World Water Vision

*No more business as usual*

by

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IHE-Delft
History and motivation

**Background:**

- 1992 Dublin Conference on water and the Environment
- 1992 Rio Earth Summit (Ch. 18, Agenda 21: Water)
- 1997 Marrakech: First World Water Forum
  Mandate to WWC to develop the ‘World Water Vision’
  Presentation of the ‘World Water Vision’
Why a Vision?

Important role of Water
Water for food
Water for people
Water for energy
Water for the environment
Water use and abuse

we supply 150-300 l/c.d
we drink 1-2 l/c.d
Water use and abuse

Water to transport waste
Water use and abuse

Water resources as final disposal site for waste

Eutrophication
Why a vision?

Water is a scarce good
Directly available for people and other organisms: 0.014%

Groundwater: 22%

Freshwater (Land): 2.6%

Saltwater (Ocean): 97.4%

Soil humidity

Polar ice and glaciers: 77%

Atmosphere, rivers, organisms

Lakes

Planet Earth

Water resources on Earth in percentage
Estimated annual world water use

Km³ per Year

Municipal Uses
Industry
Agriculture

1900 1940 1960 1980 2000
Availability of renewable water

- 2000: 6600 m$^3$/capita.year
- 2025: 4800 m$^3$/capita.year

However:
- uneven distribution
- most water appears at the wrong place and at the wrong time (flooding)
Uneven distribution - uneven consumption

- 20% of the world population has no access to safe drinking water
- 50% lack good sanitation facilities
- 15% (= 800 million people) get less than 2000 calories/day
- In 2025, 3 billion people live in water stressed regions!
Annual water use per capita

USA
366 m$^3$

EUROPE
232 m$^3$

AFRICA
25 m$^3$
Water and our future

Forecast scenarios:

- ‘Business as usual’, continue current practices and user functions
- ‘Environmental scenario’, fully restore and protect the environment
- ‘Change scenario’, balance between user functions and environmental functions
The business as usual scenario

Global water use in the 20th century

<table>
<thead>
<tr>
<th></th>
<th>1900</th>
<th>1950</th>
<th>1995</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use</strong></td>
<td>1900</td>
<td>1950</td>
<td>1995</td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>500</td>
<td>1,100</td>
<td>2,500</td>
</tr>
<tr>
<td>Consumption</td>
<td>300</td>
<td>700</td>
<td>1,750</td>
</tr>
<tr>
<td><strong>Industry</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>40</td>
<td>200</td>
<td>750</td>
</tr>
<tr>
<td>Consumption</td>
<td>5</td>
<td>20</td>
<td>80</td>
</tr>
<tr>
<td><strong>Municipalities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>20</td>
<td>90</td>
<td>350</td>
</tr>
<tr>
<td>Consumption</td>
<td>5</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td><strong>Reservoirs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaporation</td>
<td>0</td>
<td>10</td>
<td>200</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>600</td>
<td>1,400</td>
<td>3,800</td>
</tr>
<tr>
<td>Consumption</td>
<td>300</td>
<td>750</td>
<td>2,100</td>
</tr>
</tbody>
</table>
The water crisis

**1900 - 2000:**
- Population tripled
- Water use 6x higher

**2025:**
- 60% of world water stress!
  (Africa, Asia, Latin America)
Water stress in 2025 under the business as usual scenario

- 0% No stress
- 10% Low stress
- 20% Moderate stress
- 40% High stress
- 80% Very high stress
From crisis to vision

Divert from the collision course by:

- Limiting expansion of irrigated land
- Making water more productive
  - Improving crop varieties
  - Substituting crops
  - Better irrigation management
  - Improved irrigation technologies
- In 2025 40% more food at 10% more water
From crisis to vision

- More efficient water supply and sanitation
  - Reduce ‘unaccounted for’ water
  - Expand non-water based sanitation
  - Stimulate Industrial and domestic water re-use

- Increase storage
  - Dams
  - Groundwater recharge
  - Wetlands
From crisis to vision

- Changing water management
  - Pricing of water services at full cost
  - Service oriented management
  - Empowering communities
From crisis to vision

- Valuing ecosystem functions
- Supporting innovations
  - R & D
  - Creating awareness
  - Education and training
- Mobilising financial resources
## Vision for 2025

<table>
<thead>
<tr>
<th>Use</th>
<th>Cubic kilometers</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1995</td>
<td>2025</td>
</tr>
<tr>
<td>Agriculture</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>2500</td>
<td>2650</td>
</tr>
<tr>
<td>Consumption</td>
<td>1750</td>
<td>1900</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>750</td>
<td>800</td>
</tr>
<tr>
<td>Consumption</td>
<td>80</td>
<td>100</td>
</tr>
<tr>
<td>Municipalities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>350</td>
<td>500</td>
</tr>
<tr>
<td>Consumption</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Reservoirs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaporation</td>
<td>200</td>
<td>220</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Withdrawal</td>
<td>3800</td>
<td>4200</td>
</tr>
<tr>
<td>Consumption</td>
<td>2100</td>
<td>2300</td>
</tr>
</tbody>
</table>
## Vision for 2025

Annual investment requirement to achieve the vision in 2025:

$ 180 billion/year = total $ 4.5 trillion

<table>
<thead>
<tr>
<th>Use</th>
<th>Billions of US$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1995</td>
</tr>
<tr>
<td></td>
<td>2025</td>
</tr>
<tr>
<td>Agriculture</td>
<td>30 – 35</td>
</tr>
<tr>
<td>Environment and Industry</td>
<td>10 – 15</td>
</tr>
<tr>
<td>Water Supply and Sanitation</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>70 – 80</strong></td>
</tr>
<tr>
<td></td>
<td><strong>180</strong></td>
</tr>
</tbody>
</table>
Water supply and sanitation sector

Vision 21 - ‘Water for People’

The good news:

Number of People without Safe Drinking Water (x10^6)

<table>
<thead>
<tr>
<th>Region</th>
<th>1980</th>
<th>1990</th>
<th>1994</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asia and the Pacific</td>
<td>1200</td>
<td>1400</td>
<td>1600</td>
</tr>
<tr>
<td>Western Asia</td>
<td>1900</td>
<td>2200</td>
<td>2500</td>
</tr>
<tr>
<td>Total</td>
<td>3900</td>
<td>4900</td>
<td>5900</td>
</tr>
</tbody>
</table>
Vision 21 - ‘Water for People’

The bad news:

Number of People without Adequate Sanitation (x10^6)

- Africa
- Latin America and the Caribbean
- Asia and the Pacific
- Western Asia
- Total

Comparing years:
- 1980
- 1990
- 1994
Sustainability

Cost and Rational
Cost of water supply and sanitation

- Vision 2025: $75 billion/y required (investment 1995: $30 billion/y)
- $150 - 215 billion to achieve sewerage compliance in 2010 in EU
- $325 billion investment for water supply in USA coming 20 years
- $325 billion investment for pollution control in USA
Cost of water supply versus sanitation

![Graph showing the cost of water supply and sanitation versus liters per household and per capita per day.](image)
Coverage of wastewater treatment

- **Primary/secondary treatment**
  - World-wide: <10%
  - EU: 90%

- **Tertiary treatment**
  - World-wide: <1%
  - EU: <30%
Can we afford not to act?

Cost of inaction:

- Public health impacts
- Environmental damage
- Economic damage
Cost of inaction

Public health impacts

<table>
<thead>
<tr>
<th>Disease</th>
<th>Deaths (x 10^3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diarrhoeal diseases</td>
<td>2,219</td>
</tr>
<tr>
<td>Malaria</td>
<td>1,110</td>
</tr>
<tr>
<td>Trypanosomiasis</td>
<td>40</td>
</tr>
<tr>
<td>Intestinal worm</td>
<td>17</td>
</tr>
<tr>
<td>Dengue</td>
<td>15</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>7</td>
</tr>
</tbody>
</table>

Water-related mortality

Total 3.4 million deaths in 1998
Cost of inaction

Environmental damage

- Each litre of wastewater pollutes a much larger volume of fresh water (river, lakes)
- World-wide eutrophication of rivers and lakes (weed problems, algal blooms, user functions, environmental functions)
- Oxygen depletion
- Loss of biodiversity
Cost of inaction

Economic damage

- Lives lost

- Economic uses of water resources threatened
  - tourism/recreation
  - shrimp/fish production
  - higher cost of drinking water production
Cost of inaction

Cost of cholera outbreak Peru 1991

- US$ 1 billion in lost exports/tourism (= 3x investment in water supply and sanitation during previous 10 years)
- 320,000 cholera cases
- 2900 deaths
- Epidemic spread to many countries in region causing similar damages
- Cholera still endemic in most countries in region
Rational: **Cleaner Production**

**Principle 1:**

**Use minimum input of resources per unit of product**
Practice:

we use 150-300 l/c.d
we drink 1-2 l/c.d
A ‘Cleaner Production’ check

Principle 2:

Do not use input materials of higher quality than necessary
Practice:

we use drinking water to flush toilets, wash cars, etc.
A ‘Cleaner Production’ check

Principle 3:

Do not mix separate waste flows
Practice:

municipal sewage = urine + faeces + grey water + industrial effluents + stormwater
Principle 4:
Consider re-use and resource recovery before treatment and final disposal
Practice:
Sewage is discharged into open waters, mostly without prior treatment.
Rational of current concept

Water supply:

- Why supply 150-300 l/c.d if only 1% used for drinking?
- Why use drinking water to clean floor, wash car or hose garden?
- Why use drinking water to transport waste?
- Why dilute pathogens in large volumes of pathogen-free drinking water?
Rational of current concept

Waste water:

- Why strongly dilute BOD and nutrients before treatment?
- Why destroy energy content contained in BOD?
- Why expensive nutrient removal instead of stimulating their re-use?
Vision 2025

- Water services planned on basis of sustainability
- Good management, accountability
- Inexpensive water-efficient equipment widely available and applied
- Rainwater harvesting broadly applied
- Extensive re-use of urban waste water
- Expansion of low- or no-water sanitation systems
No vision
With Vision