



مهندسی آب و فاضلاب

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Introduction to Urban Sewage Treatment

CTB3365x Introduction to water treatment

Prof.dr.ir. Jules B. van Lier

Courses wastewater treatment

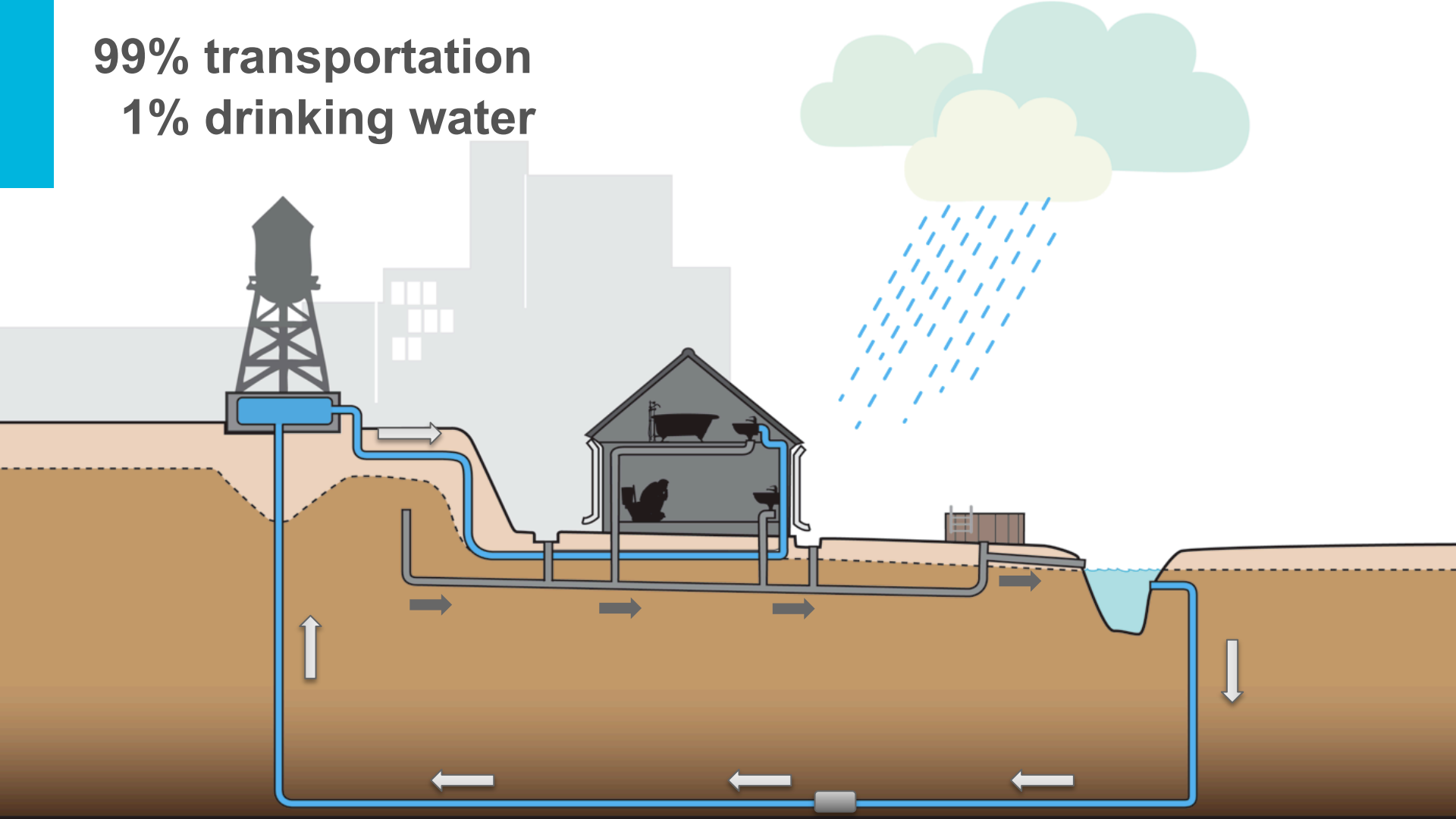
This course

- Characteristics of urban sewage
- Common treatment technologies

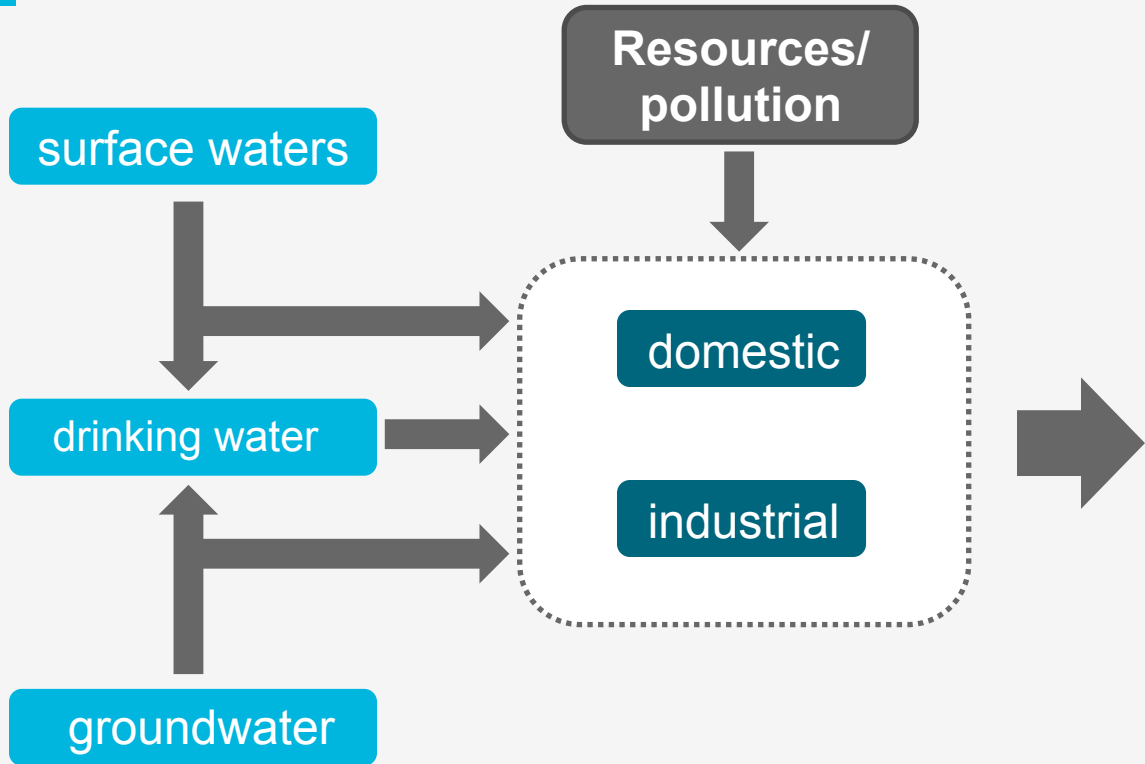
Follow-up courses

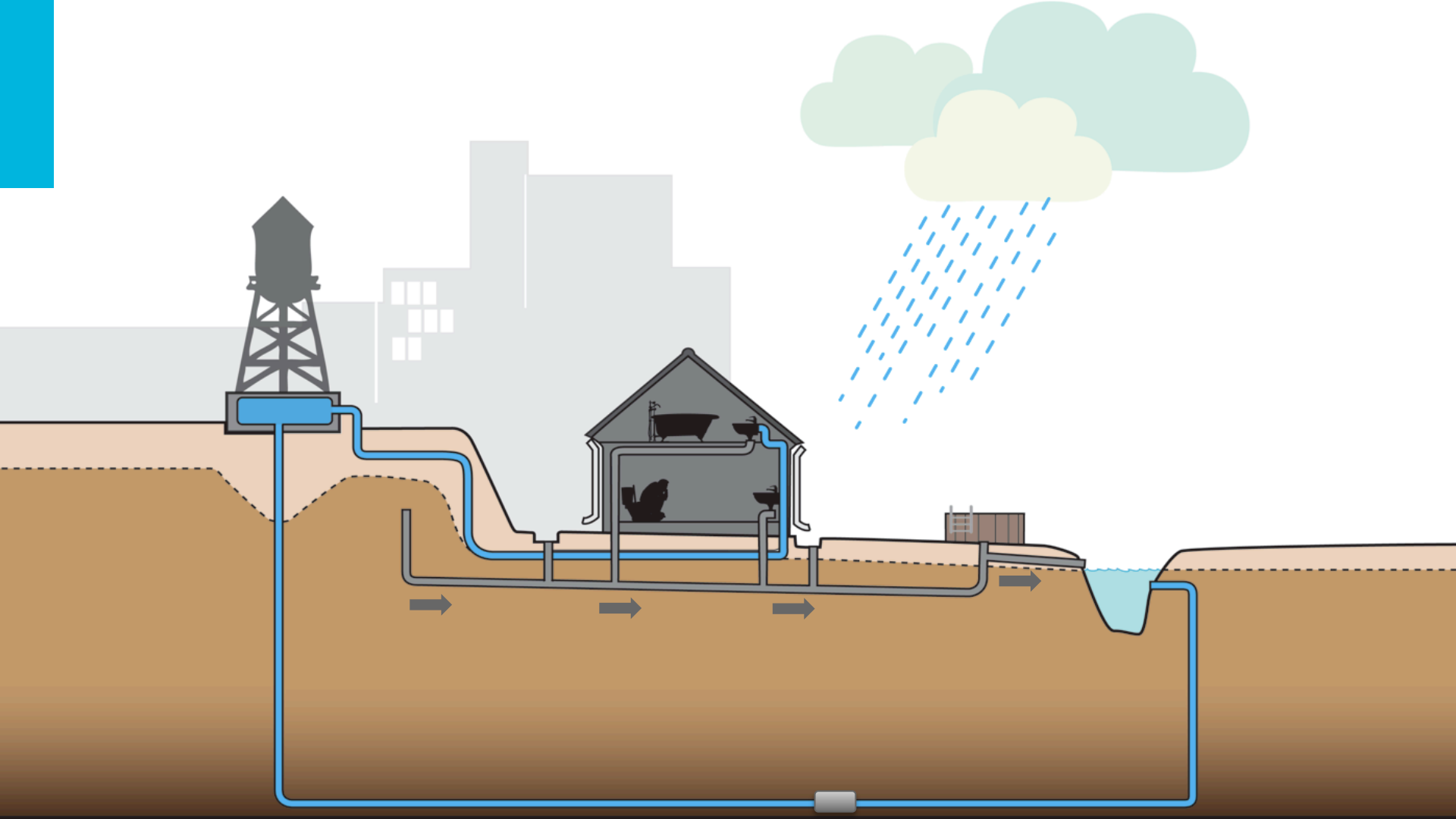
- Advanced technologies
- Alternative technologies

**99% transportation
1% drinking water**

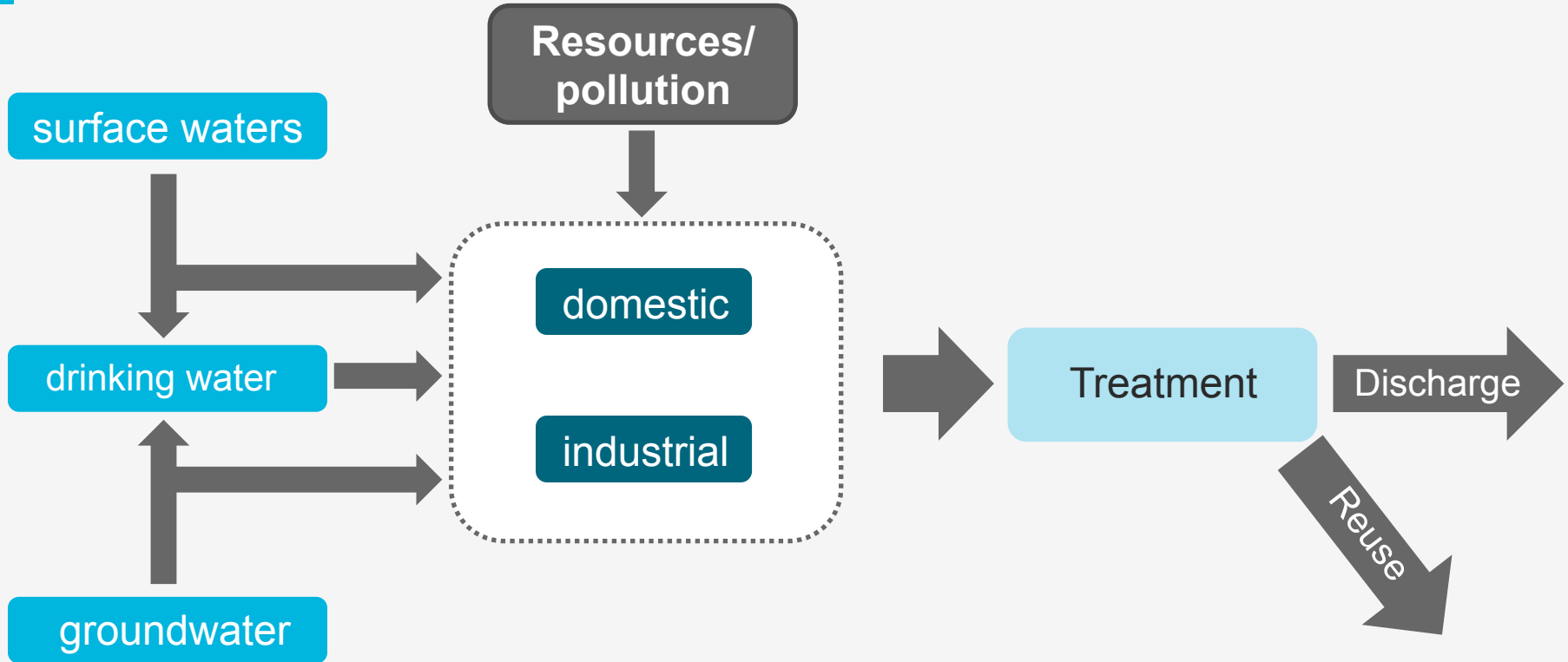


Urban water chain

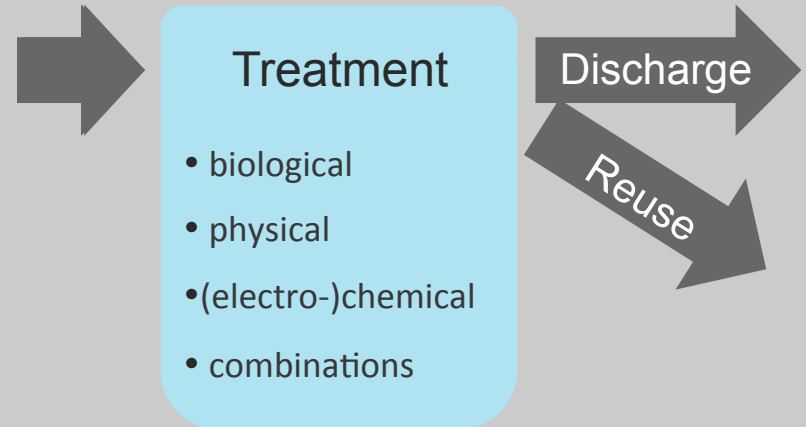
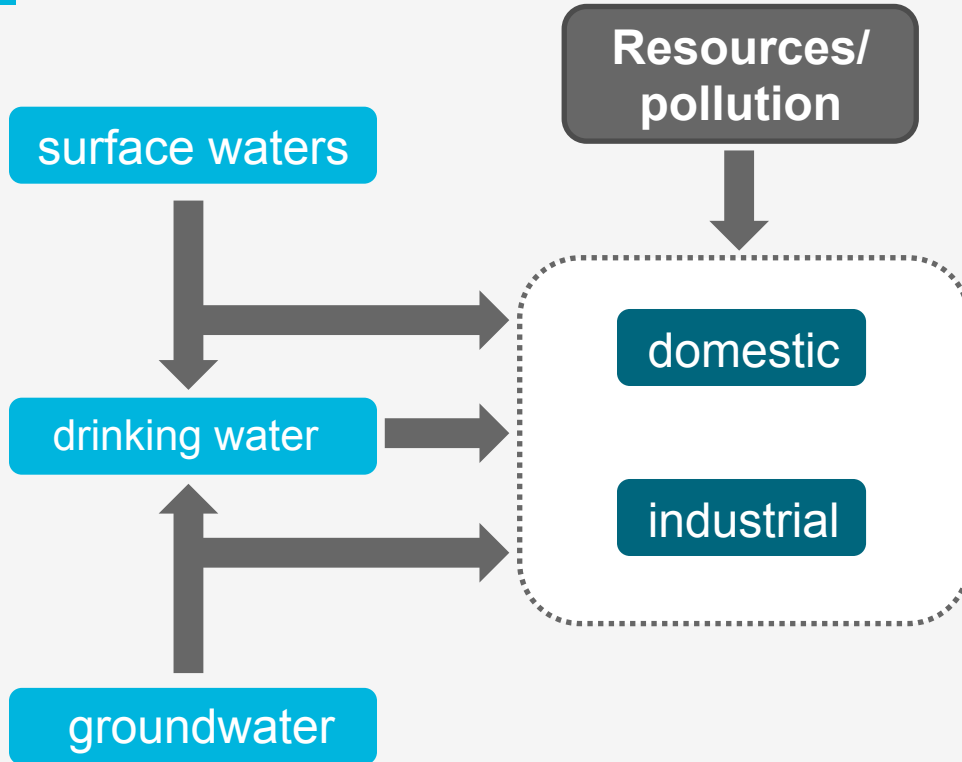




Urban water chain



Urban water chain



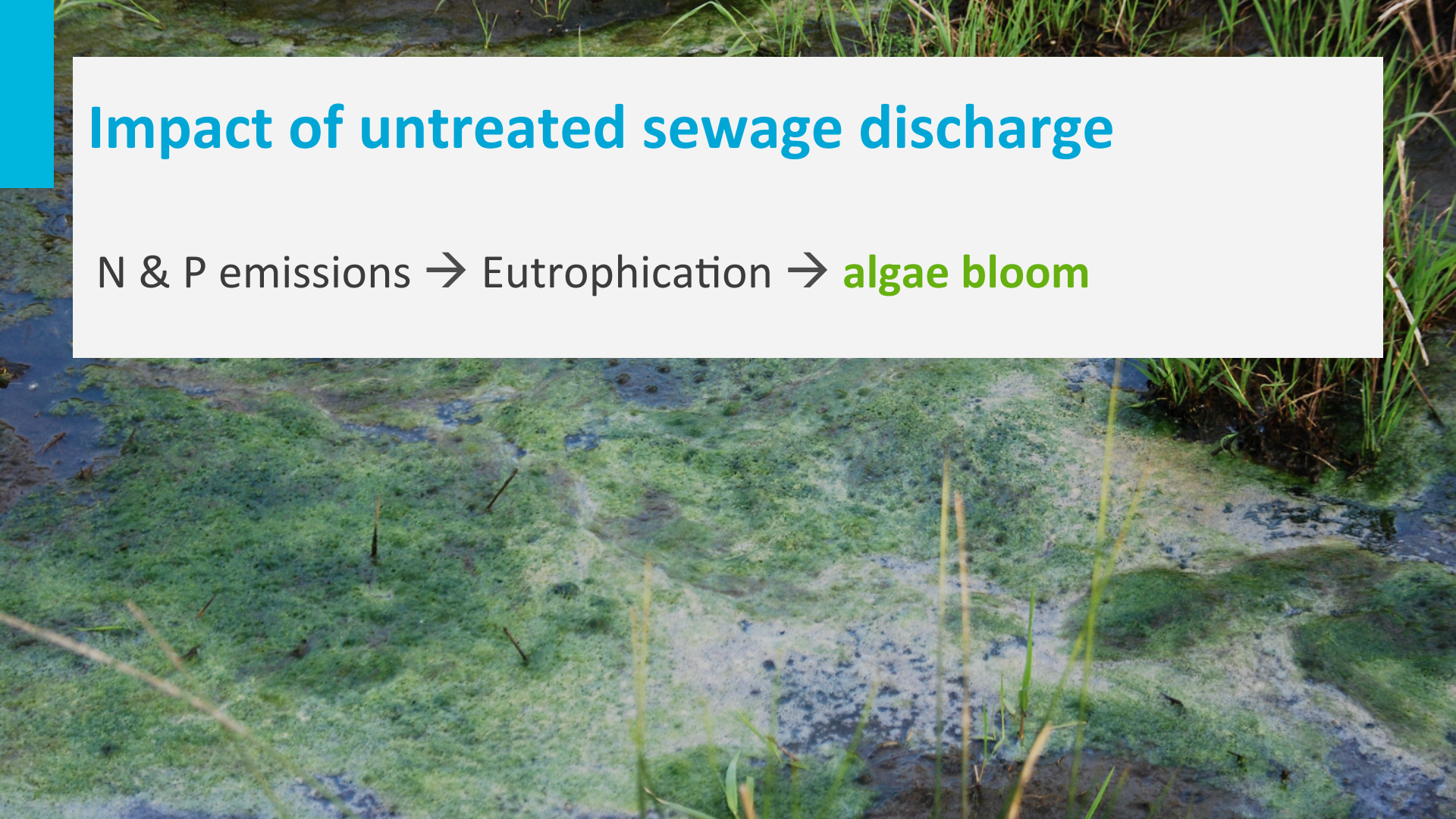
The background of the slide is a photograph showing a large number of dead fish floating on the surface of a body of water. The fish are mostly silver and grey, and their bodies are scattered across the entire frame, illustrating the impact of untreated sewage discharge.

Impact of untreated sewage discharge

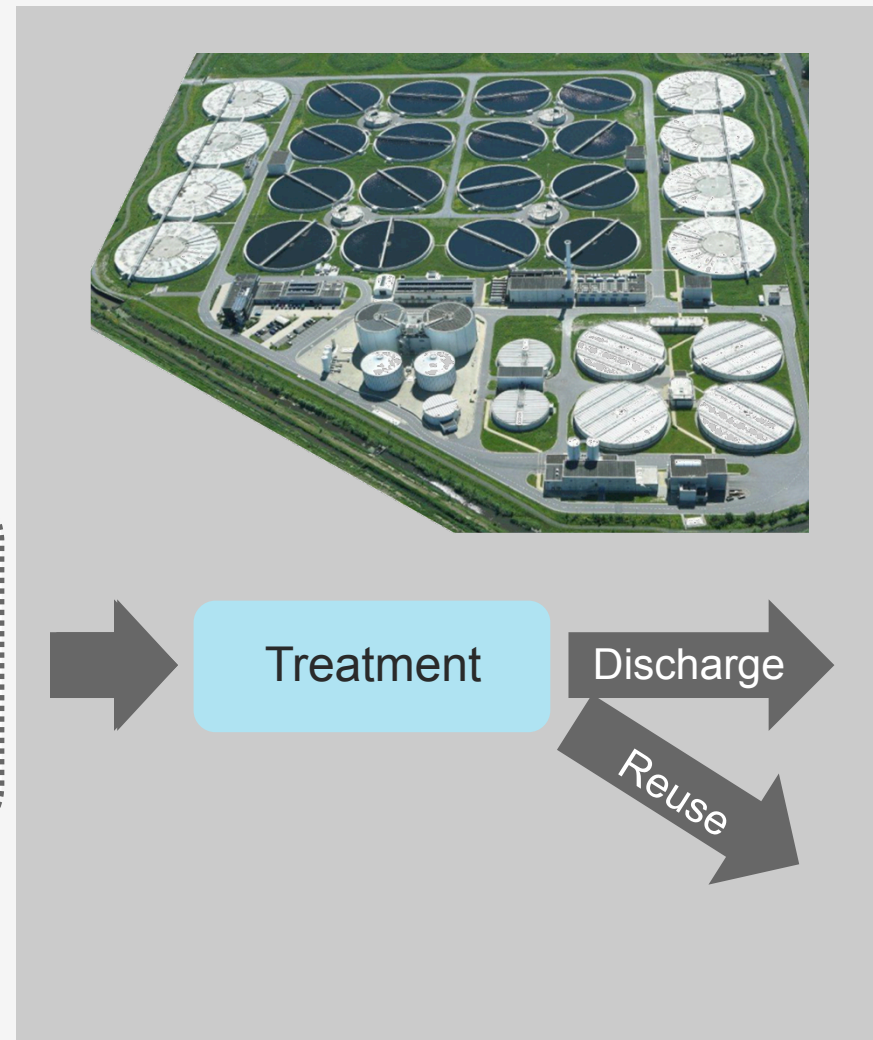
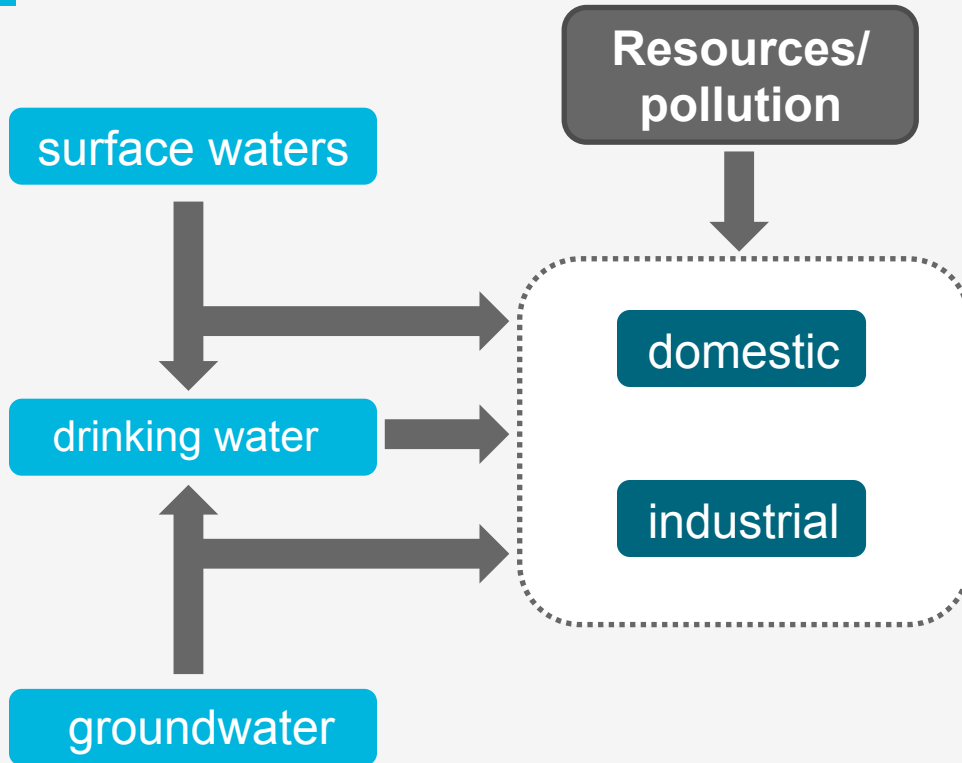
Carbon emission → O_2 depletion → dead fish

Impact of untreated sewage discharge

N & P emissions → Eutrophication → **algae bloom**



Urban water chain



Learning objectives

Terminology

Why treatment

Urban sewage characteristics

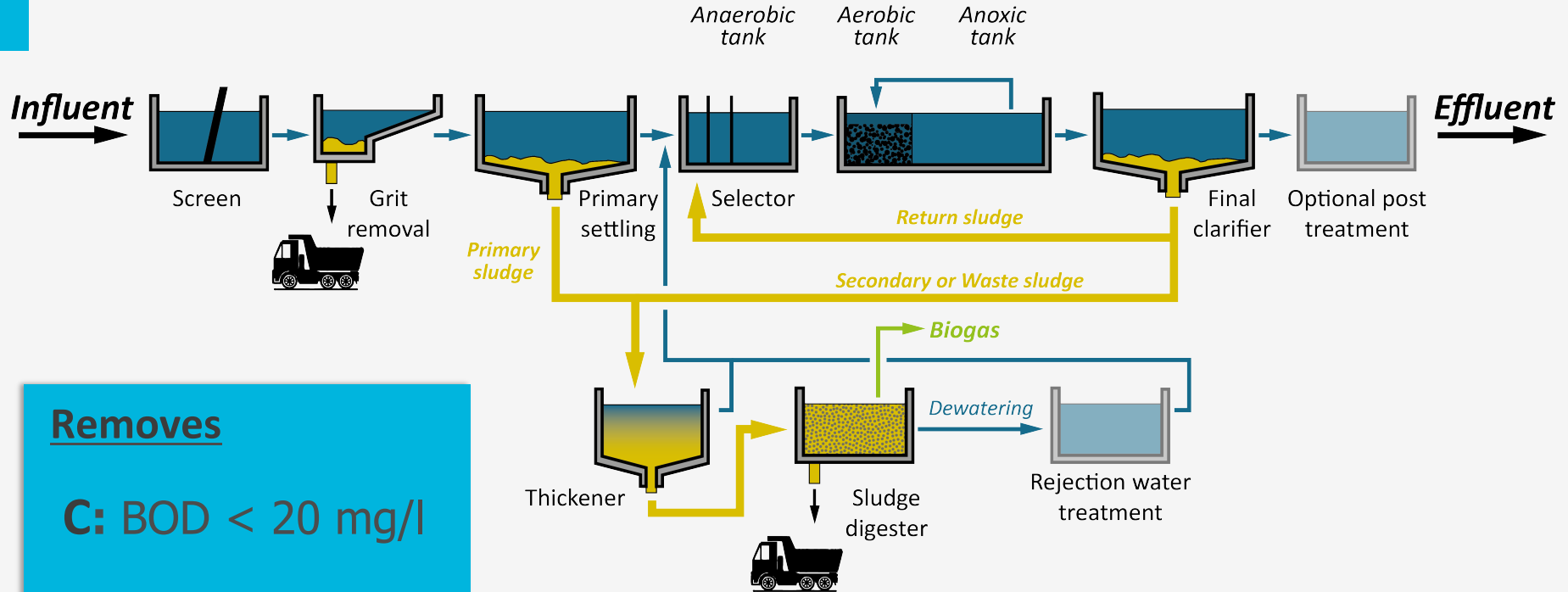
Basic STP process units

Full scale design

Largest sewage treatment plant in the Netherlands

sewage treatment of 1.4 million people





Removes

C: BOD < 20 mg/l

P: < 10 mg/l

N: < 1 mg/l



Regulations on Wastewater Treatment

National: clean water act (1972)

Law on pollution of surfacewaters: C-removal
polluter pays: 40 - 80 € /p.e./year

International: North Sea & Rhine agreement (1990)

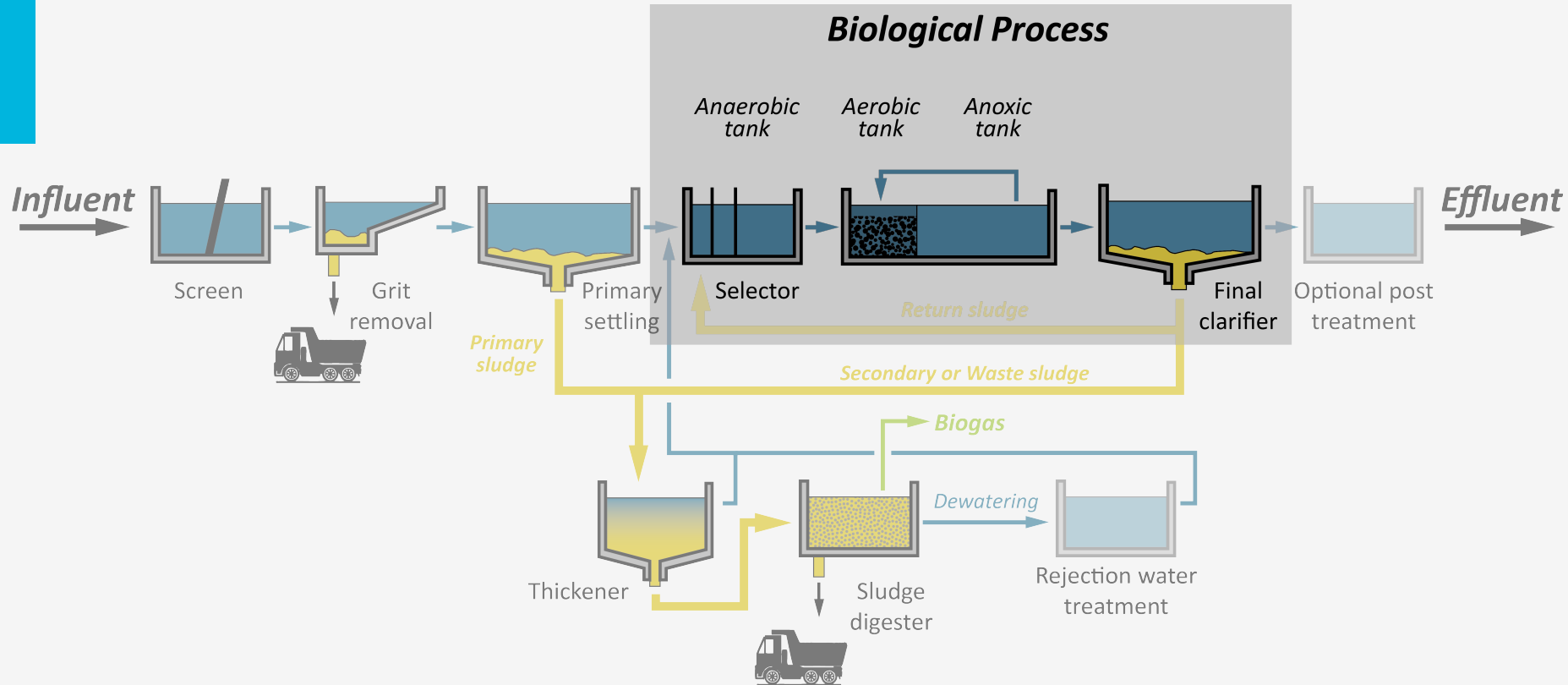
- nitrogen (N) removal
- phosphorus (P) removal

International: Water Framework Directive (EU)

Stricter effluent demands

Wastewater Treatment in the Netherlands

	Average /Quality		Standard influent	Effluent demands	
	influent	effluent			
BOD } organic	200	4	180	20	mg/L
COD }	513	4	470	125	mg/L
N-total	46	8	40	10-15	mg/L
P-total	7	1	6-7	1-2	mg/L
SS	230	10		30	mg/L



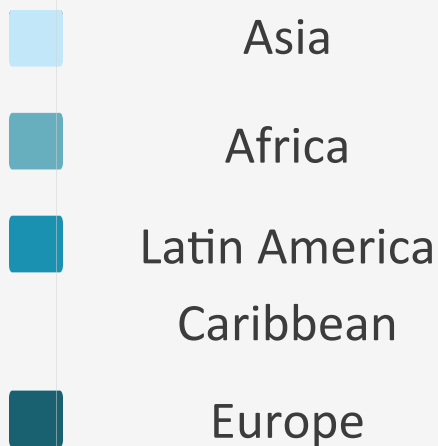
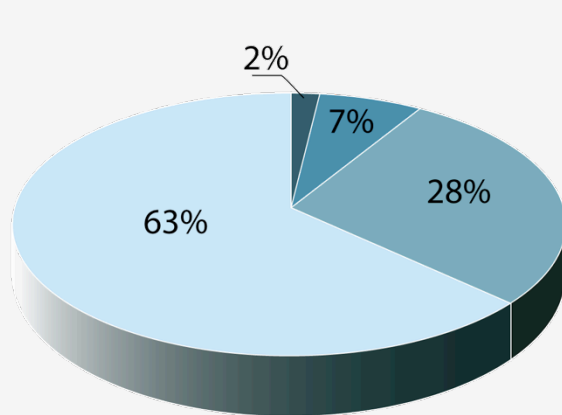
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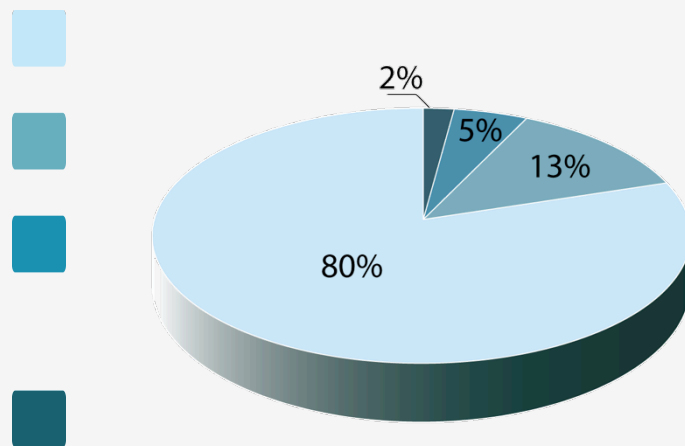


Situation worldwide

1.1×10^9 people have no access to safe **drinking** water



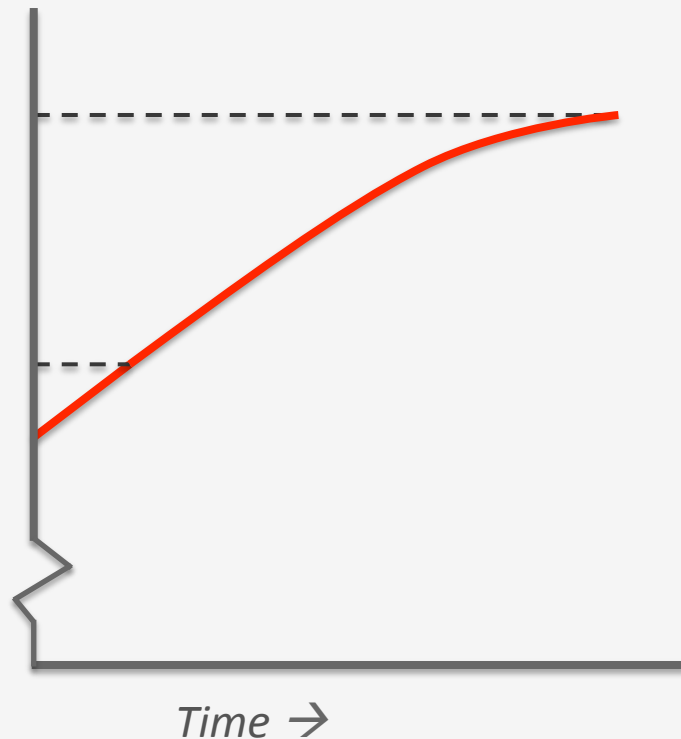
2.4×10^9 people have no access to sanitation



Situation worldwide

2.6×10^9 people have no access to sanitation in 2013

2.4×10^9 people have no access to sanitation in 2000



Industrialised countries

- full legislative and institutionalized
- strict control and implementation of the laws
- polluter pays
- public perception



Developing countries

- little institutional back-up
- little control on implementation
- lack of financial resources
- Scarcity of fresh water



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