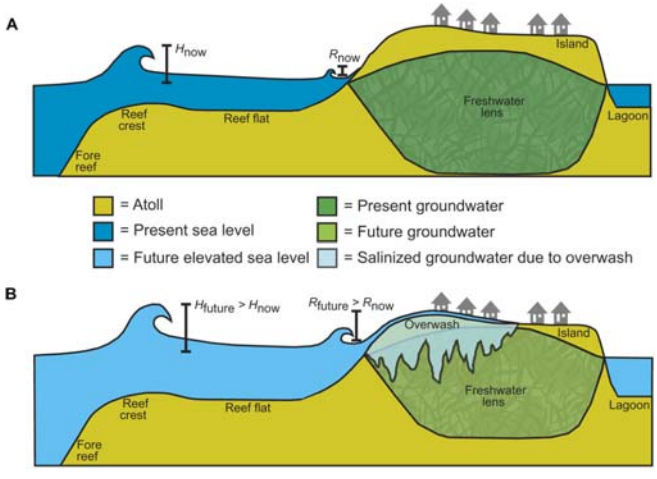


Global Warming: the predictable emergency

22

Global Warming: the predictable emergency



http://advances.sciencemag.org/content/4/4/eaap9741.full

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Water (mis)uses

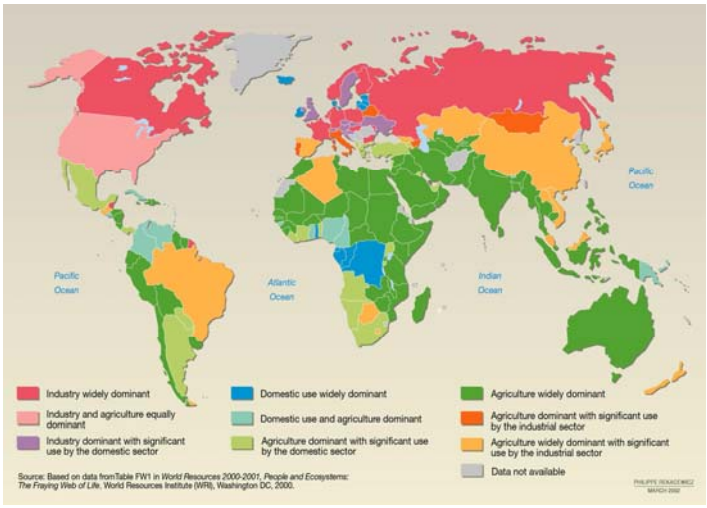
'Among the many things I learnt as a president, was the centrality of water in the social, political and economic affairs of the country, the continent and the world'

Nelson Mandela, WSSD, 2002

'Water flows uphill towards money'

Anonymous, American West

Water use



www.unep.org/dewa/vitalwater/

25

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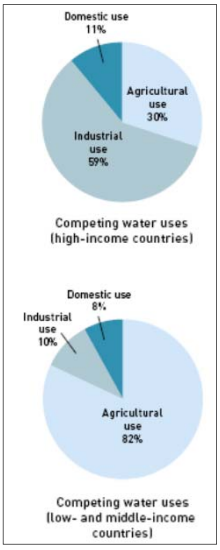
Water use

Global annual water use by industry is expected to rise from an estimated 725 km3 in 1995 to about 1,170 km3 by 2025, by which time industrial water usage will represent 24 % of all water abstractions. Much of this increase will be in developing countries now experiencing rapid industrial development.



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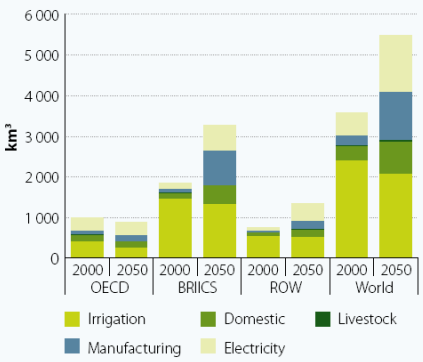
Water stress and water scarcity

FIGURE 6.1 **Global water demand in 2000 and 2050**



Note: BRIICS (Brazil, Russia, India, Indonesia, China, South Africa); OECD (Organisation for Economic Co-operation and Development); ROW (rest of the world). This graph only measures 'blue water' demand and does not consider rainfed agriculture.
Source: OECD (2012a, Fig. 5.4, p. 217, output from IMAGE). OECD Environmental Outlook to 2050 © OECD.

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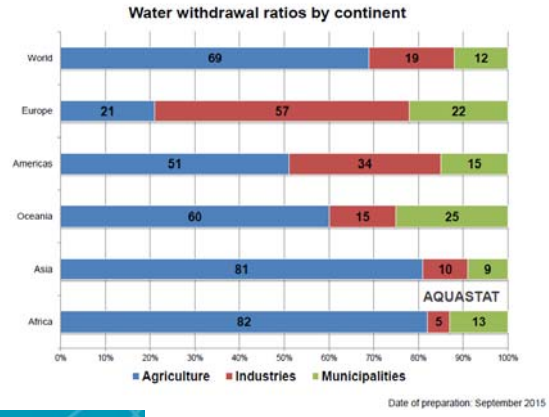
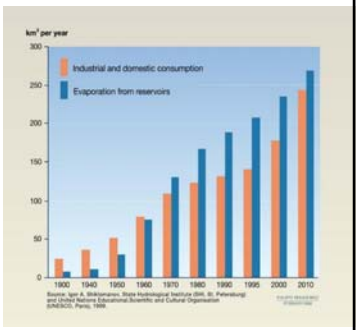
Water use

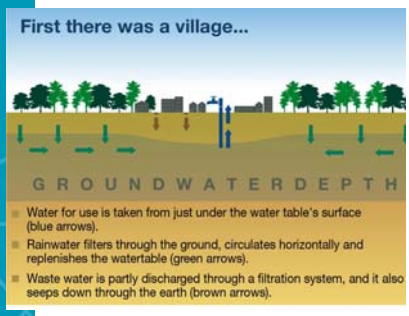


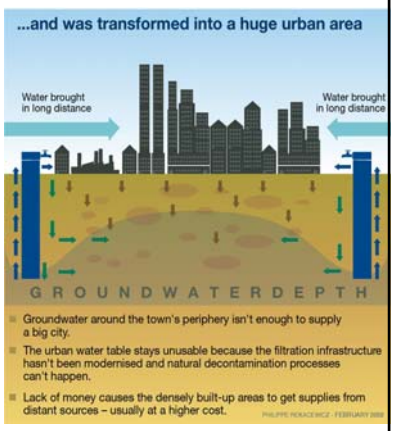


www.unep.org/dewa/vitalwater/

28

Water use urban vs rural





UNDP 2000

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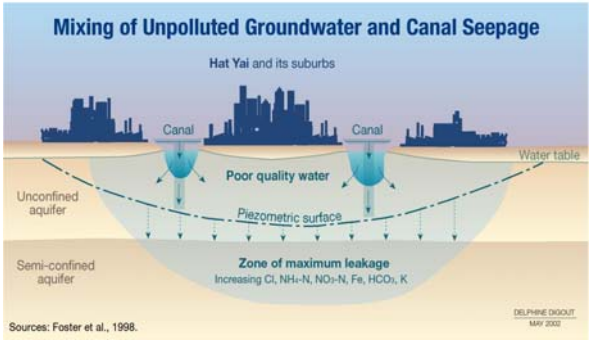
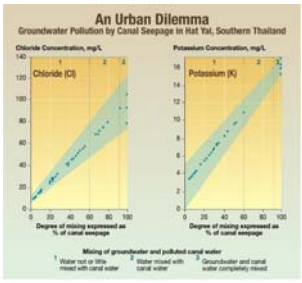
Water use urban vs rural

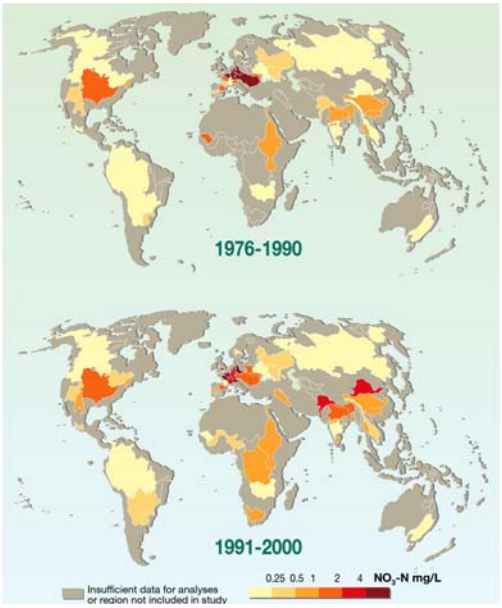




UNDP 2000

30

Impact of agriculture



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Integrated Water and Resources Management (IWRM) provides an important vehicle for reform, while five broad elements are needed

- Develop a national strategy, including pricing and allocation policies that constraint demand within the bounds of sustainability.
- Cut perverse subsidies but protect the poor
- Make polluters pay, create incentives for new technologies as part of effective regulation.
- Also, go beyond the polluter pays, to the polluter prevention pays.
- Monitor and regulate water extraction.

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Augmenting supply, options and constraints

- Diverting rivers
- Desalinization
- Virtual water
- Recycling wastewater

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Augmenting supply, options and constraints

TABLE 2.3

Average US figures for water production

	Source / treatment type	Energy use (kWh/million L)
Water	Surface water	60
	Groundwater	160
	Brackish groundwater	1 000-2 600
	Seawater	2 600-4 400
Wastewater	Trickling filter	250
	Activated sludge	340
	Advanced treatment without nitrification	400
	Advanced treatment with nitrification	500

Note: The table does not include energy used for distribution.
Sources: CEC (2005); EPRI (2002); Stillwell (2010); Stillwell et al. (2010, 2011).

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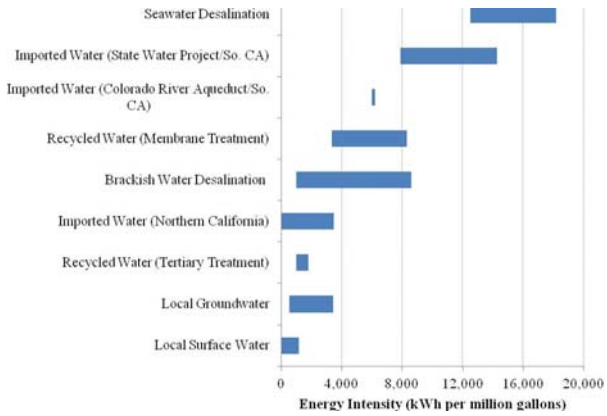
Desalinization



Desalination or desalinization is a process that removes minerals from saline water. Salt water is desalinated to produce fresh water suitable for human consumption or irrigation. One potential "by-product" of desalination is salt.

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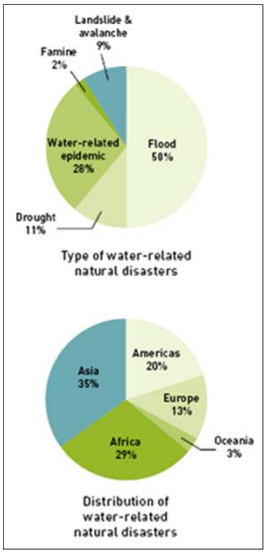
Water risks

Between 1991 and 2000, the number of people affected by natural disasters rose from 147 million per year to 211 million per year. In the same period, more than 665,000 people died in 2,557 natural disasters, of which 90% were water-related. Of these water related disasters, floods represented about 50%, water-borne and vector-borne diseases about 28%, and droughts 11%. Floods caused 15% of deaths and droughts 42% of all deaths from all natural disasters. Recorded economic losses from natural catastrophes have grown from US$ 30 billion in 1990 to US$ 70 billion in 1999.



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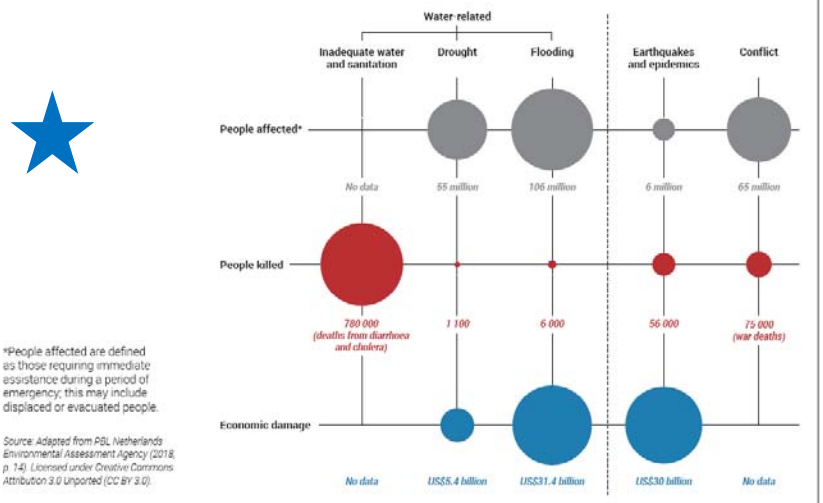
Water risk

Figure 1 Average annual impact from inadequate drinking water and sanitation services,[1] water-related disasters, epidemics and earthquakes, and conflicts



*People affected are defined as those requiring immediate assistance during a period of emergency; this may include displaced or evacuated people.

Source: Adapted from PBL Netherlands Environmental Assessment Agency (2018, p. 14). Licensed under Creative Commons Attribution 3.0 Unported (CC BY 3.0).

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Human cost

480 000 children/year
> 2 times COVID19

- **1.1 billion people lack access to water**
- **2.6 billion people lack access to sanitation**
- **Inequality is a central part of the story.**

- **Each day die 1 300 children as a result of diarrhoea**.
- 443 million school days each year are lost to water-related illnesses.
- Almost 50 percent of all people in developing countries are suffering due to water and sanitation deficits.

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Water supply

'We feel it our duty to say that high-priced water is not in the interest of public health. Pure water in abundance, at a price within the reach of all, is one of the most powerful agencies for promoting the health of any community'

North Carolina Board of Health, 1898

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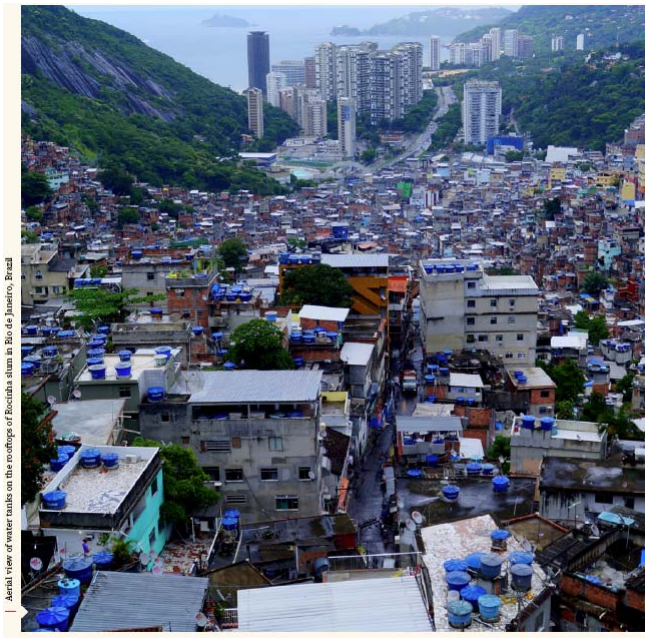

Aerial view of water tanks on the rooftops of Rocinha slum in Rio de Janeiro, Brazil

28 The United Nations World Water Development Report 2019

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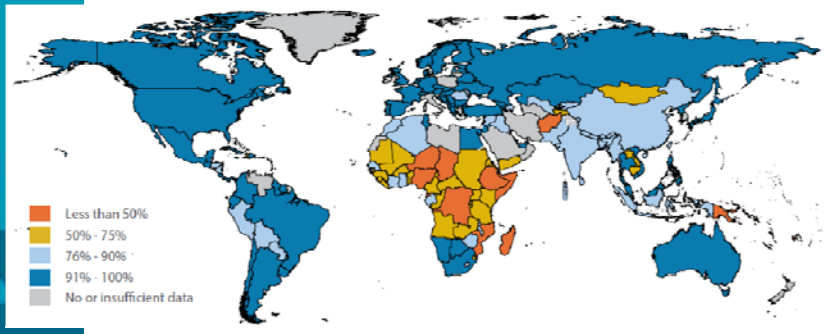
• Water supply



UN Habitat 2009

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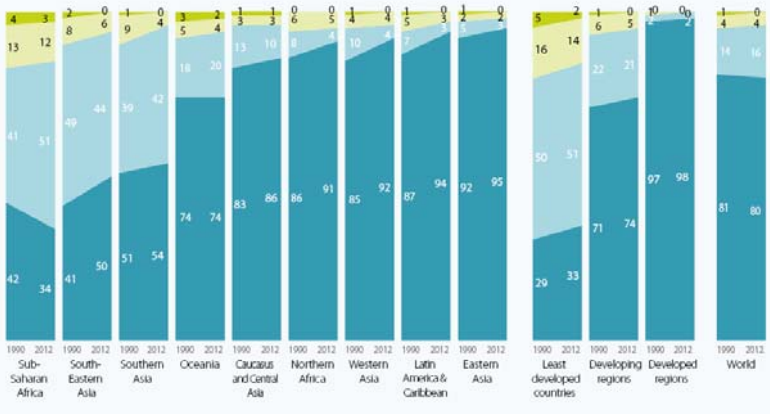
Water supply

FIGURE 6.2 **Trends in urban water supply coverage (1990-2012)**



Source: WHO and UNICEF (2014a, Fig. A4-1, p. 66), reproduced with the permission of the publisher.

“Adequate” & “Improved”

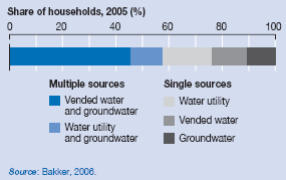
Water Supply

Adequate: Supply of water that is safe, sufficient, regular, convenient, and available at an affordable price.

Improved: Access to a water supply from a household connection, a public standpipe, a borehole, a protected dug well or a protected rain water connection. At least 20 litres per person per day must be available from a source within 1 km of the user's dwelling.

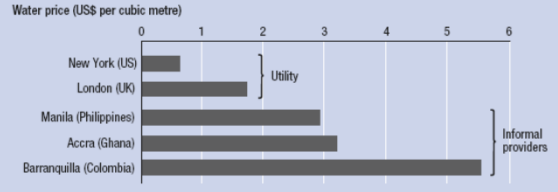
The water divide

Figure 2.1 Most households in Jakarta get their water from several sources



Source: Bakker, 2006.

Figure 1.15 Water prices: the poor pay more, the rich pay less



Source: Solo 2003; WUP 2003.

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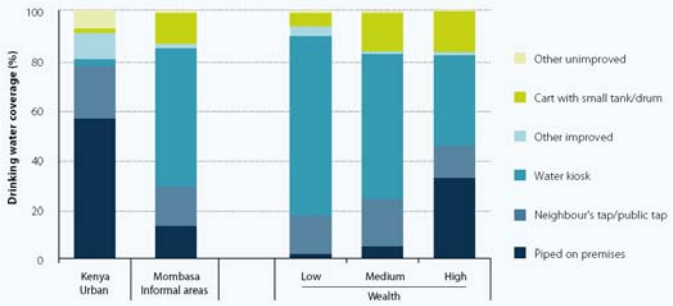
Unequal access

example of Mombasa

FIGURE 6.4 **Access to water in Mombasa's informal settlements**



Source: WHO and UNICEF (2014a, Fig. 24, p. 20). Reproduced with the permission of the publisher.

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Private vs Public service

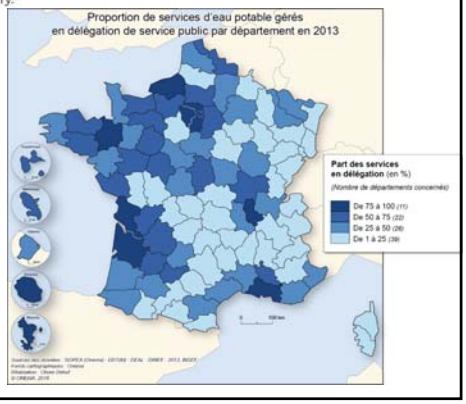
#3. Primary Purpose

Public Sector

Generally Public Sector entities are driven by the purpose of providing the basic public services to common public at reasonable cost in their respective industries by being also self-sustainable and profitable. However, profitability is not the primary motive.

Private Sector

The purpose of Companies in Private Sector is profit making by operating within the rules and compliances of respective country.



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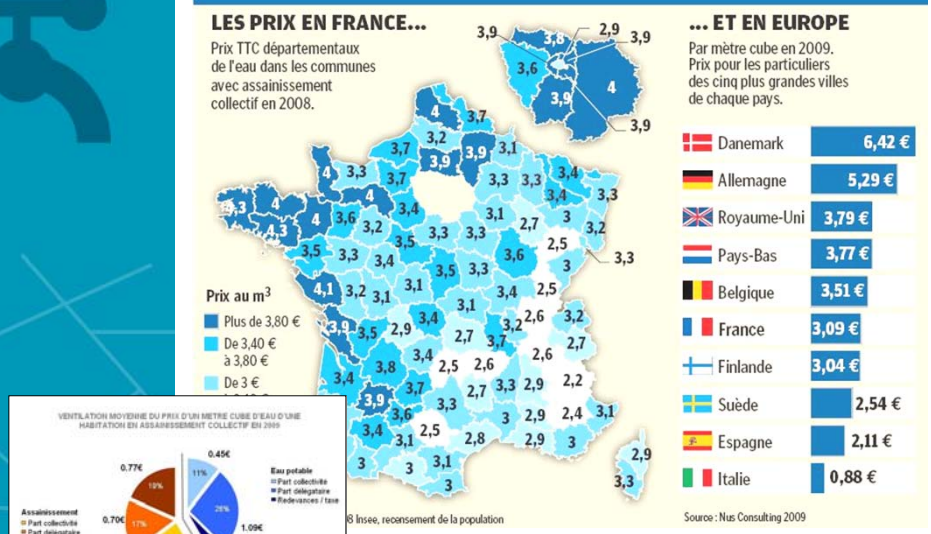
Water price



4 €/m3 = 60 ct / j/ pers

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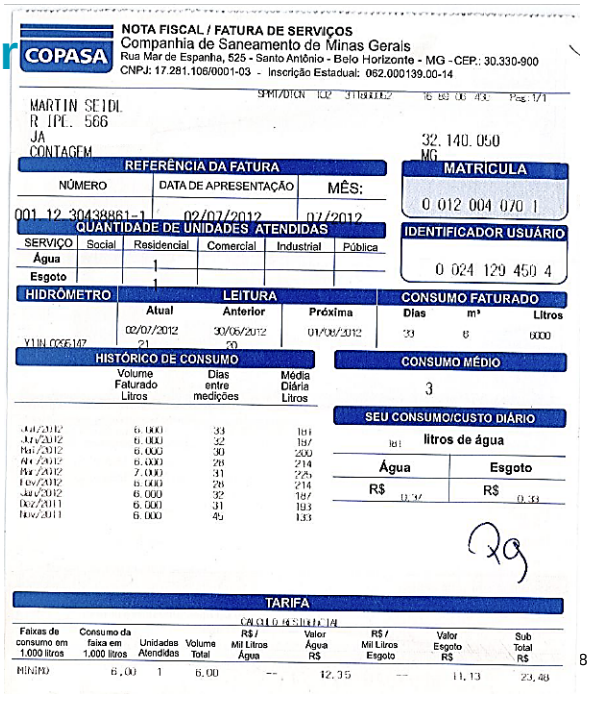
Water



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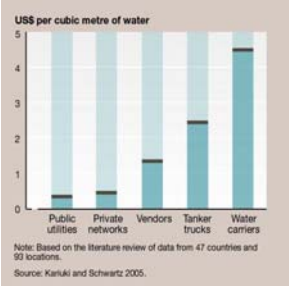
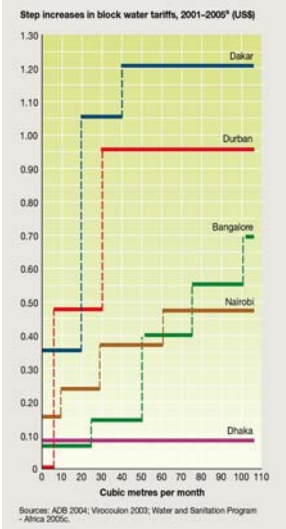
Water price

Public services provide cheaper water





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Water for human consumption

- The debate over the relative merits of public and private sector has been a distraction from the inadequate performance of both private water providers to overcome the global water deficit.
- Inequalities based on wealth, and location, play a central role in structuring water markets.
- Water pricing reflects a simple perverse principle: the poorer you are, the more you pay.
- The diversity in public-private partnerships cautions against lumping all private sector involvement under the general heading of “privatization”.
- Regulation is critical to the progressive realization of the human right to water.

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MS2021

Sanitation

‘Good toilettes are far higher signs of civilization than grand palaces and fine art galleries’

William Clendenin,
Cincinnati Health Officer, 1866

‘Filthy water cannot be washed’

African Proverb

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MS2020

Mother and child walking along an open sewer in a slum

52

MS2021

Today…

- **1.1 billion people lack access to water**
- **2.6 billion people lack access to sanitation**
- **Inequality is a central part of the story.**

Implications for human development

- The lack of water and sanitation leads to diminished opportunities to realize people's capabilities and human potential

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The human cost of the crisis

- **Some 1.8 million children die each year as a result of diarrhoea—which is 4,900 deaths a day**. This is equivalent to the under-five population in London and New York combined.
- Deaths for diarrhoea in 2004 were about six times greater than the average annual deaths in armed conflict for the 1990s.
- 443 million school days each year are lost to water-related illnesses.
- **Millions of women spend up to four hours a day collecting water.**
- Almost 50 percent of all people in developing countries are suffering at any given time from a health problem caused by water and sanitation deficits.

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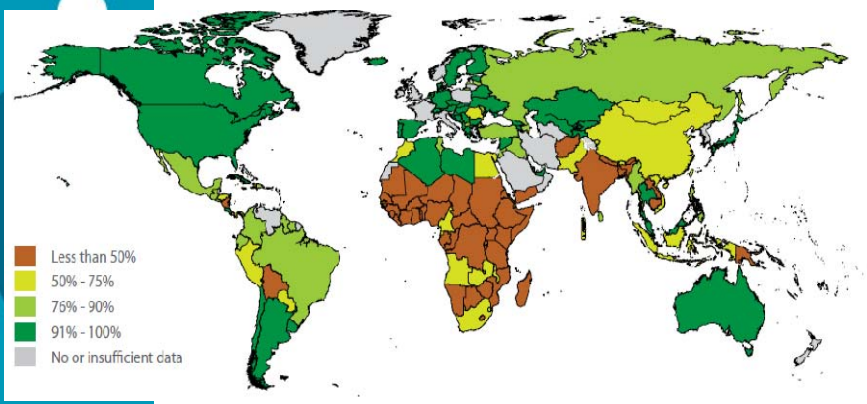
“Adequate” & “Improved”

Sanitation

Adequate: Access to sanitation that is convenient for all household members, affordable, and that eliminates contact with human excreta and other wastewater within the home and neighbourhood.

Improved: Access to a private or shared toilet connected to a public sewer or septic tank, or access to a private or shared pour-flush latrine, simple pit latrine or ventilated pit latrine.

WatSan facts



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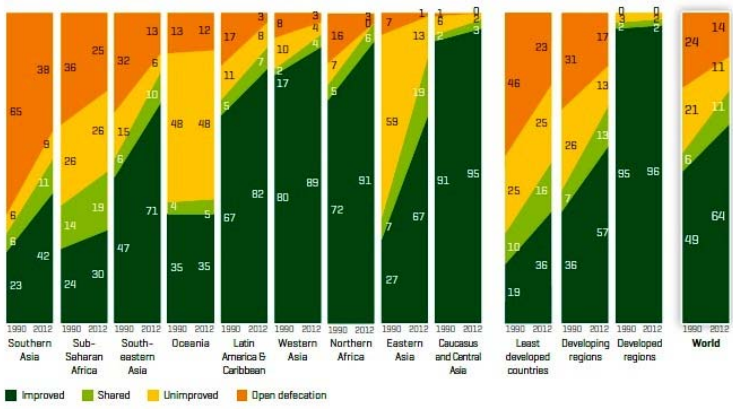
WatSan facts



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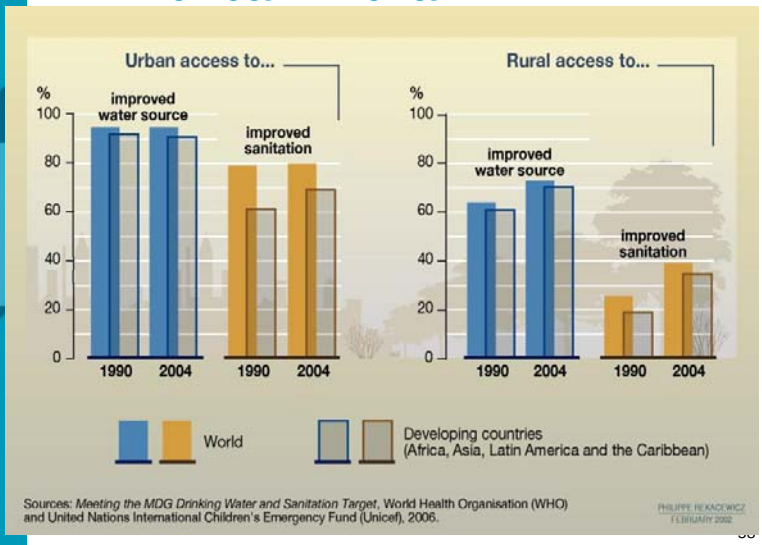
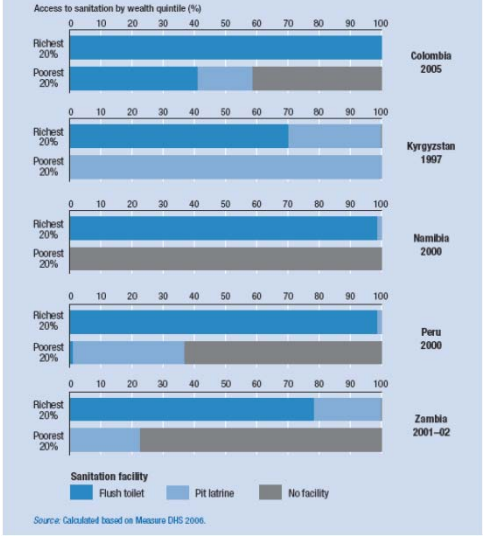
The sanitation divide urban - rural



The sanitation divide

Figure 1.11 The great sanitation divide

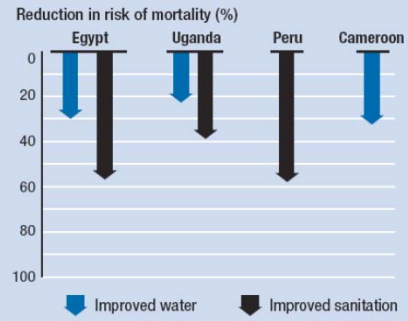


Source: Calculated based on Measure DHS 2006.

59

Diminished opportunities and increased risks

Figure 1.6 Clean water and toilets cut infant deaths



Note: Data based on surveys carried out between 1995 and 2004. For more details see *Technical note 3*. Data refer to post-neonatal deaths (1–12 months). Improved water and sanitation refer to one or more types of access generally considered improved.

Source: Fuentes, Pfütze and Seck 2006b.

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Diminished risks and increased opportunities

Handwashing with soap is the single most cost-effective health intervention.

Handwashing promotion is cost-effective when compared with other frequently funded health interventions. A $3 investment in handwashing brings the same health benefits as an $11 investment in latrine construction, a $200 investment in household water supply and an investment of $1000 in immunization.

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Why does sanitation lag so far behind?

- The national policy barrier – sanitation if ever figures prominently on the national political agenda.
- The behavior barrier – households tend to attach higher priority to water than to sanitation.
- The perception barrier – households often view better sanitation as a private amenity with private benefits rather than a public responsibility.
- The poverty barrier – Nearly 1.4 billion people without sanitation live on less than $2 a day.
- The gender barrier – women place higher value on access to private sanitation facilities but have weaker voice.
- The supply barrier – products designed without reference to community needs and priorities and delivered through unaccountable government agencies have low uptake rates.

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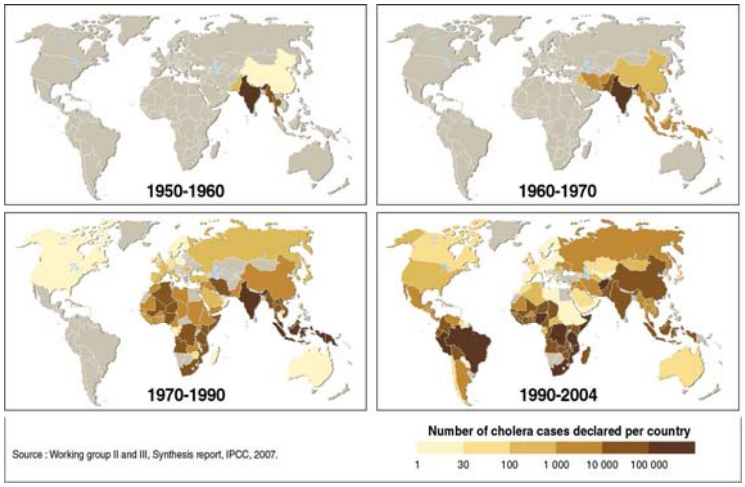
Climbing the ladder…

Figure 3.1 **Climbing the sanitation ladder has financial as well as health implications**

Source: Adapted from Lenton, Wright and Lewis 2005.

63

But also…



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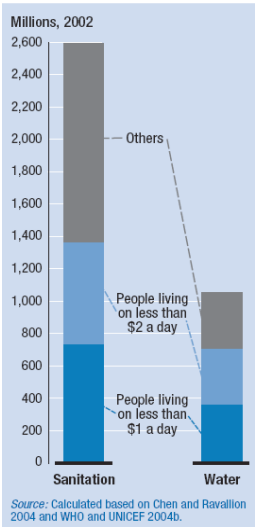
Above all, this is a crisis of the poor

Figure 1.9 **Poor people account for most of the water and sanitation deficit**



Source: Calculated based on Chen and Ravallion 2004 and WHO and UNICEF 2004b.

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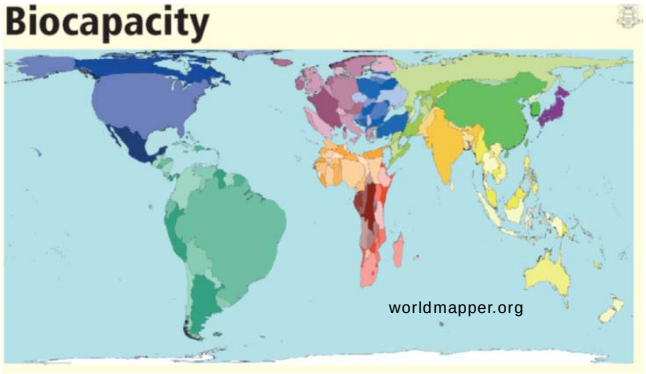
Virtual water and water footprint

66

Biocapacity is measured in global hectares (Gha). A global hectare is 1 hectare of biologically productive space with world-average biological productivity. Biocapacity depends on physical features such as sun, water and soil. Human factors such as management, irrigation, degradation of soil, deforestation, creation of dust bowls and acid rain can affect it. **"A global hectare is a hectare with world-average ability to produce resources and absorb wastes"** (Living Planet Report, 2006)



16% of the world's biocapacity is in Brazil.

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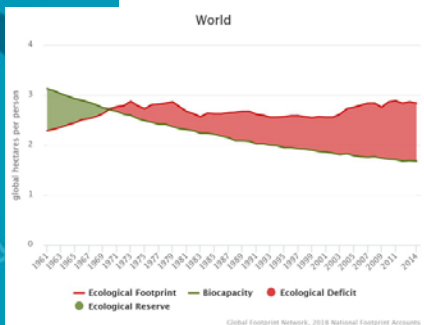
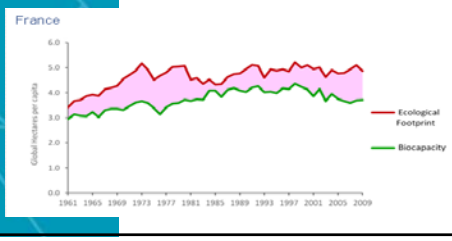
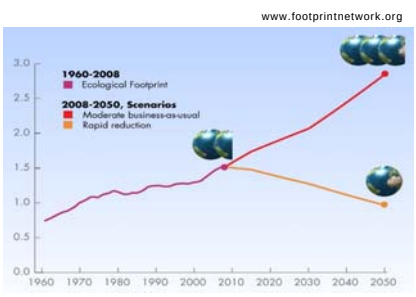
Ecological footprint …







The ecological footprint measures human demand on nature, expressed in global hectares per capita

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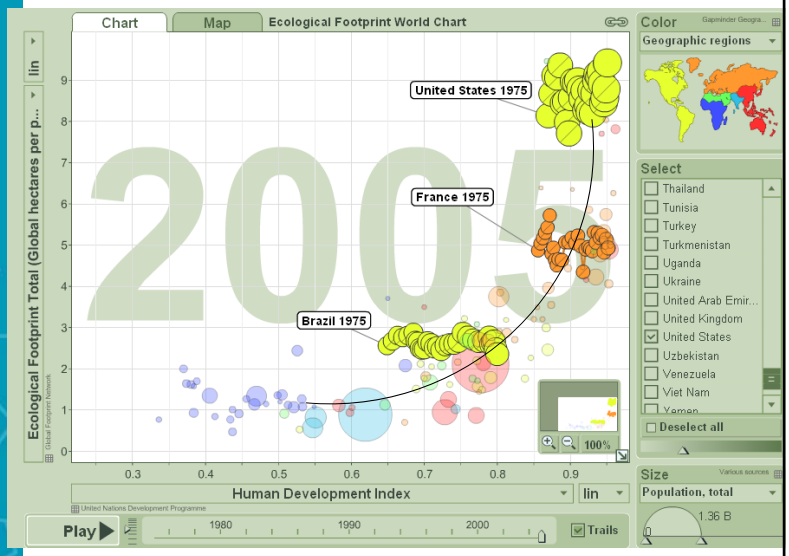


www.gapminder.org 69

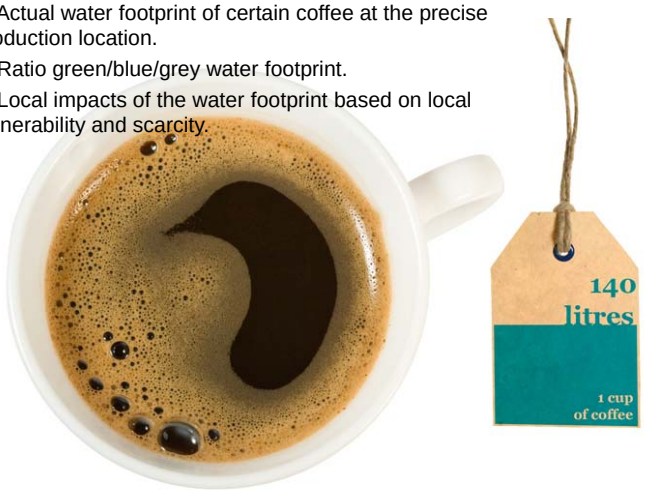
Water footprint, virtual water

The water footprint has been developed in analogy to the ecological footprint concept. **The 'ecological footprint' of a population represents the area of productive land and aquatic ecosystems required to produce the resources used, and to assimilate the wastes produced**, by a population with a specified standard of living. Whereas the 'ecological footprint' shows the area needed to sustain people's living, **the 'water footprint' indicates the annual water volume required to sustain a population.** The water footprint concept is closely linked to the virtual water concept. Virtual water is defined as the volume of water required to produce a commodity or service.

WWAP 2003 70

This is a **global average** and **aggregate** number.
Policy decisions should be taken on the basis of:

1. Actual water footprint of certain coffee at the precise production location.
2. Ratio green/blue/grey water footprint.
3. Local impacts of the water footprint based on local vulnerability and scarcity.



[Hoekstra & Chapagain, 2008]

Water footprint

Table 2.1. Calculation of the virtual water content of coffee produced in Brazil with the wet production method.

	Variable	Value	Unit	Source
A	Crop water requirement	1277	mm	CROPWAT
B	Yield of fresh cherry	4.22	ton/ha	Calculated from yield of green coffee given by FAO (2003c)
C	**Virtual water content of fresh cherries**	**3028**	m^3/ton	C=10×A/B
C1	Water use for pulping	7.5	m^3/ton of fresh cherries	Assumption, based on GTZ (2002b)
D	Remaining fraction after pulping	0.44	ton/ton	Bressani (2003), GTZ (2002a)
E	Virtual water content of pulped cherries	6899	m^3/ton	E=(C+C1)/D
E1	Water use for soaking and washing	5	m^3/ton of pulped cherries	The Roast and Post Coffee Company (2003), GTZ (2002b)
F	Remaining fraction after fermentation and washing	0.9	ton/ton	Bressani (2003)
G	Virtual water content of wet parchment coffee	7671	m^3/ton	G = (E+E1)/F
H	Remaining fraction after drying	0.506	ton/ton	GTZ (2002c)
I	**Virtual water content dry parchment coffee**	**15159**	m^3/ton	I=G/H

www.waterfootprint.org

Table 4.1. Virtual water content of coffee per coffee-producing country.

Countries	Crop water requirement	Yield of green coffee	Virtual water content of green coffee	Virtual water content of roasted coffee
	mm	ton/ha	m^3/ton	m^3/ton
Brazil	1277	0.68	18925	22530
Colombia	893	0.74	12139	14451
Indonesia	1455	0.55	26650	31727
Vietnam	938	1.87	5086	6054
Mexico	1122	0.46	24347	28985
Guatemala	1338	0.90	14940	17786

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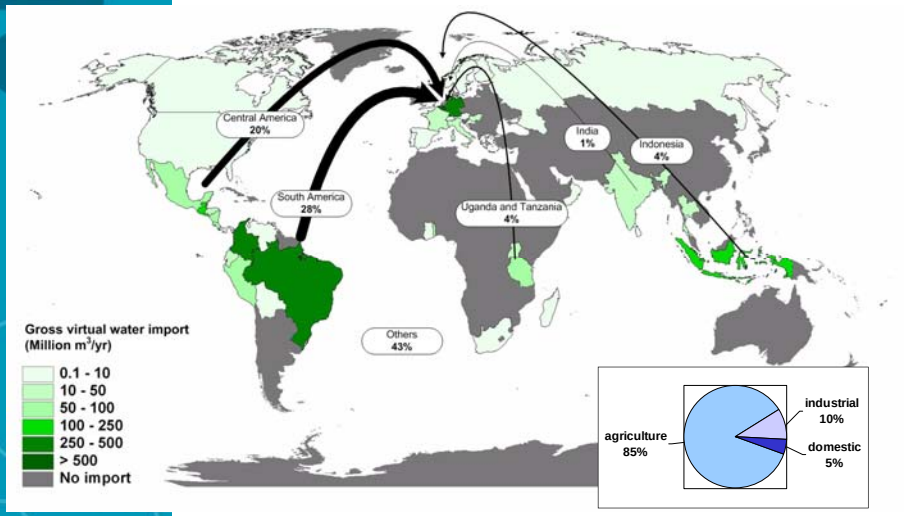
Virtual water



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Water footprint, virtual water

Product	Unit	Equivalent water in cubic metres
Bovine, cattle	head	4,000
Sheeps and goats	head	500
Meat bovine fresh	kilogram	15
Meat sheep fresh	kilogram	10
Meat poultry fresh	kilogram	6
Cereals	kilogram	1.5
Citrus fruit	kilogram	1
Palm oil	kilogram	2
Pulses, roots and tubers	kilogram	1

Source: FAO, 1997b.

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Managing Transboundary Waters for Human development

‘Anyone who can solve the problems of water will be worthy of two Nobel prizes –one for peace and one for science’

John F Kennedy

‘Whisky is for drinking, water is for fighting over’

Mark Twain 1884

Transboundary waters

- Water is a source of human interdependence—it is a shared resource serving multiple constituencies within and between countries.
- Water has the potential to fuel wider conflicts but also to act as a bridge for cooperation.
- Two challenges: replacing unilateral action with multilateral cooperation; and putting human development at the centre of trans boundary cooperation.

Table 6.1 **International basins link many countries**

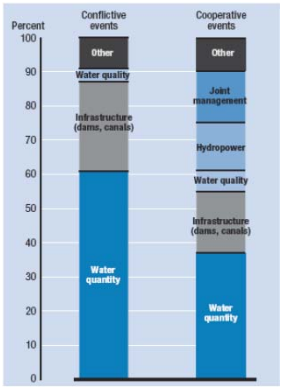
River basin	Number of basin countries	Basin countries
Danube	19	Albania, Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Macedonia, Moldova, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Switzerland, Ukraine
Congo	13	Angola, Burundi, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Gabon, Malawi, Rwanda, Sudan, Tanzania, Uganda, Zambia
Nile	11	Burundi, Central African Republic, Democratic Republic of the Congo, Egypt, Eritrea, Ethiopia, Kenya, Rwanda, Sudan, Tanzania, Uganda
Niger	11	Algeria, Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Guinea, Mali, Niger, Nigeria, Sierra Leone
Amazon	9	Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname, Venezuela and French Guiana
Rhine	9	Austria, Belgium, France, Germany, Italy, Liechtenstein, Luxembourg, Netherlands, Switzerland
Zambezi	9	Angola, Botswana, Democratic Republic of the Congo, Malawi, Mozambique, Namibia, Tanzania, Zambia, Zimbabwe
Lake Chad	8	Algeria, Cameroon, Central Africa Republic, Chad, Libya, Niger, Nigeria, Sudan
Aral Sea	8	Afghanistan, China, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, Uzbekistan
Jordan	6	Egypt, Israel, Jordan, Lebanon, Occupied Palestinian Territories, Syria
Mekong	6	Cambodia, China, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam
Volta	6	Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Togo
Ganges-Brahmaputra-Meghna	6	Bangladesh, Bhutan, China, India, Myanmar, Nepal
Tigris-Euphrates	6	Iran, Iraq, Jordan, Saudi Arabia, Syria, Turkey
Tarim	5 (+1)	Afghanistan, China, Chinese control claimed by India, Kyrgyzstan, Pakistan, Tajikistan
Indus	5	Afghanistan, China, India, Nepal, Pakistan
Neman	5	Belarus, Latvia, Lithuania, Poland, Russia
Vistula	5	Belarus, Czech Republic, Poland, Slovakia, Ukraine
La Plata	5	Argentina, Bolivia, Brazil, Paraguay, Uruguay

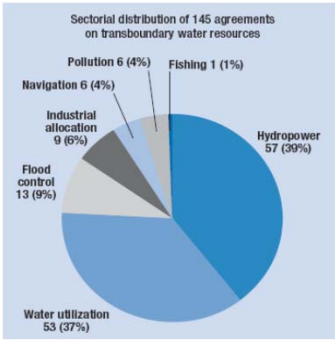
Source: Adapted from Wolf and others 1999.

Why do transboundary waters matter for human development?

- There are 263 international basins.
- More than 40% of the world's population live within transboundary basins.
- The number of countries in shared basins is 145.
- Sub Saharan Africa is the region that better demonstrates the realities of hydrological interdependence.
- Azerbaijan, Croatia, Latvia, Slovakia, Ukraine and Uzbekistan receive between 50% to 75% of their water from outside their borders.
- Hungary, Moldova, Montenegro, Serbia and Turkmenistan receive more than 75%.
- Water for livelihoods.

Cooperation over water can take different forms





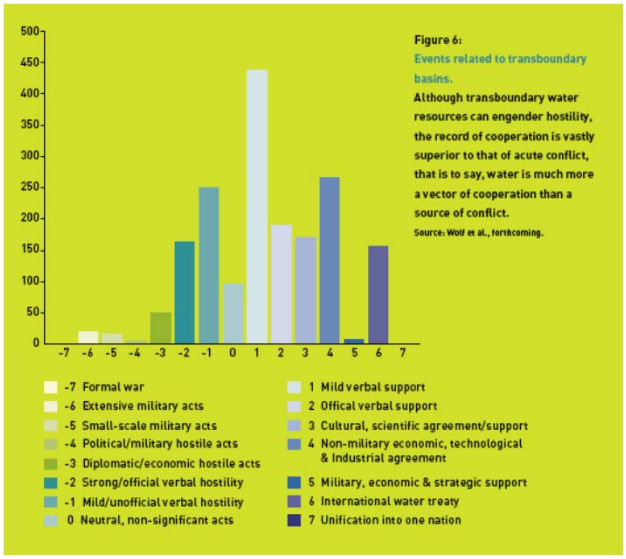


Figure 6:
Events related to transboundary basins.
Although transboundary water resources can engender hostility, the record of cooperation is vastly superior to that of acute conflict, that is to say, water is much more a vector of cooperation than a source of conflict.
Source: Wolf et al., forthcoming.

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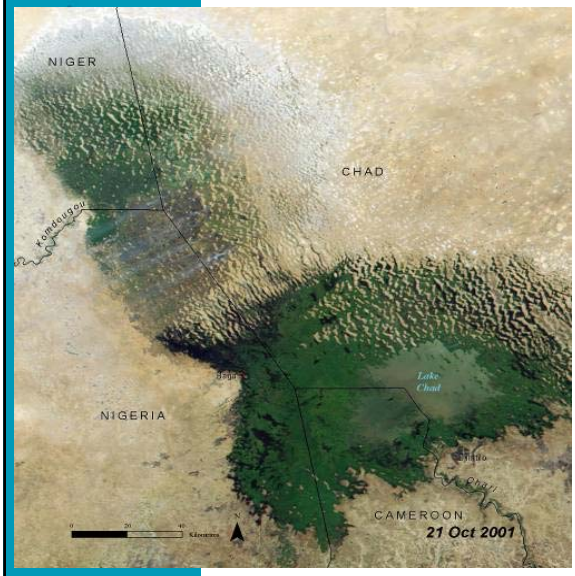
The costs of non-cooperation

- **Environmental disasters**
  - Externalities and free riders
  - Lake Chad
  - Aral Sea
- **Threats to livelihoods**
  - Dependence on agriculture and irrigation – Tigris-Euphrates, Central Asia
  - Fisheries – Mekong, Lake Victoria

Cooperation prevails

- Over the past 50 years there has been 37 cases of reported violence among countries because of water. All but 7 of those cases took place in the Middle East.
- Over the same period more than 200 treaties were negotiated.

Shrinking Lake Chad



Lake Chad, located at the junction of Nigeria, Niger, Chad, and Cameroon was once the 6th largest lake in the world. Persistent droughts have shrunk it to about] a tenth of its former size. The lake has a large drainage basin—1.5 million km² —but almost no water flows in from the dry north. 90% of lake's water flows in from the Chari River. The lakebed is fl at and shallow; even before the drought, the lake was no more than 5-8 m deep. Considered a deep wetland, Lake Chad was once the second largest wetland in Africa, highly productive, and supporting a diversity of wildlife. The lake is very responsive to changes in rainfall. When rains fail, the lake drops rapidly because annual inflow is 20-85 per cent of the lake's volume. Human diversion from the lake and from the Chari River may be significant at times of low flow, but rainfall is still the determining factor in lake level. This image set displays a continued decline in lake surface area **from 22902 km² in 1963 to a meager 304 km² in 2001.**

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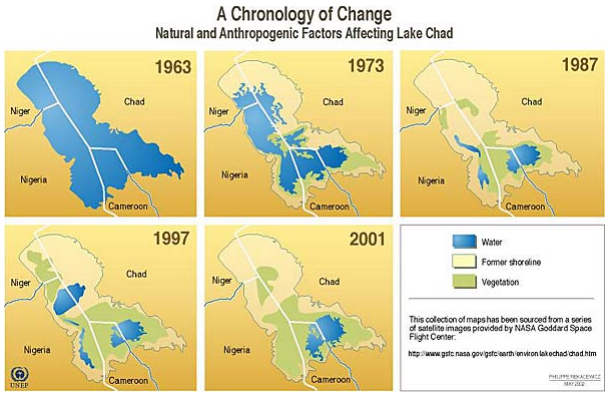
The costs of non-cooperation

Research carried out over the past 40 years indicates that the main factors in the shrinking of the lake have been:

- Major overgrazing in the region, resulting in the loss of vegetation and serious deforestation, contributing to a drier climate;
- Large and unsustainable irrigation projects built by Niger, Nigeria, Cameroon and Chad, which have diverted water from both the lake and the Chari and Logone rivers.

The changes in the lake have contributed to local lack of water, crop failures, livestock deaths, collapsed fisheries, soil salinity, and increasing poverty throughout the region.



The Aral Sea: the cost of unsustainable practices

- In 1960 the Aral Sea was the size of Belgium, sustaining a vibrant local economy. Today, it is a virtually lifeless hypersaline lake a quarter of its previous size.
- The reason: an earlier era of Soviet state planning determined that the great rivers of Central Asia—the Syr Darya and the Amu Darya—should be put to the service of creating a vast irrigated cotton belt.
- This approach to water management sealed the fate of an entire ecological system, with devastating consequences for human well-being.
- Some efforts are currently being deployed to rehabilitate the sea. It has had a noticeable positive effect on the northern part.

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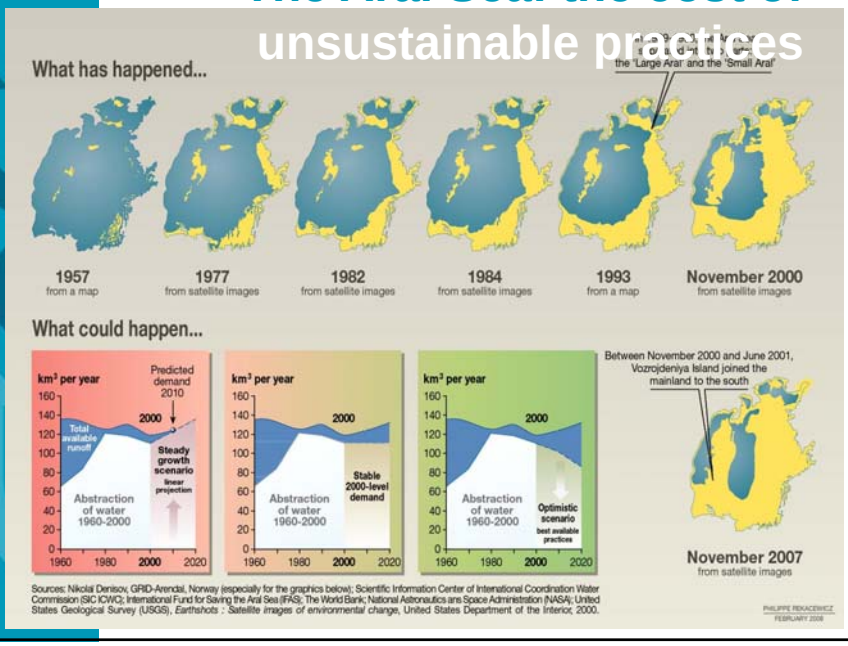
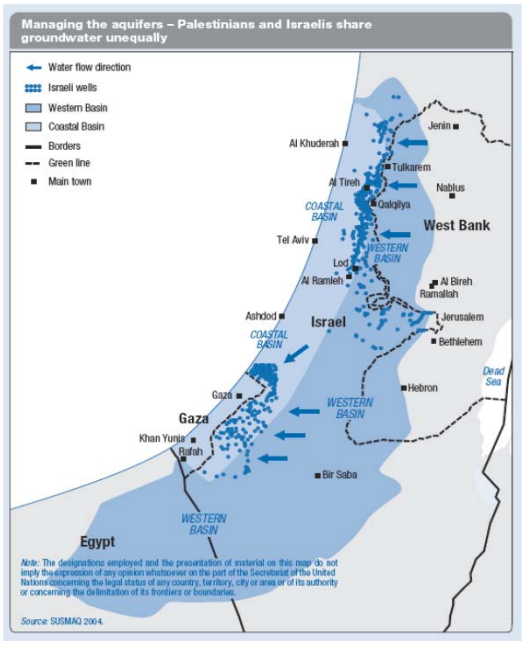
The Aral Sea: the cost of unsustainable practices

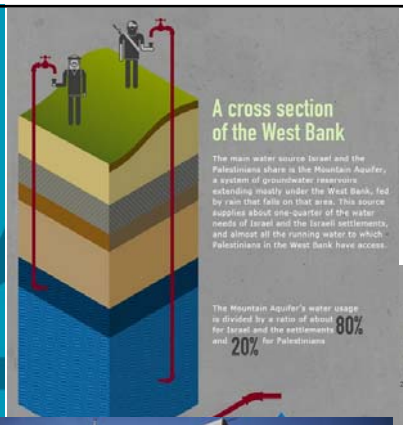


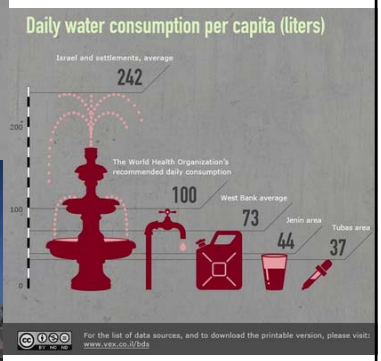
Colorado river
US vs Mexico

Numbers from the Colorado River Accounting and Water Use Report 2009. 88

On average, Israelis get **350 L/pers/day,** while Palestinians in the West Bank get **70 L/pers/day.** The minimum quantity of water recommended by the USAID and the WHO for household and urban use is **100 L/pers/day.**







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- Un documentaire sur l'état de la Terre vue du ciel, qui montre la pression que l'homme fait subir à l'environnement et les conséquences que cela entraîne sur le changement climatique. Yann Arthus-Bertrand ne le présente pas comme un film catastrophe mais comme un message d'espoir, en rappelant qu'il reste 10 ans pour agir. **Les thèmes abordés sont tous en relation avec l'environnement : le manque d'eau, la déforestation, la fonte des glaces ou encore l'épuisement des ressources naturelles.**
- Date de sortie : 5 juin 2009 (France)
- Réalisateur : Yann Arthus-Bertrand
- Bande originale : Armand Amar
- Narrateurs : Yann Arthus-Bertrand, Salma Hayek, Jacques Gamblin, Glenn Close,
- Producteurs : Luc Besson, Denis Carot

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WEDC Water, Engineering & Development Centre at Loughborough University UK	www.wedc.lboro.ac.uk/
IRC	www.irc.nl www.irc.nl/source/
WSSCC Water Supply & Sanitation Collaborative Council	www.wsscc.org
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