Drinking water supply in developing countries

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The Romans and drinking water supply

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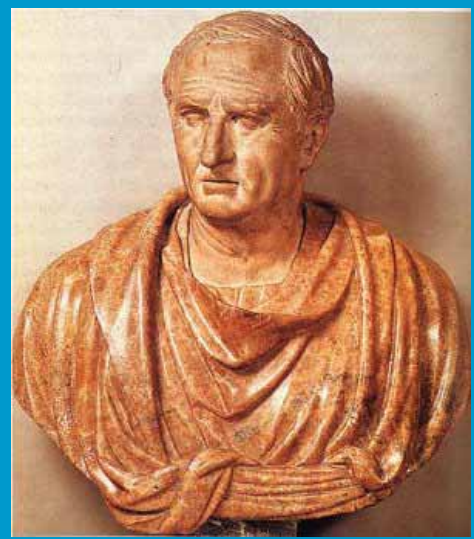
The Romans and drinking water supply

Three issues show the greatness of Rome:
Roads, water supply mains and sewers

Dionysius of Halicarnassus
(30-8 before Chr. Rome)



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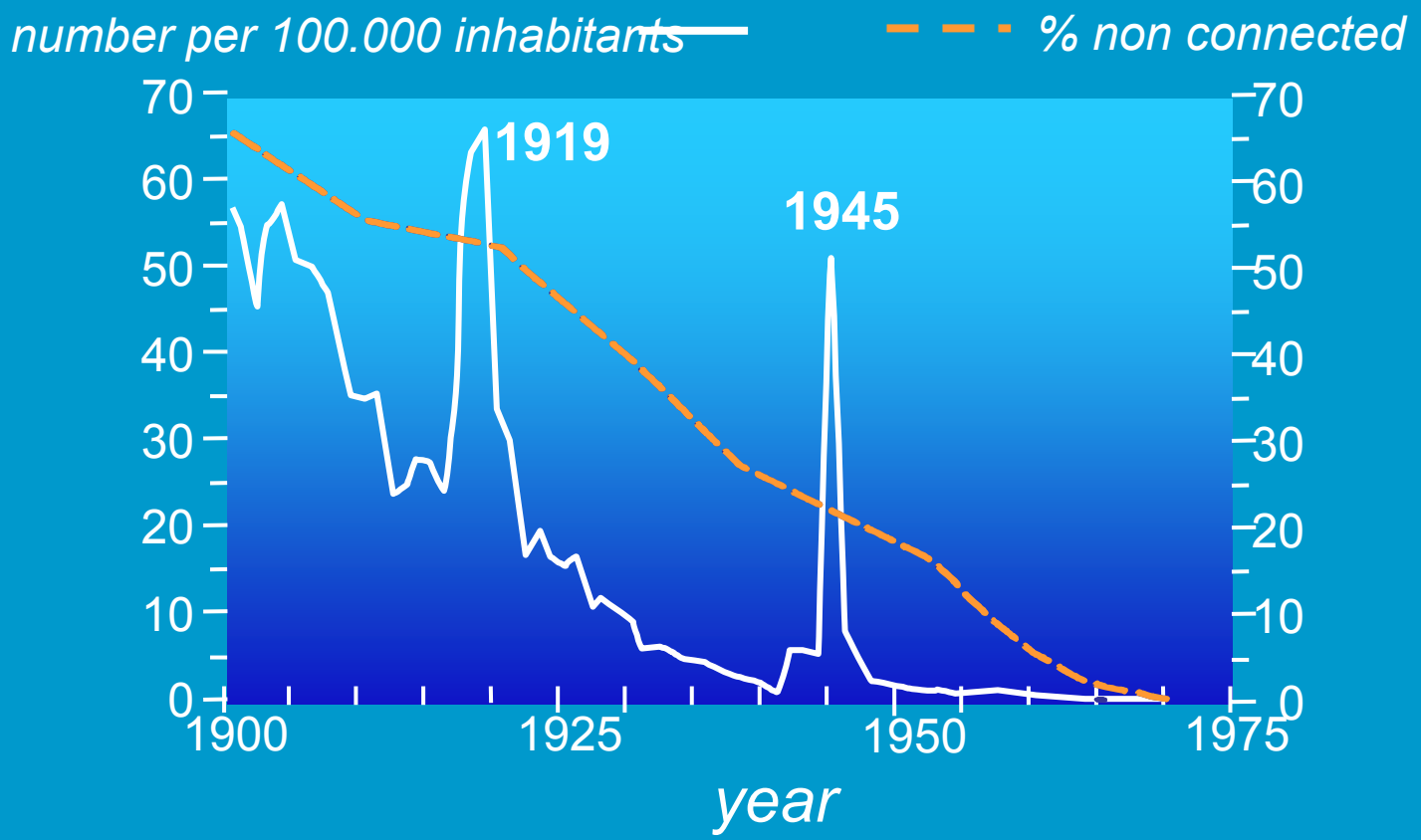
Drinking water supply in the Netherlands

- End 18th century development of medical statistics
- Beginning of 19th century development of hygienism
- 1832 1st CHOLERA outbreak
- Around 1850 relation between water and illness
- 2nd half 19th century projects of waste and waste water
- 2nd half 19th century start of central water supply in big cities
- 1st half 20th century water supply in little communities
- 1940 70% of the population connected to water supply
- 1968 99% of the population connected to water supply
- 1984 legal obligation for bacteriological analyses

Typhoid and the percentage of non connected inhabitants



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What are the costs?

- Drinking water € 1,20 per m^3
- Sewerage € 70 per inh. per year
- Waste water treatment € 120 per inh. per year

- total costs: less than €1 per inh. day!!

- Total in sector: 4 billion euro per year!!

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Requirements for drinking water supply

- Sufficient drinking water (demand is covered)
- Sufficient pressure (minimal 20 m above street level)
- Required quality (sampling and checking with standards)

Piped water is drinking water!

Bacteriologically reliable

No chemical polutants

Drinking water without chlorine

Low leakage percentage

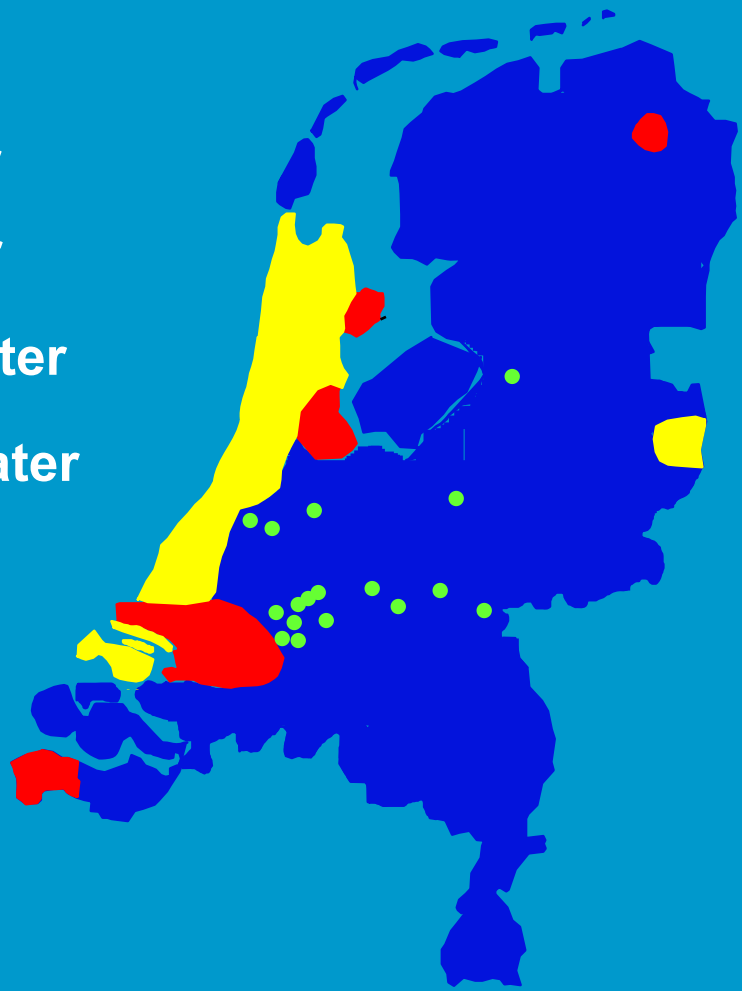
Source of drinking water

Ground water

Surface water

Infiltration water

River bank water



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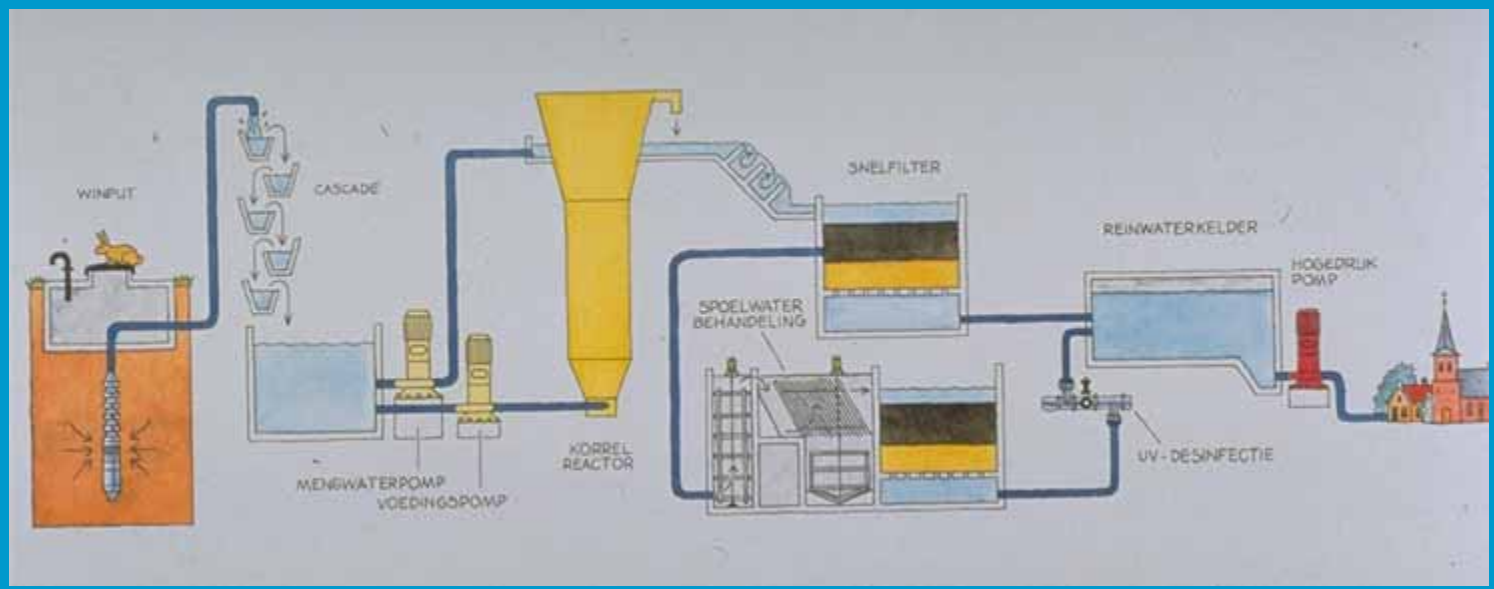
Groudwater pumping station



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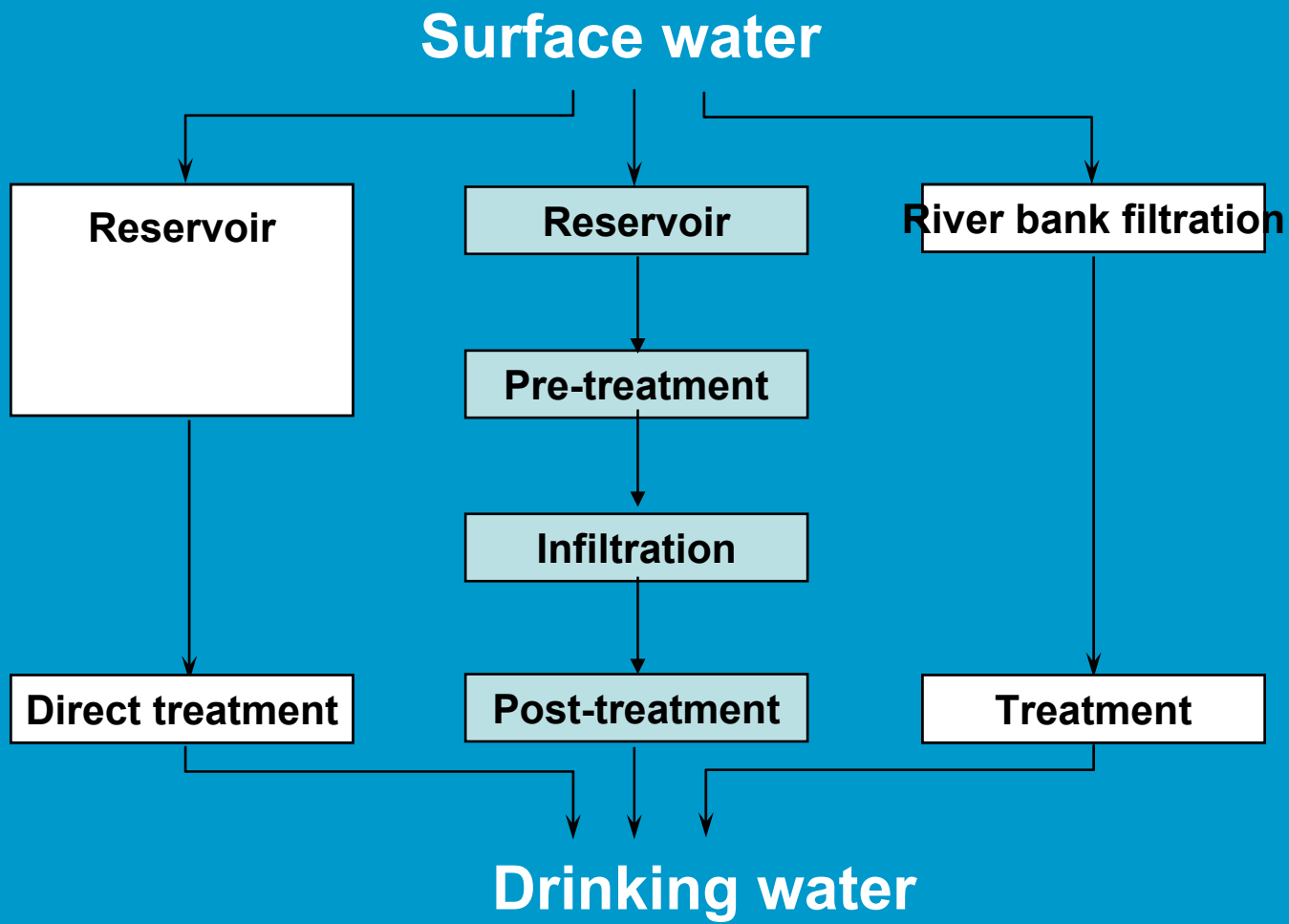
Treatment of surface water



Infiltration water


Post-treatment


Katwijk aan Zee
Pompstation Katwijk
Leiden
Pompstation Scheveningen
Opjaagstation Zoetermeer
Pompstation Monster
's Gravenhage
Gouda
Delft
ø 1600
ø 1200
Rotterdam
Schoonhoven
Pompstation Bergambacht
ø 1400
Gorinchem
Hogedruk-pompstation Brakel
Dordrecht
Afgedamde Maasbekken

Set-up of drinking water project in developing countries

- Problem definition and demand inventory
- Determination of objectives and boundary conditions
- Generation of alternatives
- Determination of criteria
- Selection of alternative
- Design

Appriopriate technology: Accepted and sustainable

Appropriate technology, service level

- Availability
- Quality
- Consumption objective

High service level for small part of population
Minimal service level for total population
•
Boundary conditions
- Geohydrologica situation
- Willingness to pay
- Technological development
- Presence of sewers

Appropriate technology, service level

Alternatives

- Traditional well
- Improved well
- Well or borehole with handpump
- Rainwater catchment
- Water distribution system
  - Public standpost
  - Garden connections
  - House connections

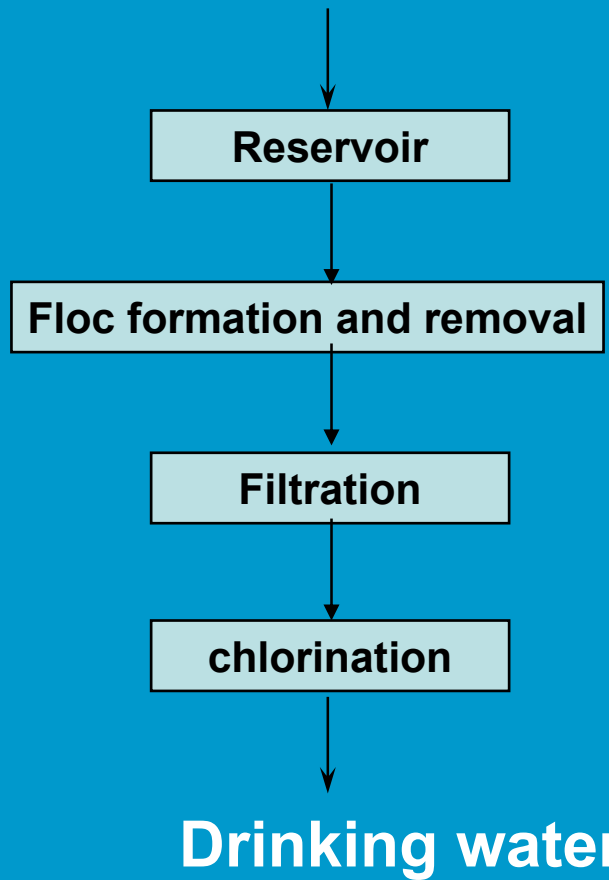
Appropriate technology, treatment

Multi-barrier systems
vs
Convential drinking water treatment

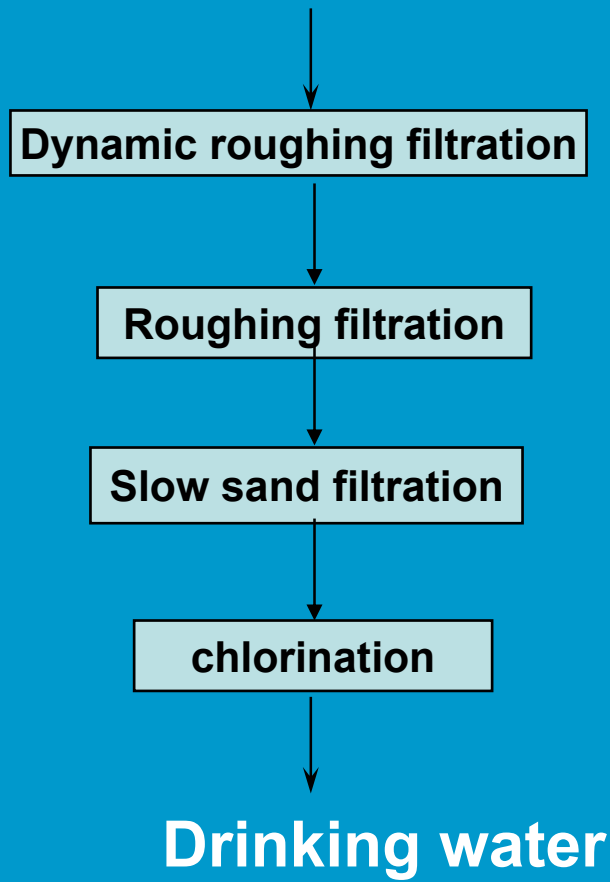
Advantages
Robust
No chemical
High efficiency

Disadvantages
Initial investments
Occupation of space

Conventional surface water treatment



Multi-barrier surface water treatment



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Roughing/ slow sand filtration