2. Legal and conceptual aspects

Haute école d'ingénierie et d'architecture Fribourg
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EPFL

Urban Hydraulic Systems
Prof. Dr. Michael Pfister

2. Legal and conceptual aspects

Goals of this chapter

- To know the Swiss legislation related to urban hydraulics
- Which acts are relevant?
- Which concepts are applied and why?
- What must be done with rainwater (infiltration and retention)?
- How has wastewater to be handled?
- How clean must water be (in water courses and after treatment)?
- Two basic sewer systems
- Why were the concepts basically changed in recent years?

2. Legal and conceptual aspects

Content:
2.1 Background
2.2 Legislation
2.3 Polluted water
2.4 Not polluted water
2.5 Sewer systems
2.6 PGEE
2.7 Pro memoria

Literature:
Download the law/act 814.20 and 814.201, www.fedlex.admin.ch

Butler, D., Davies, J.W. (2011). *Urban Drainage*. Spon Press, London
VSA (1990). Genereller Entwässerungsplan.

2. Legal and conceptual aspects

Exercice

1. Federal Act on water protection (814.20)
2. Federal Ordinance on water protection (814.201)
3. SIA Code 190 Sewers (library)
4. Book “Die Canalsiation von Berlin”

- 4 groups
- Which aspects are relevant for urban hydraulics?

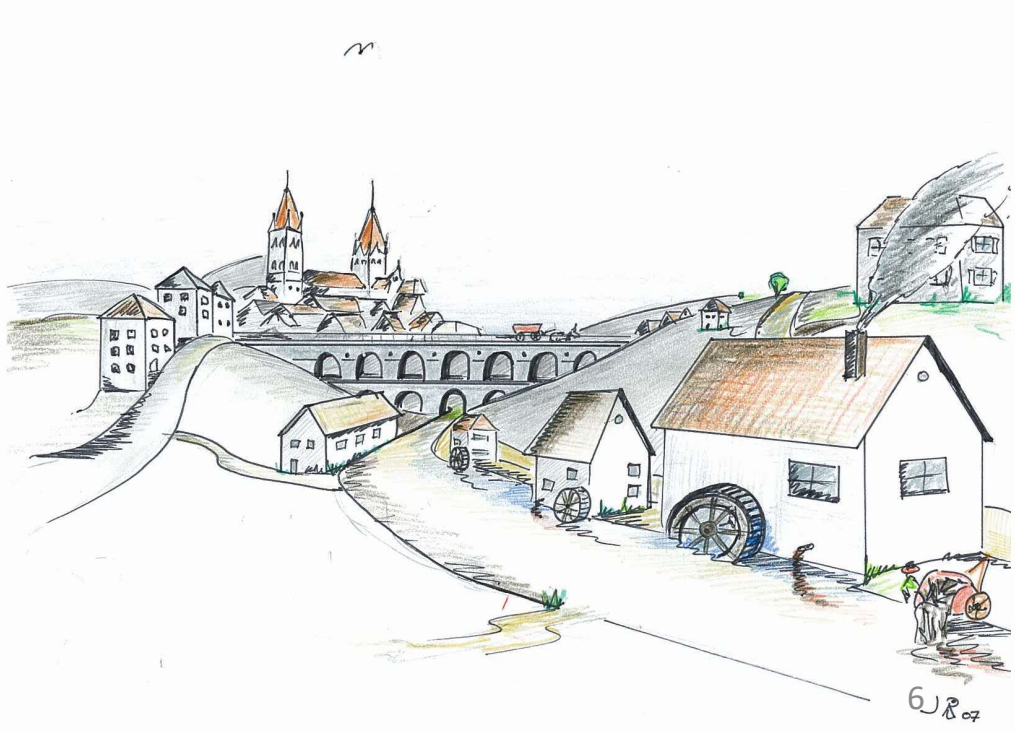
prepare short presentations on what impacts urban hydraulic systems and ignore parts which are not relevant to the latter

2.1 Background

2.1 Background

Historical development of combined sewer I (Assainissement de Lausanne)

Natural water course, on surface, receives partially waste of urban areas



Modified water course, on surface, exploitation of energy, receives waste of urban areas, water flows to lake

2.1 Background

Historical development of combined sewer II (Assainissement de Lausanne)

Tunnelled water course to protect city from floods, receives most waste of urban areas, water flows to lake

Tunnelled water course, receives all wastewater of city, surface water and wastewater are treated in STEP

2.1 Background

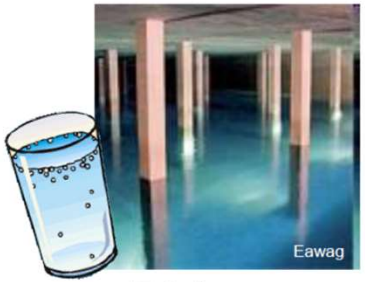
Background

1. 1900. The inauguration of urban water systems allowed for improved hygienic conditions (waste removal) and flood protection, combined system
2. However, a modified ecological diversity, water quality, and hydrograph in watercourses and rivers was noticed in early years.
3. 1960. WWTP are provided to improve the quality of rivers and lakes
4. WWTP operate inefficient under variable discharge and pollution, the historically installed combined system is replaced by the separated system
5. Surface runoff should not be conveyed to rivers, but be stored an infiltrated a well as evaporated on site, sponge city concept

A global approach involving the entire system (groundwater, surface water, drainage systems) was required on a legal base, sustainability in the focus

2.1 Background

We exploited the water resources for centuries to … (Weber 2016)

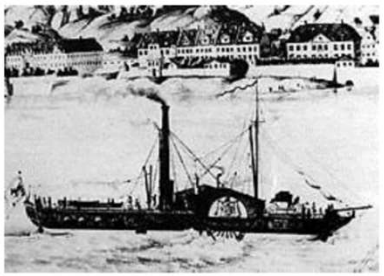


Trinkwasser

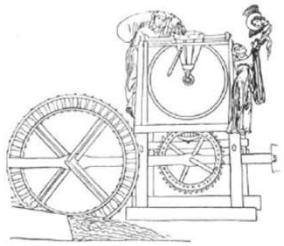
Schutz/ Verteidigung

Bewässerung

Abwasserableitung



Transport und Schifffahrt



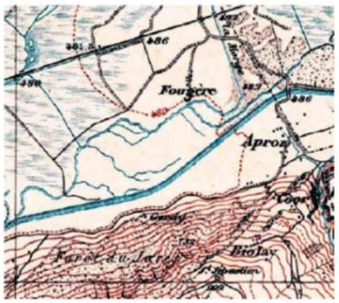
Antrieb und Energieproduktion

Erholung

We modify streams: urbanization, correction, drainage, irrigation, water ways…

(Weber et al. 2007, Rhône en Valais)

1850

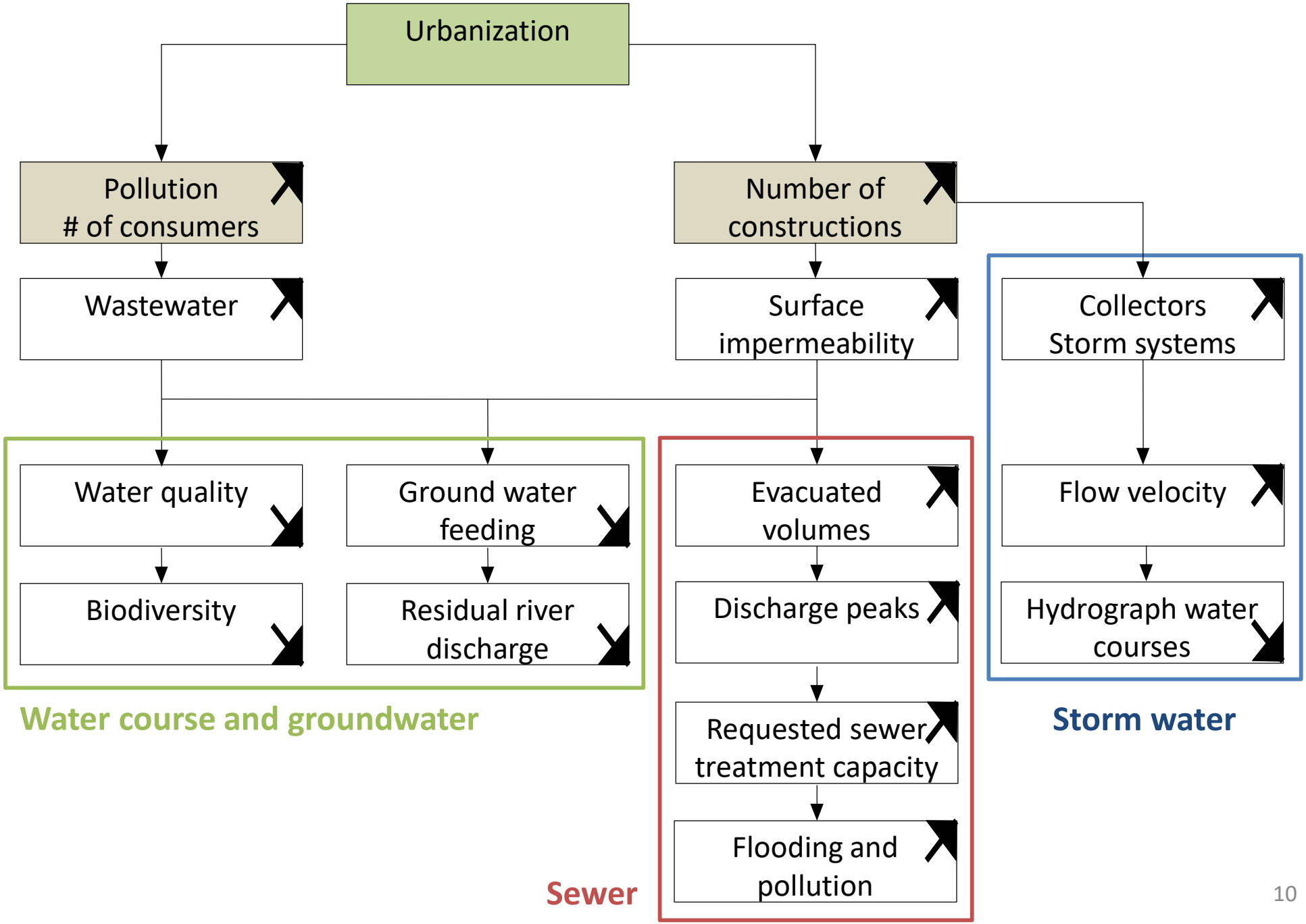


1900

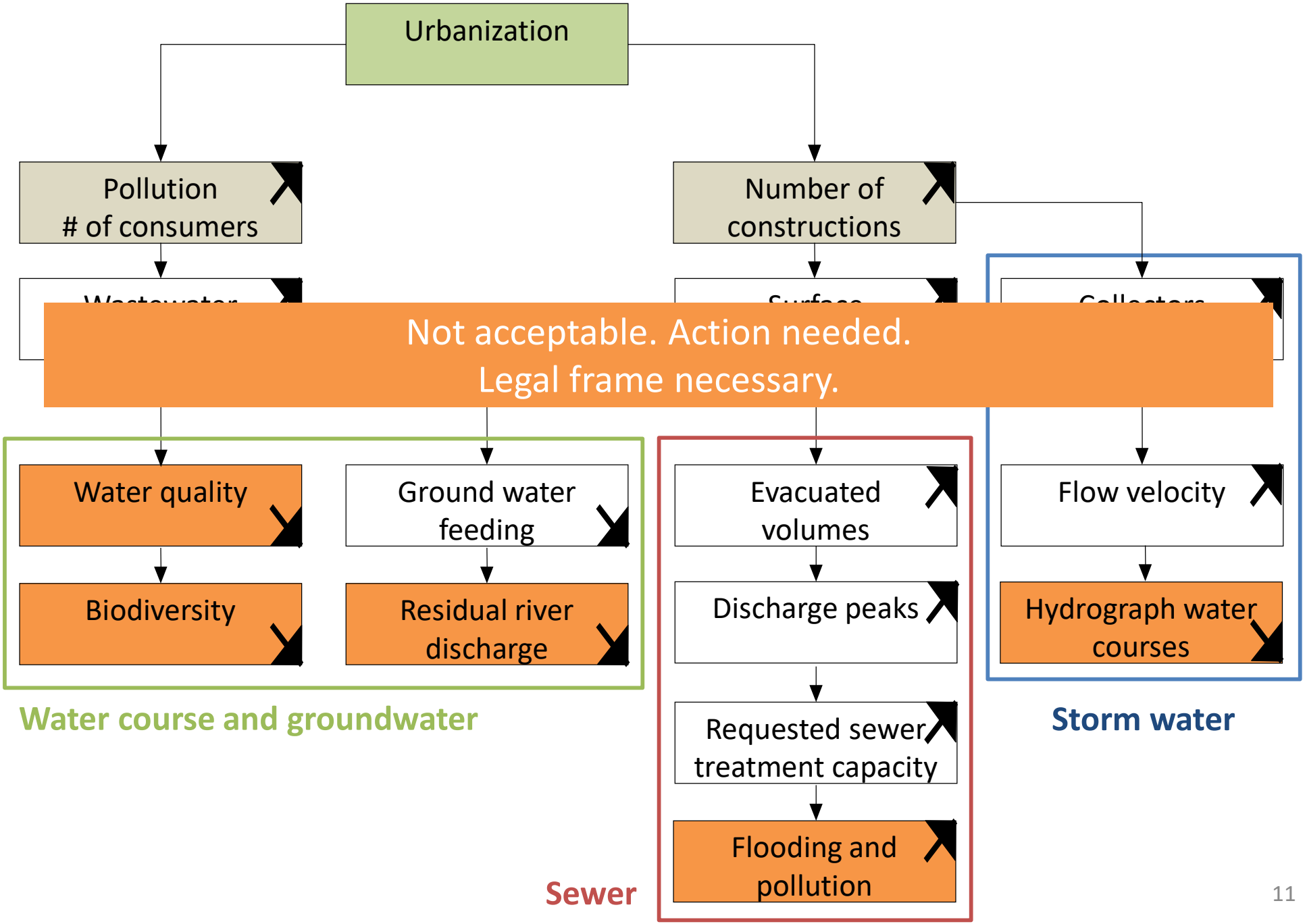
1950

2003

2.1 Background (VSA GEP)

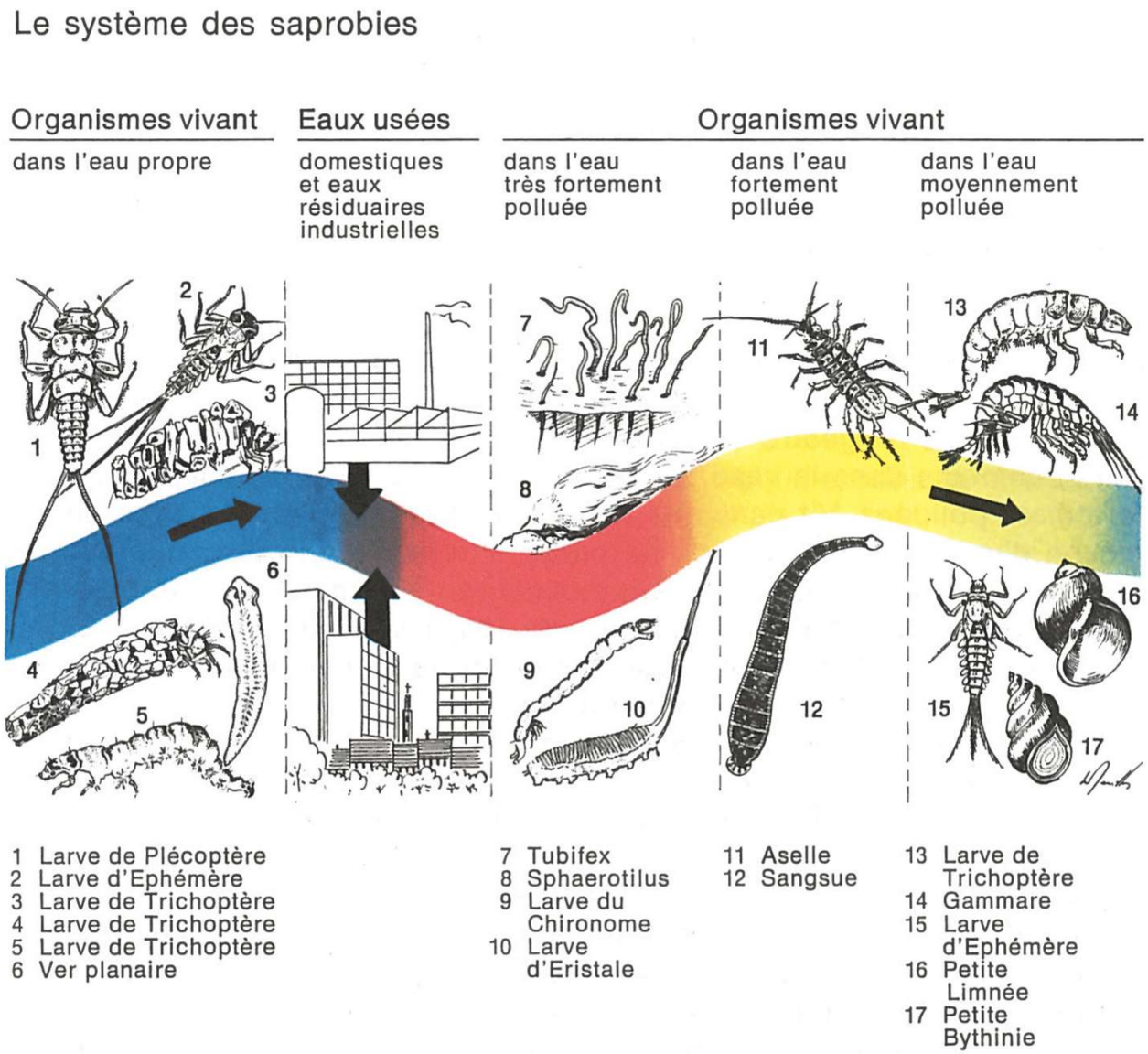


2.1 Background (VSA GEP)



2.1 Background

Restitution of wastewater into stream: reaction of ecosystem



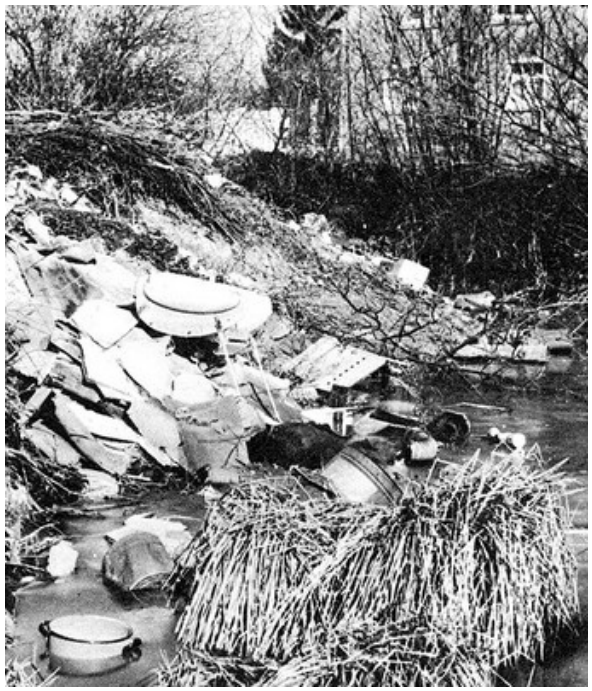
2.1 Background

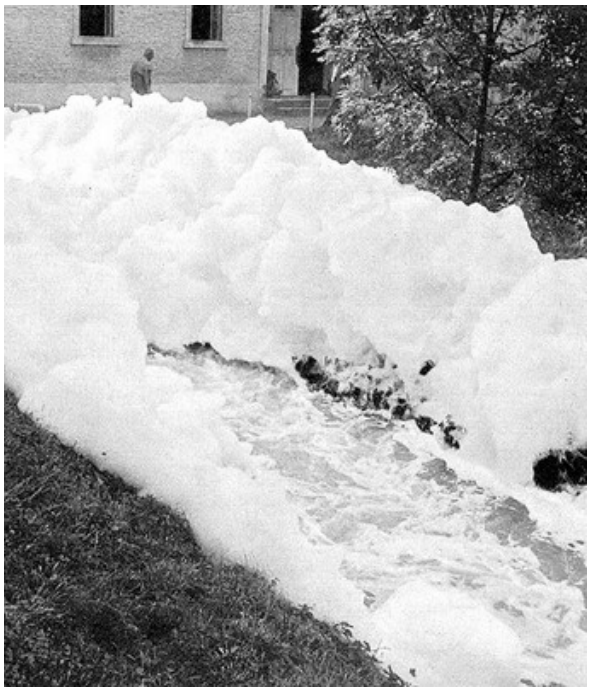
Keystone, Neuchâtel et Aare

2.1 Background

Photos: pollution of rivers in 1970. Lack of treatment plants (BAFU/OFEV)
Rivers disappeared: Energy production (no residual discharge) or main sewer

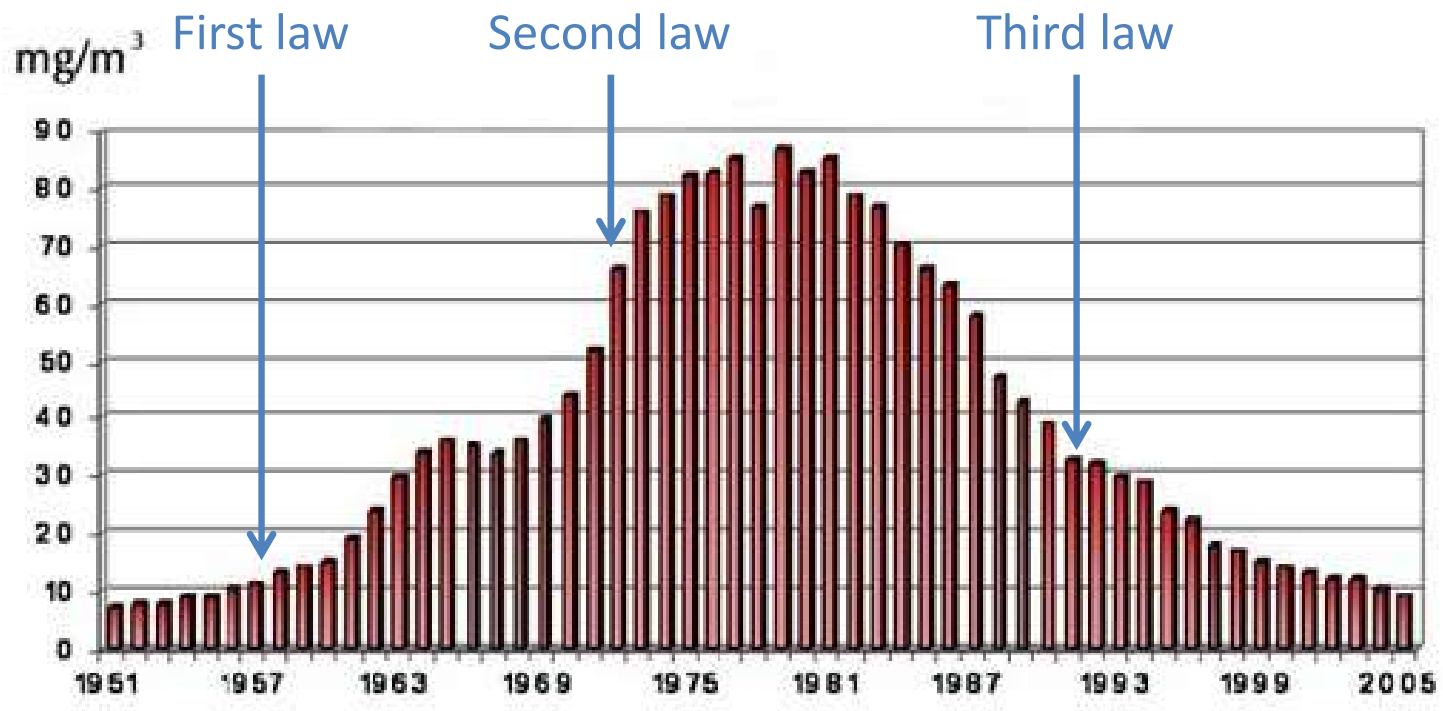
Lakes and mountain rivers were still relatively clean and provided fresh water





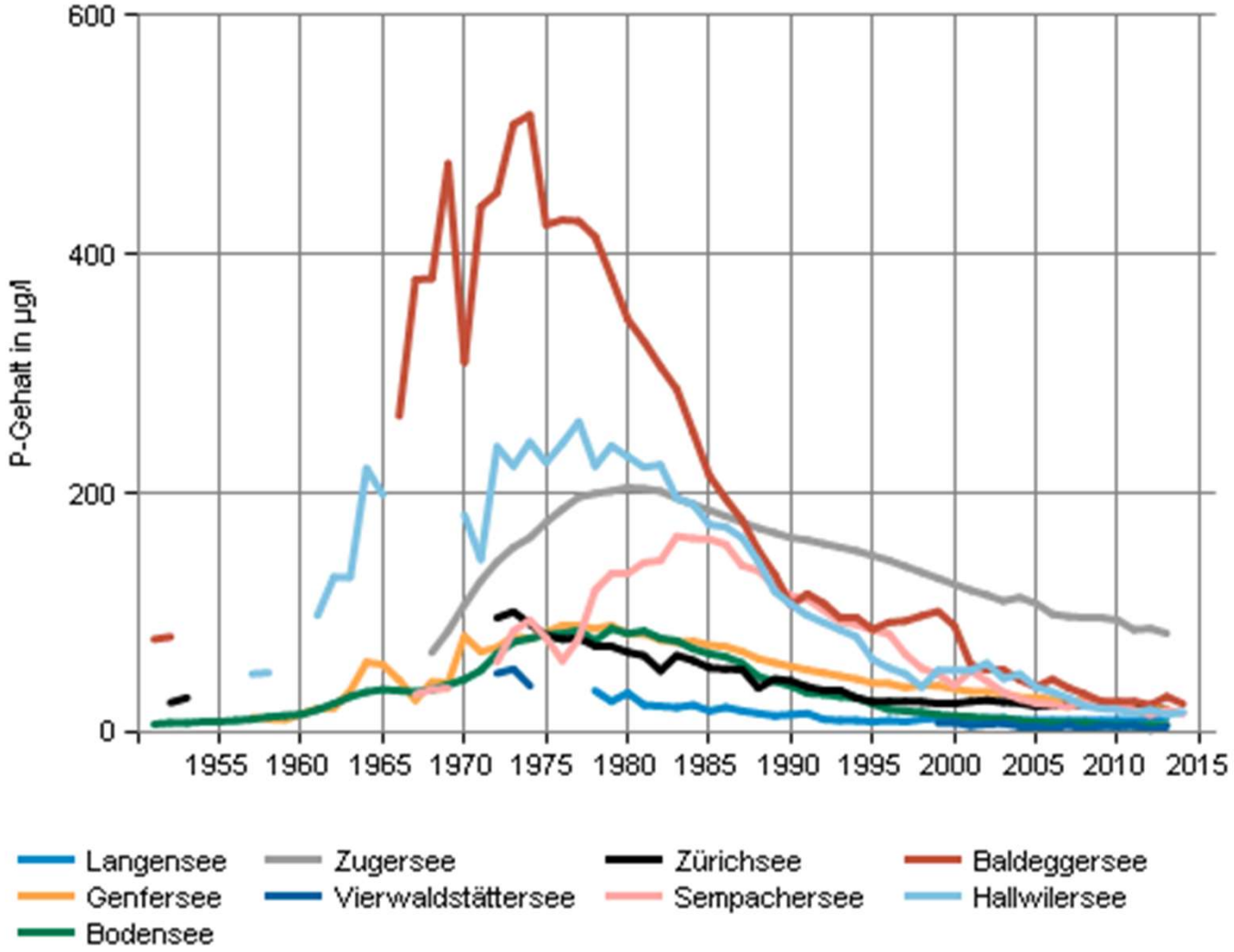
2.1 Background

1960-1980 Pollution of lakes increased
Indicator: Phosphor (here development in Lake Constance) (BAFU/OFEV)



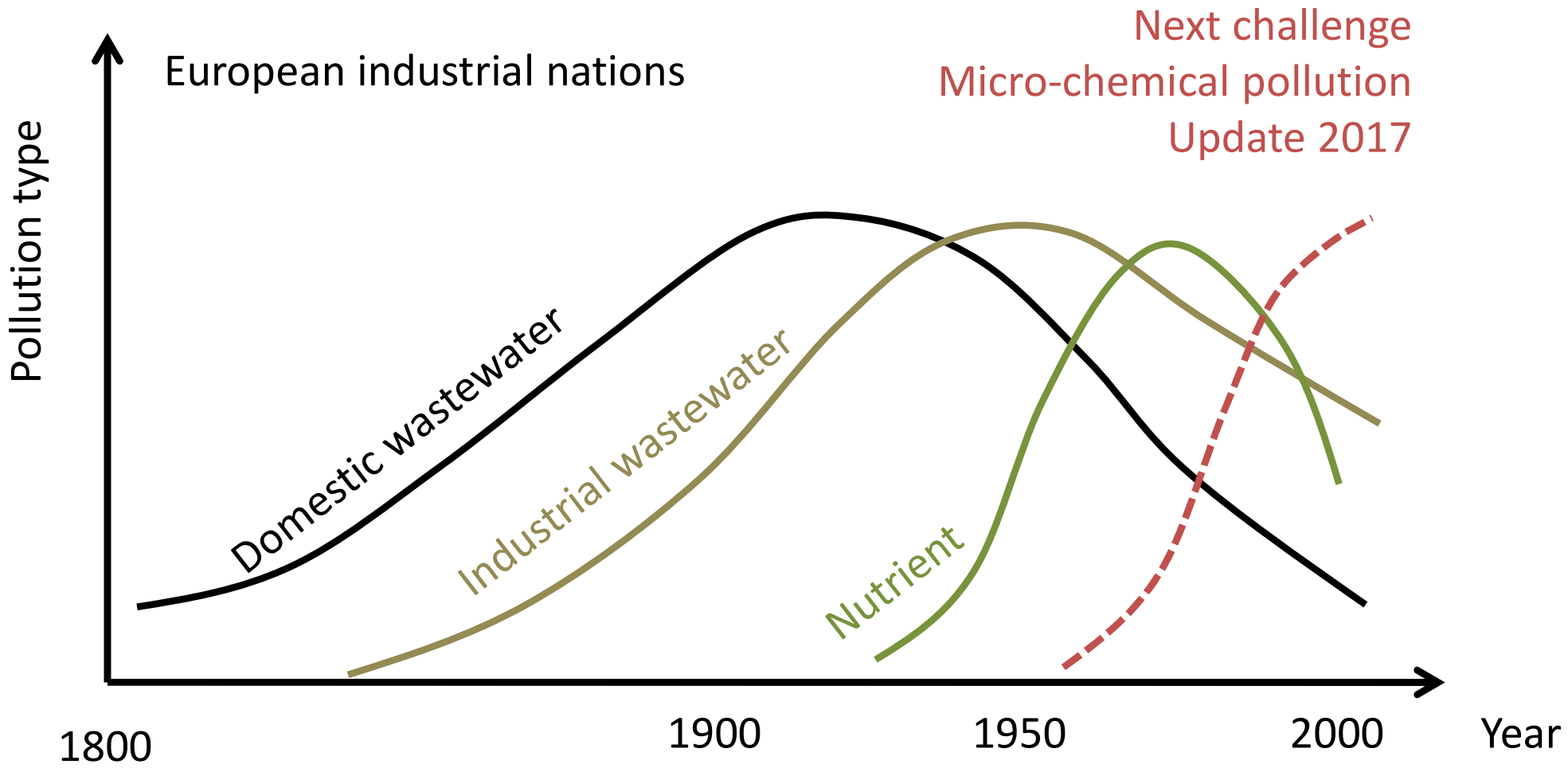
2.1 Background

Indicator: Phosphor in various Swiss lakes (BAFU/OFEV)
Average Europe is around 100 µg/l



2.1 Background

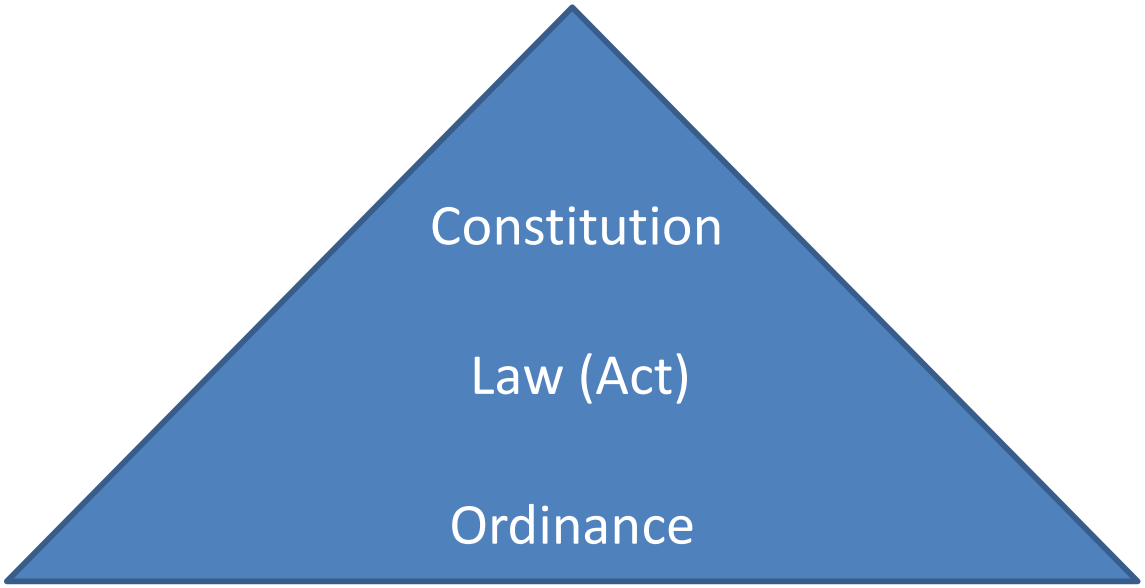
Timetable of water pollution (EAWAG News 48)



2.2 Legislation

2.2 Legislation

Organization (OFEG)

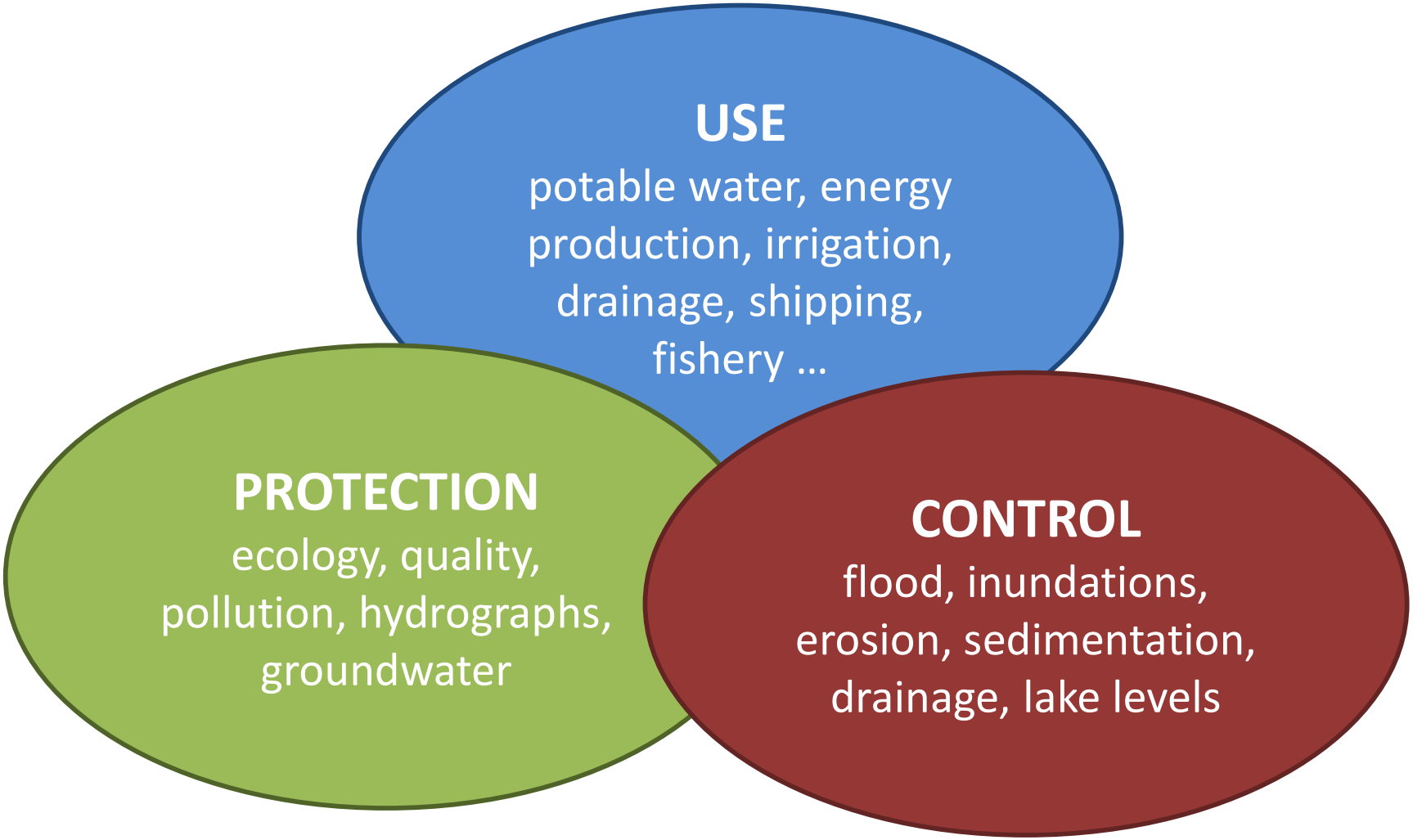


national codes, technical guidelines

- Basic legislation by Confederation (supported by guidelines, recommendations and maps)
- Implementation and execution by the Cantons
- Owner of water courses are mainly the Cantons

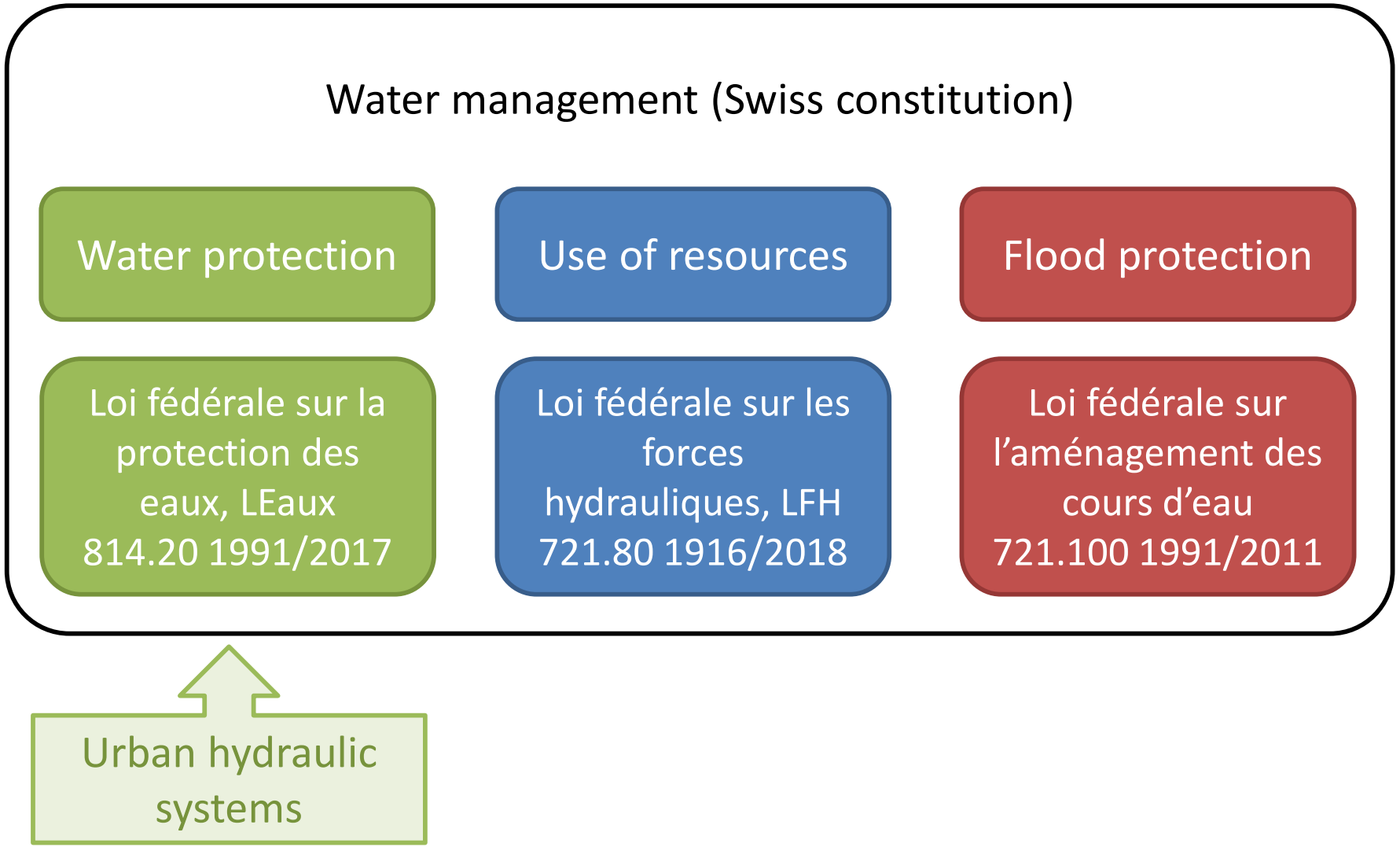
2.2 Legislation

Water management: Various interests in water



2.2 Legislation

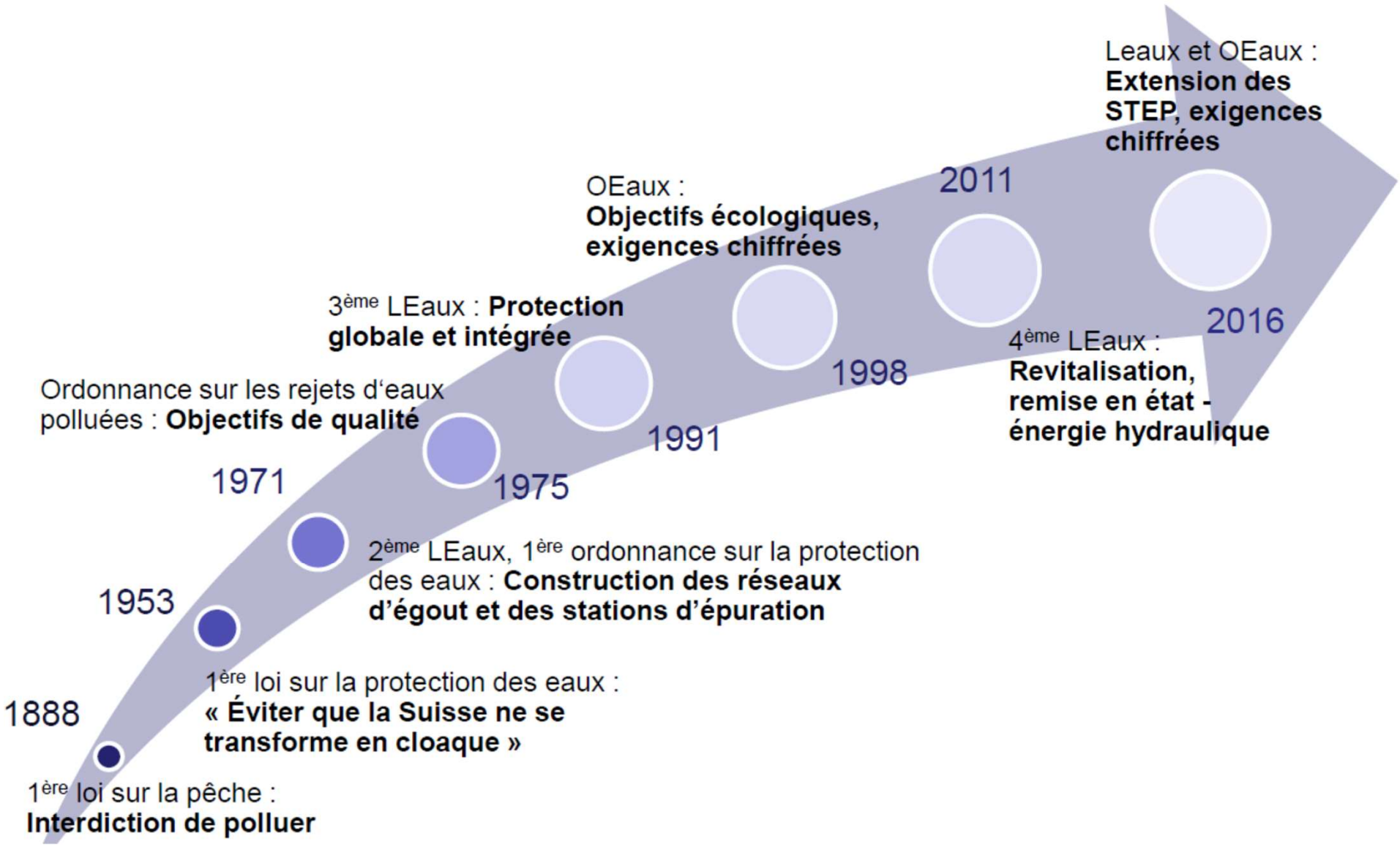
Main focus of water management (OFEG)



2.2 Legislation

History of Swiss legislation on water protection

(OVEV, Lehmann, 2018)



2.2 Legislation

Constitution Suisse (I) (101, 2018), Art. 76

1. The Confederation shall within the scope of its powers ensure the economic use and the protection of water resources and provide protection against the harmful effects of water.

2. It shall lay down principles on the conservation and exploitation of water resources, the use of water for the production of energy […] affecting the water-cycle.

3. It shall legislate on water protection, on ensuring appropriate residual flow, on hydraulic engineering and the safety of dams, […]

4. The Cantons shall manage their water resources. They may levy charges [taxes] for the use of water, subject to the limits imposed by federal legislation. […]

2.2 Legislation

Constitution Suisse (II) (101, 2018)

Art. 73. Sustainable development. The Conf. and the Cantons shall endeavor to achieve a balanced and sustainable relationship between nature and its capacity to renew itself and the demands placed on it by the population.

Art. 74. Protection of the environment. The Conf. shall legislate on the protection of the population and its natural environment against damage or nuisance. The costs of avoiding or eliminating such damage or nuisance are borne by those responsible for causing it.

Art. 75. Spatial planning. The Conf. shall lay down principles on spatial planning.

Art. 79. Fishing. The Conf. shall lay down principles on fishing [...] and in particular on the preservation of the diversity of fish species, [...].

2.2 Legislation

Federal Act on the Protection of Waters (I) (814.20 1991/2023)

Message du Conseil Fédéral	29 avril 1987
Arrêté du Parlement	24 janvier 1991
Référendum ayant abouti	14 juin 1991
Votation populaire	17 mai 1992, Oui 66.1%
Entrée en vigueur	1 novembre 1992

Art. 1. Purpose. To preserve / guarantee / ensure / permit

a. the health of people, animals and plants;
b. the supply and economic use of drinking water […];
c. the natural habitats of indigenous fauna and flora;
d. waters suitable as a habitat for fish;
e. waters as an element of the landscape;
f. the irrigation of agricultural land;
g. the use of waters for leisure purposes;
h. the natural functioning of the hydrological cycle.

2.2 Legislation

Federal Act on the Protection of Waters (I) (814.20 1991/2023)

Art. 2. This Act applies to all surface and underground waters.

Art. 3a. Anyone who causes measures to be taken under this Act must bear the costs.

Art. 6. It is prohibited to introduce into a body of water […] any substances which may pollute it.

Art. 7. Polluted wastewater must be treated. Non-polluted wastewater must be discharged by infiltration [… or] discharged into surface waters; in this case retention measures must be taken.
The cantons shall arrange the drawing up of communal and, if required, regional drainage plans

2.2 Legislation

Federal Act on the Protection of Waters (I) (814.20 1991/2023)

Art. 10. The cantons shall be responsible for the construction of public sewers and central plants for the treatment.

Art. 11. Polluted wastewater which originates in an area served by public sewers shall be discharged into such sewers.

Art. 12. Non-polluted wastewater with permanent flow shall not be passed through a wastewater treatment.

Art. 60a. The cantons ensure that the costs of the construction, operation, maintenance, improvement and replacement of wastewater treatment plants are passed on to the persons responsible for the production of the wastewater through fees or other charges.
The principles for calculating the charges shall be made public.

2.2 Legislation

Federal Act on the Protection of Waters (I) (814.20 1991/2023)

Concerning river restoration in the context of hydropower:

Art. 20. Groundwater protection zones

Art. 31. Minimum residual flow

Art. 36a. Space provided for waters

Art. 38a. Rehabilitation of waters

Art. 39a. Hydropeaking

Art. 43a. Bed load budget

2.2 Legislation

Waters Protection Ordinance (I) (814.201 1998/2023)

Art. 3. The authorities shall assess whether wastewater entering a body of water by way of discharge or infiltration is considered to be polluted or non-polluted, taking account of […]. Precipitation water running off built-up or sealed surfaces is as a rule considered to be non-polluted wastewater if […].

Art. 4. The cantons shall ensure that a regional drainage plan (RDP) is drawn up […].

Art. 5. The cantons shall ensure that general drainage plans (GDP) are drawn up […].

Art. 8. The infiltration of polluted wastewater is prohibited.

2.2 Legislation

Waters Protection Ordinance (I) (814.201 1998/2023)

Art. 11. During construction or substantial building alterations, […] precipitation water and permanent flows of non-polluted wastewater are channelled off separately from polluted wastewater prior to reaching the outside of the building.

Annex 1. Ecological Objectives for Waters

Annex 2. Requirements on Water Quality (rivers and lakes)

Annex 3. Requirements for the Discharge of Polluted Wastewater (release of WWTP)

Annex 4a. Protection of Waters (water protection area)

2.2 (Legislation) Codes

Code SIA 190:2017 *Canalisations* (SN 533 190)

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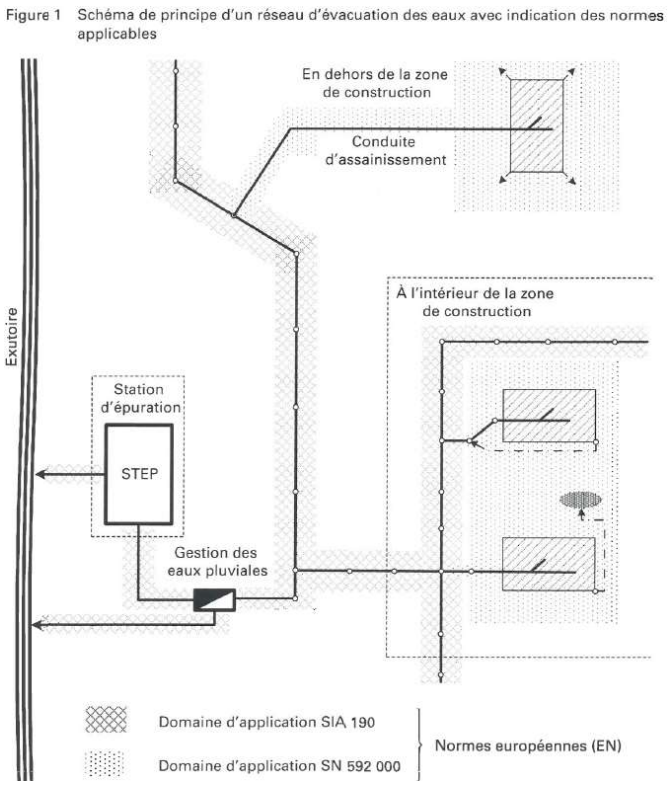

Figure 1 Schéma de principe d'un réseau d'évacuation des eaux avec indication des normes applicables

2.2 (Legislation) Codes

Code SIA 190:2017 *Canalisations* (SN 533 190)

- General aspects
- Special manholes (drop manhole and inverted siphon)
- Flow equations (Darcy-Weisbach with Colebrook-White, or GMS)
- Operational roughness
- Partial filling with limitation of maximum admissible values
- Steep conduits with air entrainment
- Minimum flow velocities


sia
SIA 190:2017 Bauwesen
Schweizer Norm
Norme Suisse
Norma Svizzera
533 190
Ersetzt den technischen Teil der Norm SIA 190:2000
Canalisations
Canalizzazioni
Kanalisationen
190
Referenznummer
SN 533190:2017 de
Gültig ab: 2017-09-01
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Postfach, CH-8027 Zürich
Anzahl Seiten: 68
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Preisgruppe: 32

D 0264 Hydraulik – *Technische Dokumentation* zur Norm SIA 190:2017

- General hydraulic interpretation of SIA 190 for partially filled conduit flow
- Special manholes (additionally separation manhole , junction manhole , and supercritical flow aspects)

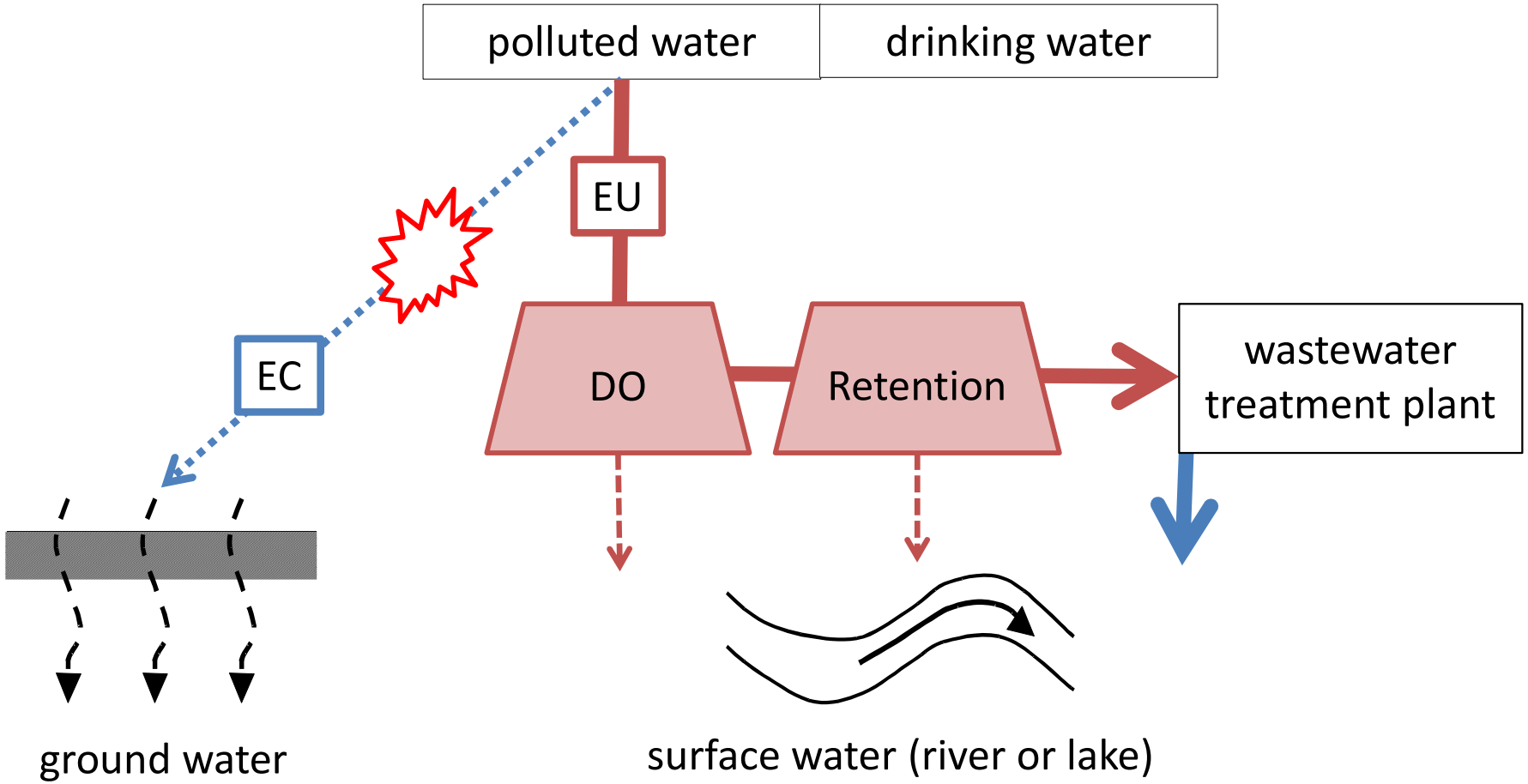
2.2 (Legislation) Codes

Technical documentations

- SIA Société suisse des ingénieurs et des architectes
- VSA Association suisse des professionnels de la protection des eaux
- DWA Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall

2.3 Polluted water

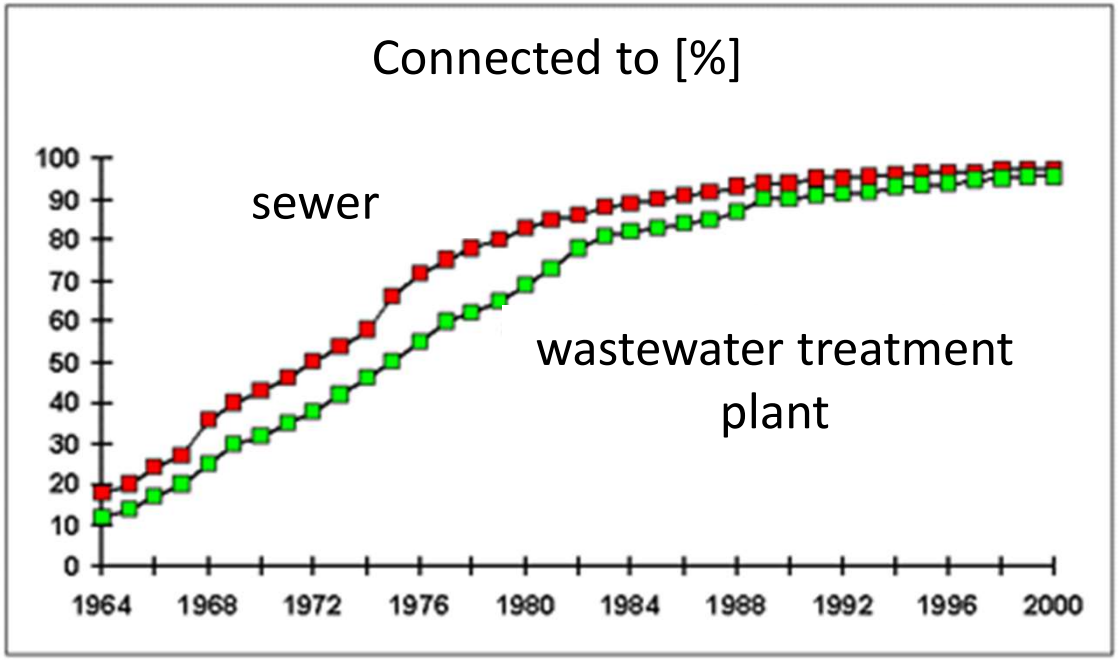
2.3 Polluted water



2.3 Polluted water

Obligation to discharge polluted water into sewer

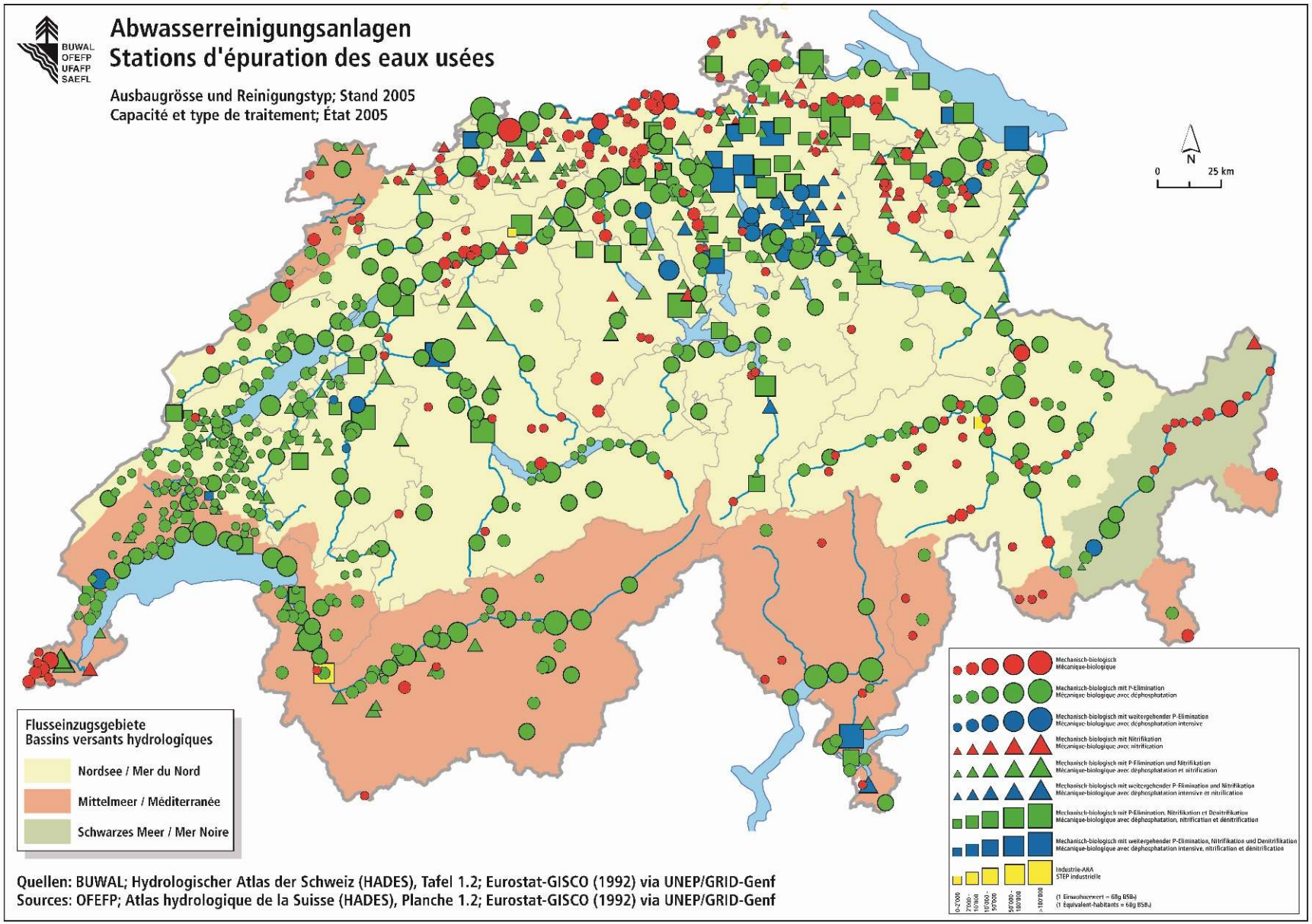
Percentage of population connected to […] in Switzerland (2005)



96.7% are connected to sewer, 1.2% not yet, 2.1% can not be connected

(BUWAL)

2.3 Polluted water



2.3 Polluted water

Restitution of treated wastewater in natural environment (I)
(Act on water protection)

Nº	Paramètres	Exigences
1	Substances non dissoutes totales	Pour les installations de moins de 10 000 EH: – concentration dans les eaux déversées: 20 mg/l Pour les installations de 10 000 EH et plus: – concentration dans les eaux déversées: 15 mg/l *(filtration avec une membrane de 0,45 µm)*
2	Demande biochimique en oxygène *(DBO_5)* *(avec blocage de la nitrification)*	Pour les installations de moins de 10 000 EH: – concentration dans les eaux déversées: 20 mg/l O_2 et – taux d'épuration par rapport aux eaux polluées brutes: 90 % Pour les installations de 10 000 EH et plus: – concentration dans les eaux déversées: 15 mg/l O_2 et – taux d'épuration par rapport aux eaux polluées brutes: 90 %
3	Carbone organique dissous *(COD)*	Pour les installations de 2000 EH et plus: – concentration dans les eaux déversées: 10 mg/l et – taux d'épuration: 85 %, exprimé comme il suit: $100 \cdot (1 - \frac{\text{mg COD dans les eaux épurées}}{\text{mg carbone organique total dans les eaux polluées brutes}})$ Si les valeurs ne sont pas respectées, l'autorité identifiera les substances impliquées, évaluera leur provenance et fixera le cas échéant les exigences à poser conformément aux annexes 3.2 et 3.3.
4	Transparence *(d'après la méthode de Snellen)*	30 cm

2.3 Polluted water

Restitution of treated wastewater in natural environment (II)
(Act on water protection)

5	Ammonium *(somme de $N\text{-}NH_4^+$ et $N\text{-}NH_3$)*	Si les concentrations d'ammonium dans les eaux polluées peuvent avoir des effets néfastes sur la qualité d'un cours d'eau, les valeurs suivantes sont applicables si la température des eaux polluées est supérieure à 10° C: – concentration dans les eaux déversées: 2 mg/l N et – taux d'efficacité du traitement: 90 %, exprimé comme il suit: $100 \cdot (1 - \frac{\text{mg N- ammonium dans les eaux épurées}}{\text{mg N- Kjeldahl dans les eaux polluées brutes}})$ Dans ces cas, on procédera à une nitrification durant toute l'année. *Remarque: l'azote obtenu par la méthode de Kjeldahl est la somme de l'azote contenu dans l'ammonium, l'ammoniac et les substances azotées organiques.*
6	Nitrite *($N\text{-}NO_2^-$)*	0,3 mg/l N (valeur indicative)
7	Composés organiques halogénés adsorbables *(AOX)*	0,08 mg/l X Si la valeur n'est pas respectée, l'autorité identifiera les substances impliquées, évaluera leur provenance et fixera le cas échéant les exigences à poser conformément aux annexes 3.2 et 3.3.

2.3 Polluted water

How is the water treatment financed?

General

- Treatment plants measure inflow discharge (one branch per community)
- The cost are shared in accordance with the individual yearly inflow volume
- Cost per person and year for operation: 100-300 CHF (BUWAL)
- Cost per person for replacement: 5'000 to 20'000 CHF (BUWAL)

Financed with

- Fees for wastewater release
- Taxes for water consumers in function of used volumes and degree of pollution
- Subventions form the cantons

Loi fédérale sur la protection des eaux (814.20)

Art 60 The cantons are responsible that the expenses for construction, operation and maintenance are covered by fees. The account is accessible for the public

2.4 Not polluted water

2.4 Not polluted water

Art 7, Federal Act on the Protection of Waters

Non-polluted wastewater must be discharged by infiltration according to the instructions of the cantonal authority. If local conditions do not permit this, such non-polluted water may be discharged into surface waters; in this case retention measures must be taken if possible, so as to ensure a steady discharge in the event of high inflow.

2.4 Not polluted water

Art 3, Waters Protection Ordinance (I)

The authorities shall assess whether wastewater […] is polluted or non-polluted, taking account of:

a. the type, the amount, the characteristics and the temporal occurrence of potential water pollutants substances in the wastewater;
b. the condition of the receiving waters.

During infiltration of wastewater, they shall also take account of whether:

a. wastewater can be polluted because of existing soil pollution or the unsaturated subsoil;
b. wastewater is sufficiently purified in the soil or in the unsaturated subsoil;
c. […].

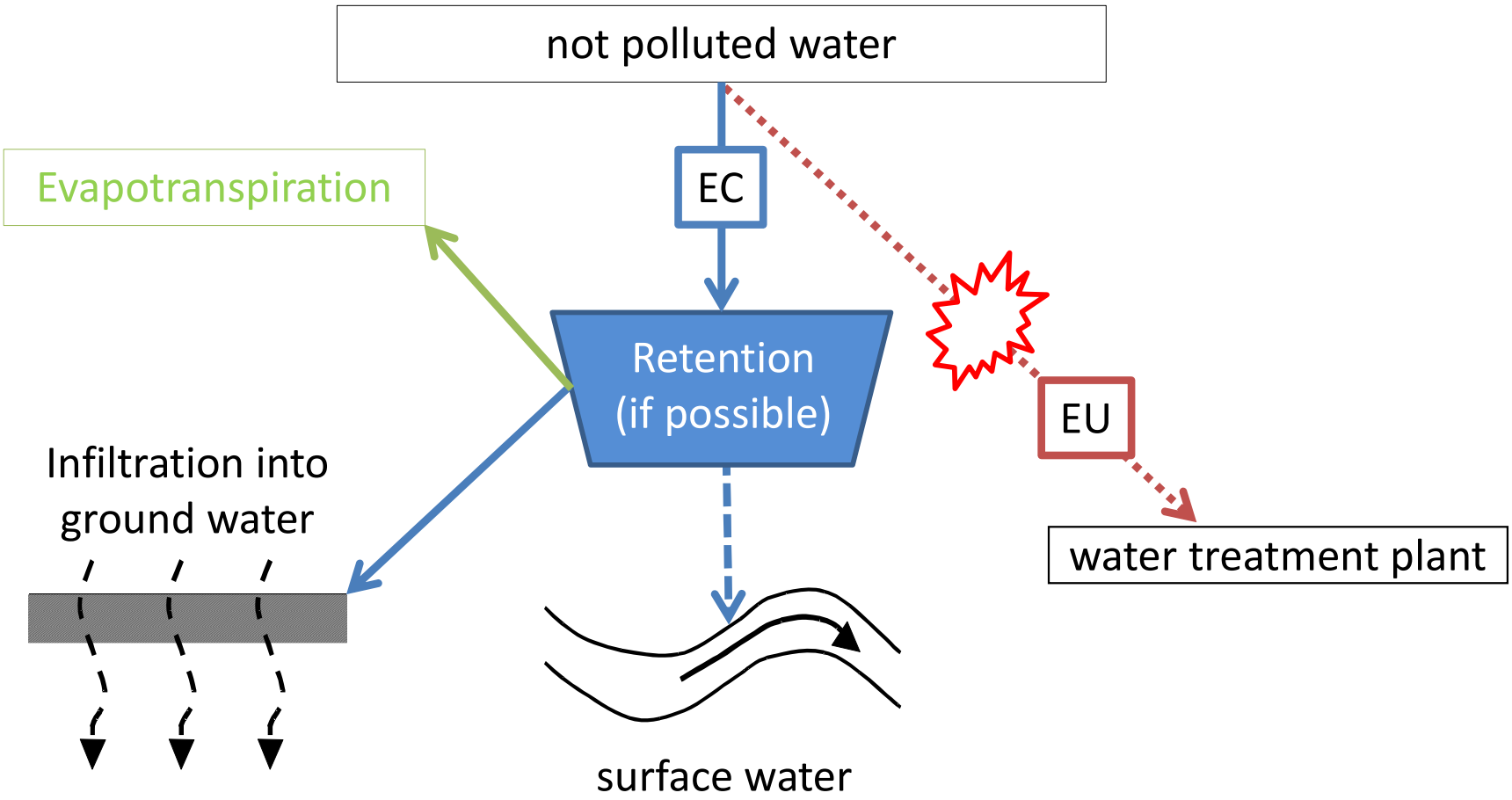
2.4 Not polluted water

Art 3, Waters Protection Ordinance (II)

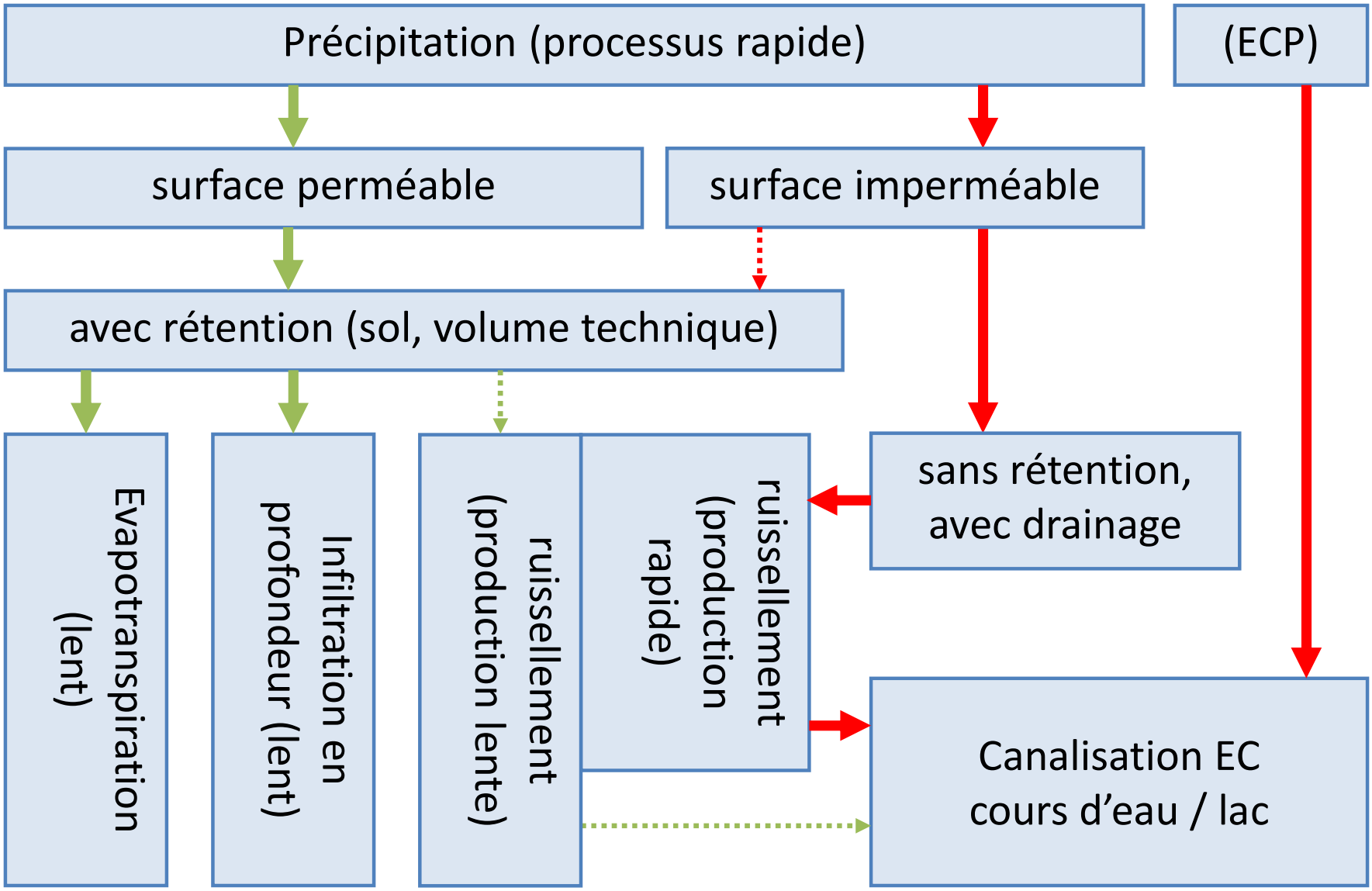
Precipitation water running off built-up or sealed surfaces is as a rule considered to be non-polluted wastewater if it:

a. originates from roof surfaces;
b. originates from roads, paths and areas on which no substantial amounts of potential water pollutants are unloaded, processed and stored and if they are sufficiently purified by infiltration into the ground […];
c. originates from track installations where there is a long-term guarantee that pesticides will not be used or if pesticides have been sufficiently retained and degraded by a biologically active layer of soil.

2.4 Not polluted water



2.4 Not polluted water



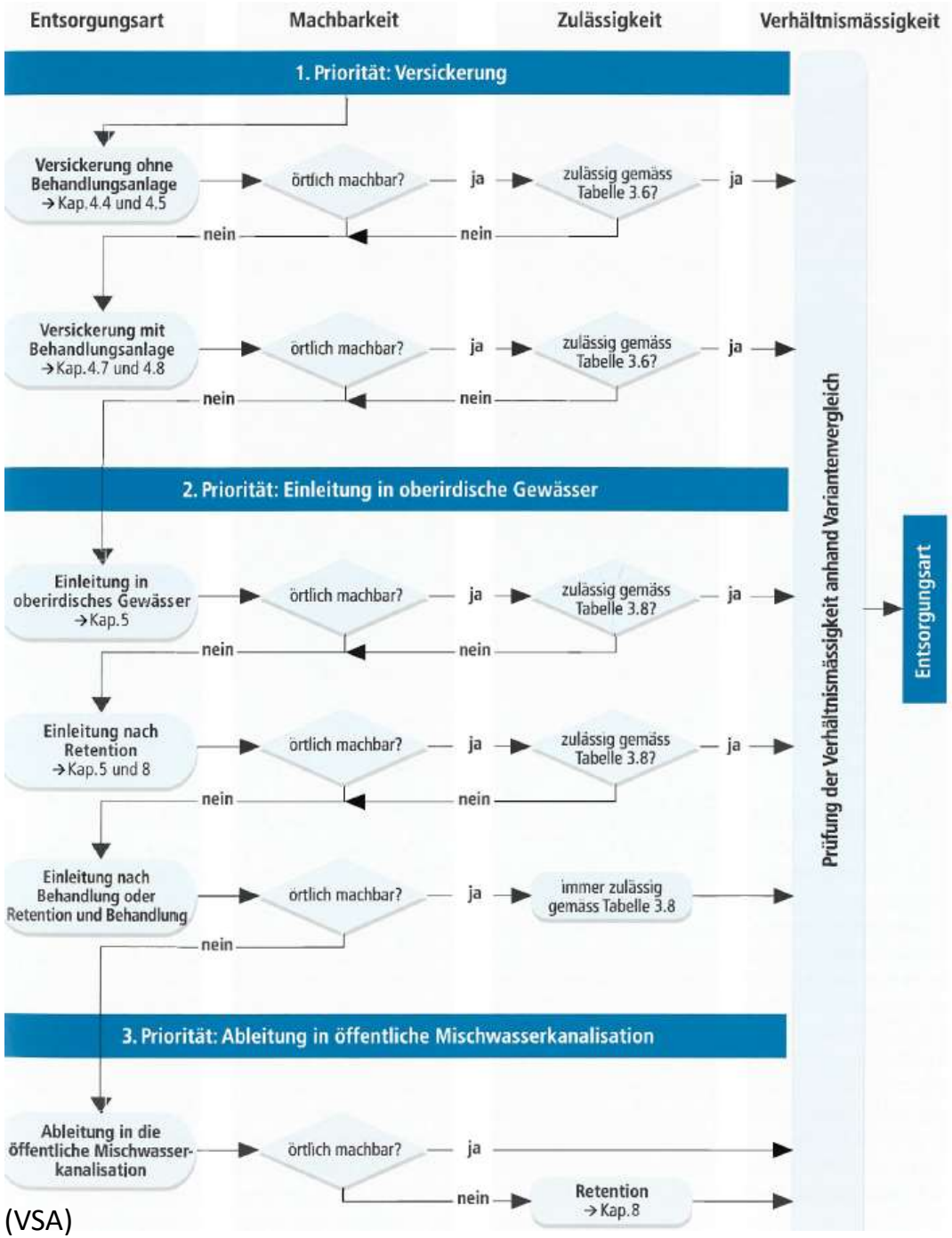
System «actuel» vs. «ville éponge»

2.4 Not polluted water

Les eaux claires = les eaux claires parasites + les eaux de ruissellement

Priorité selon la loi:

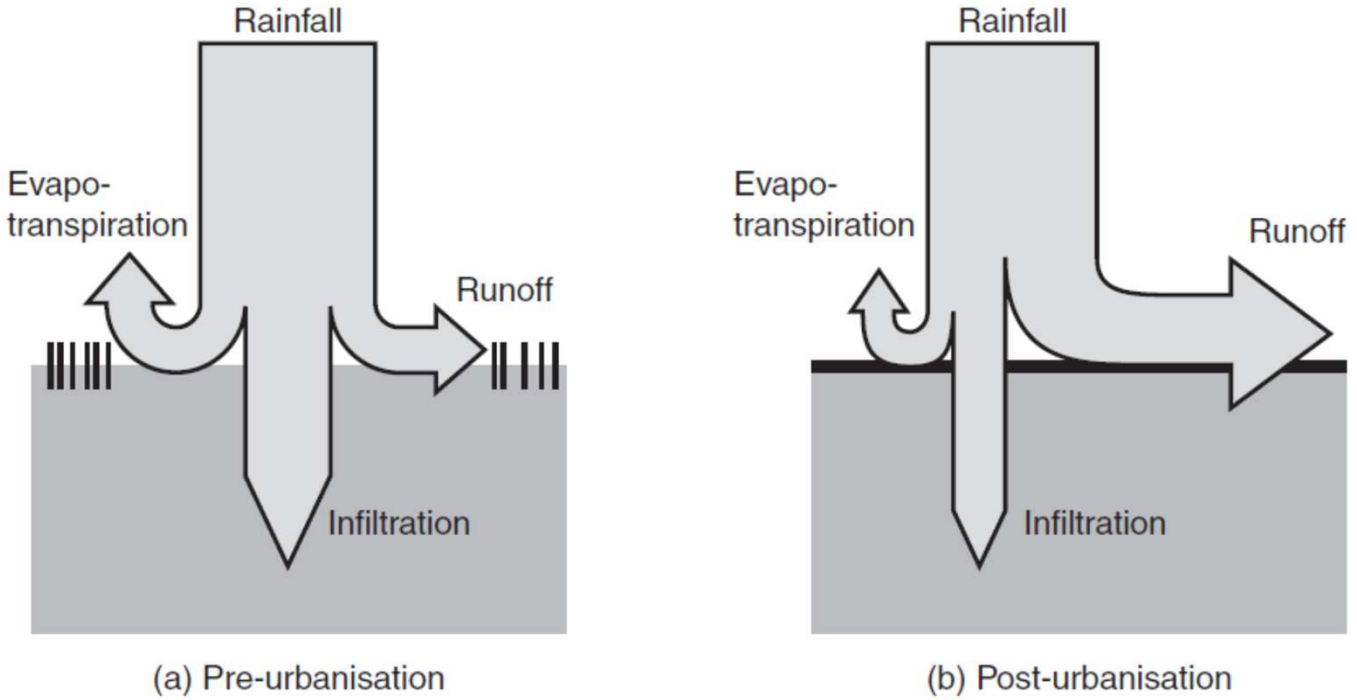
1. Infiltration, avec rétention
2. Rejet dans des eaux superficielles, avec rétention
3. Rejet dans la canalisation EC publique



(VSA)

2.4 Not polluted water

Increase of surface runoff due to urbanization (Butler and Davies)



Measures: Infiltration of runoff at the location where it is generated!

1. Direct infiltration (long lasting process)
2. Retention and infiltration after rain event
3. Overflow in separate sewer, overflow in combined sewer

2.4 Not polluted water

“Sponge city”

Common concept

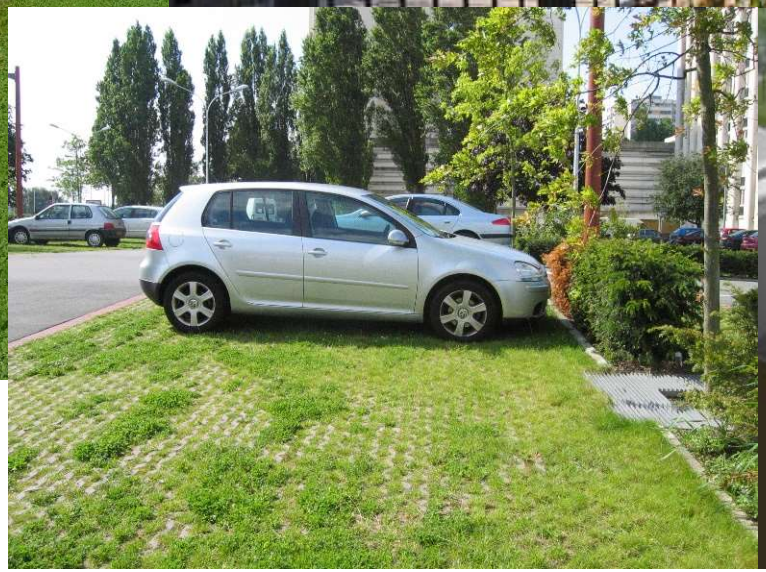
Achieved concept

(VSA)

2.4 Not polluted water

“Sponge city”

Minimize Q_R

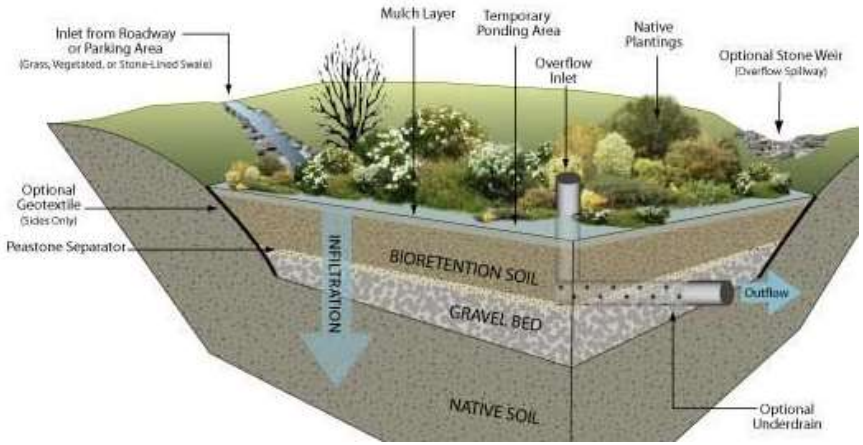


2.4 Not polluted water

“Sponge city”

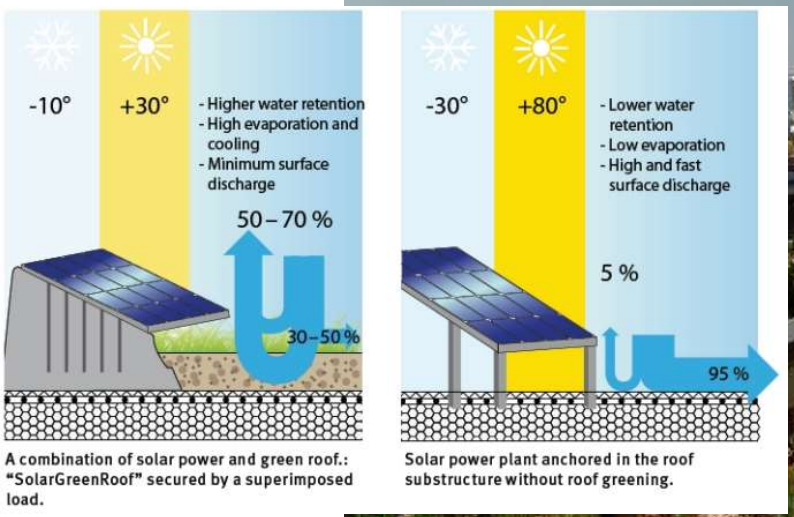
Retention Concept “Sponge City” (e.g., Berlin)

- All rainwater is stored locally, absence of drainage network
- Storage in technical “sponges”, evaporation induces cooling, absence of pronounced hydrograph in water course



2.4 Not polluted water

“Sponge city” Conflict PV and green roof?

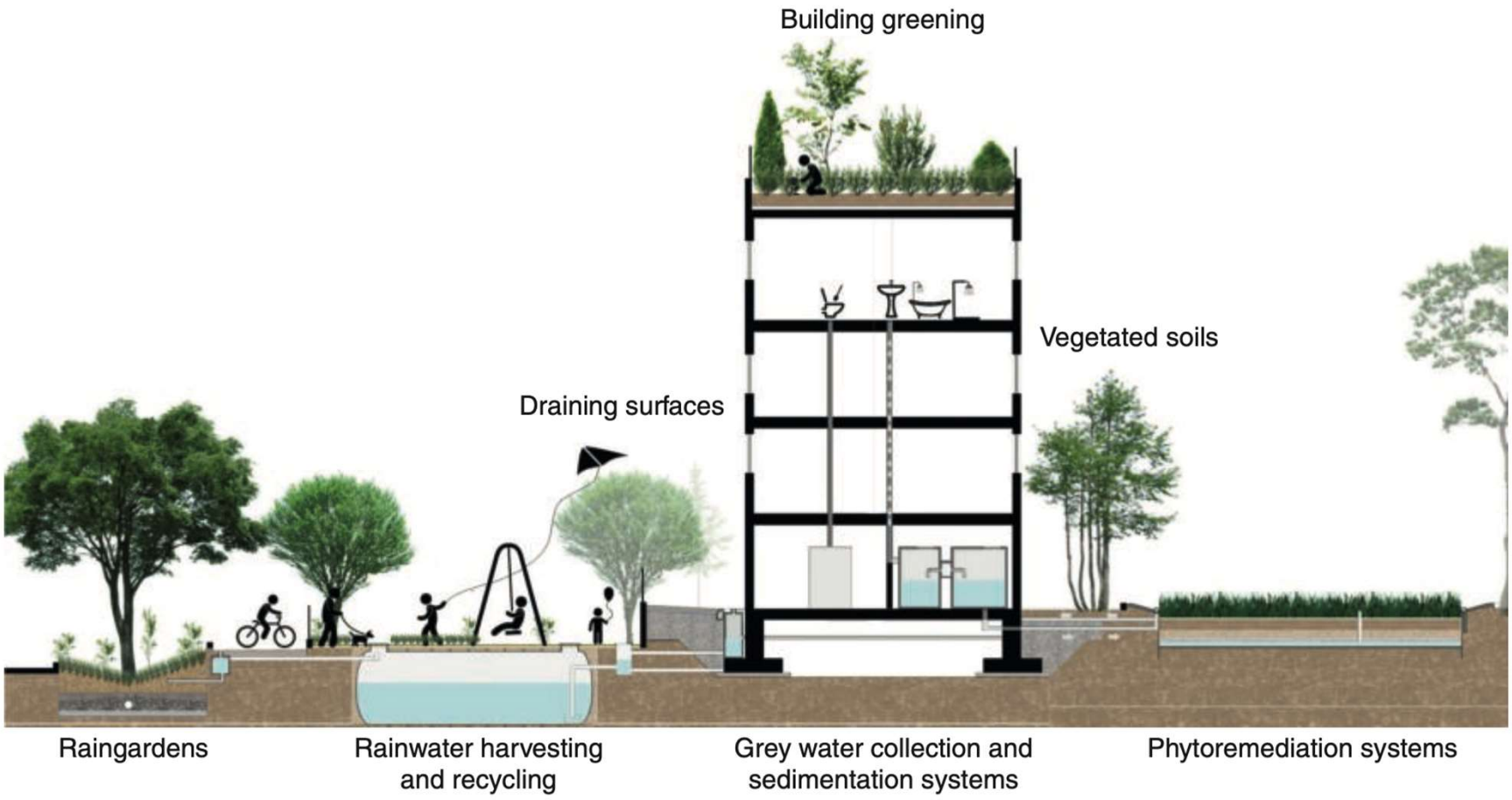


A combination of solar power and green roof.: “SolarGreenRoof” secured by a superimposed load.

Solar power plant anchored in the roof substructure without roof greening.

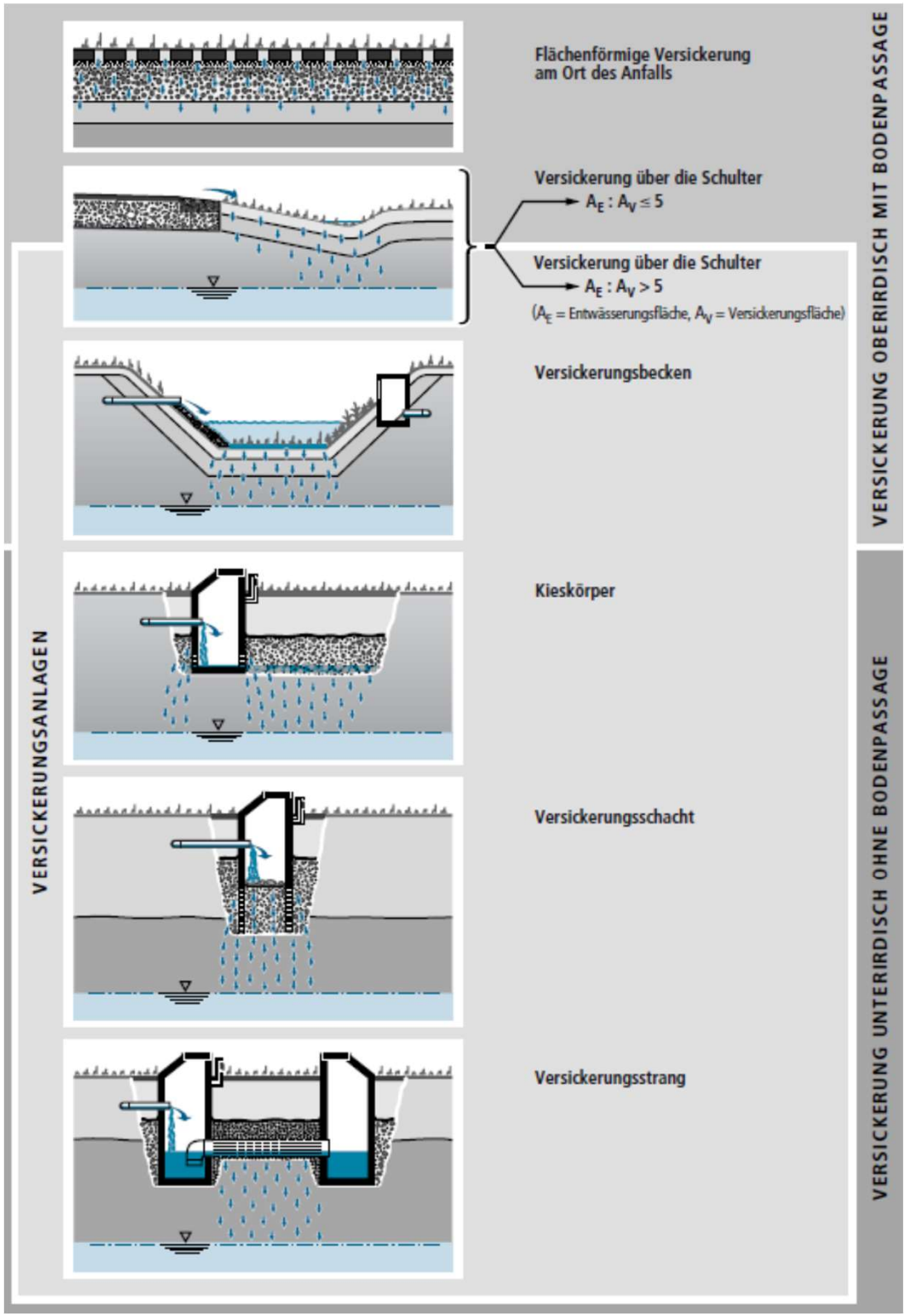
2.4 Not polluted water

“Sponge city”



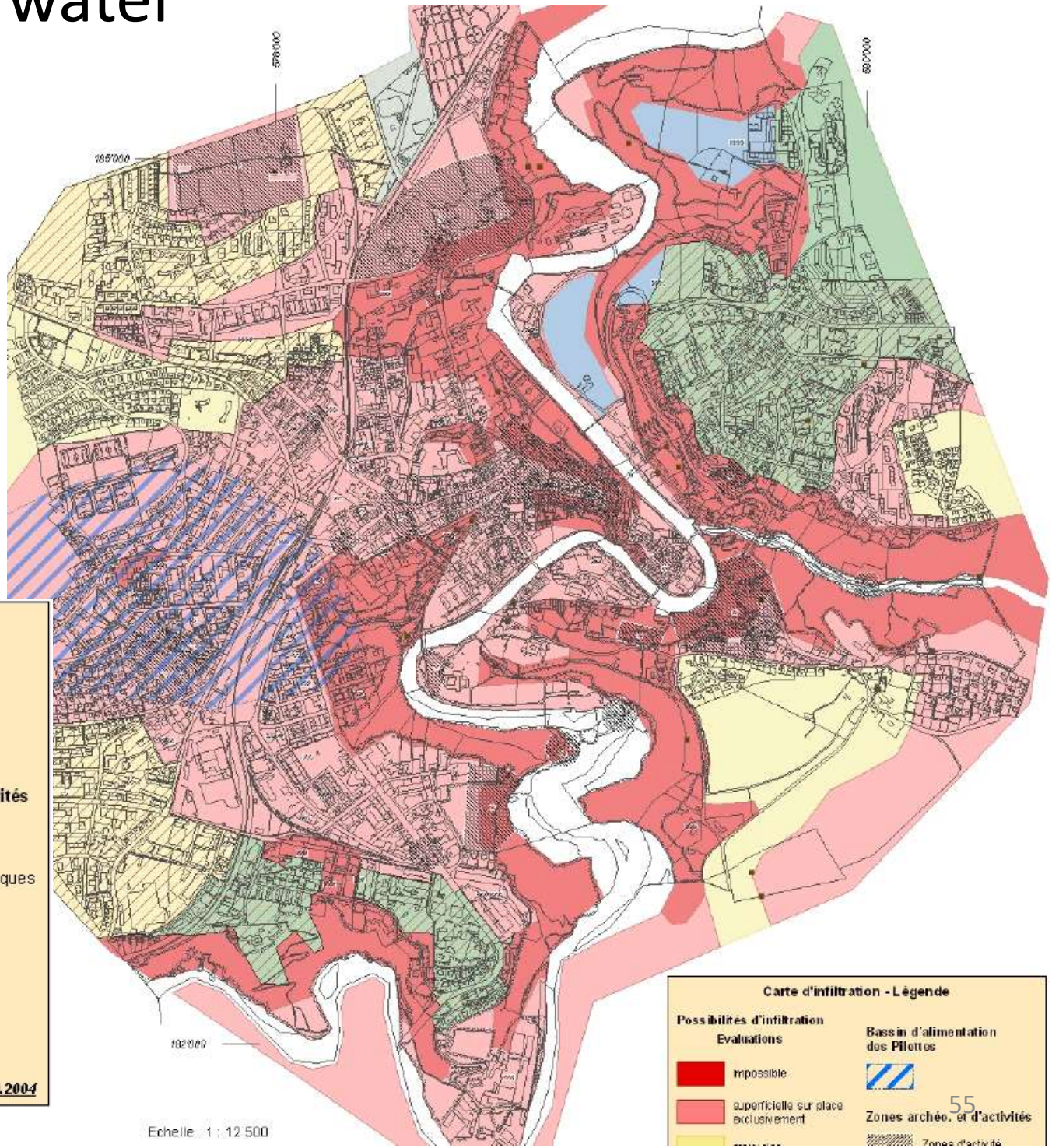
2.4 Not polluted water

Micro scale: local technical infiltration and retention (VSA)



2.4 Not polluted water

Micro scale: local technical infiltration and retention

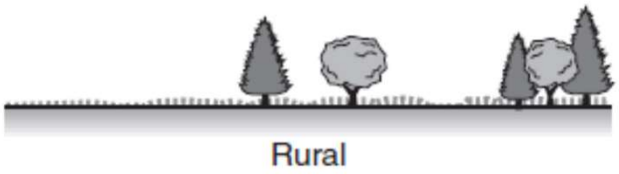


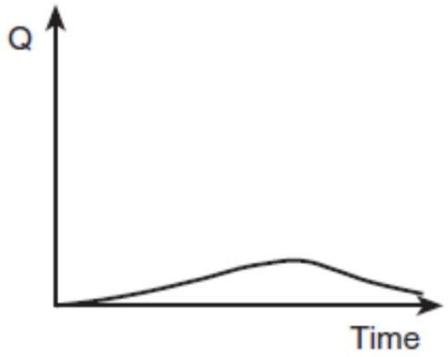
2.4 Not polluted water

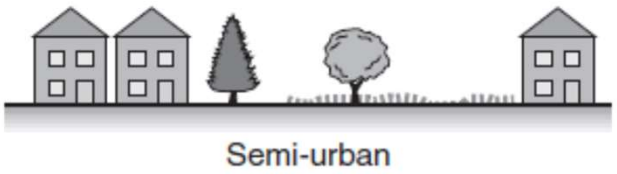
Macro scale: Example retention basin for storm water

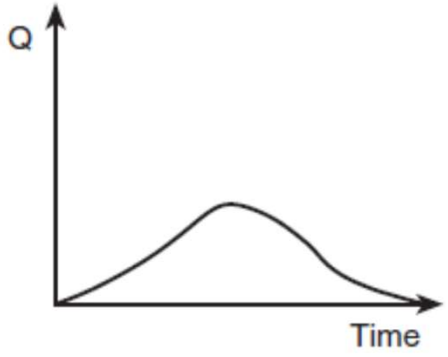
2.4 Not polluted water

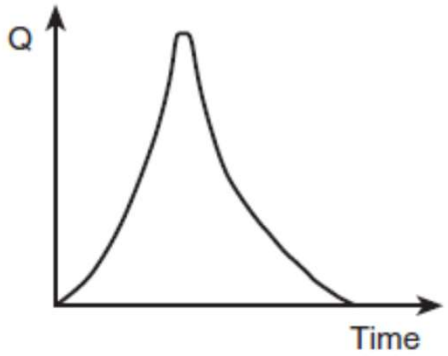
Act on water protection, Annex 1: Le régime hydrologique (débits de charriage, régime des niveaux et des débits) et la morphologie doivent présenter des caractéristiques proches de l'état naturel.











Urbanization:

- Flood volumes increases
- Peak discharge increases
- Time to peak discharge decreases

Retention and infiltration are necessary to achieve natural hydrological regime

(Butler and Davies)

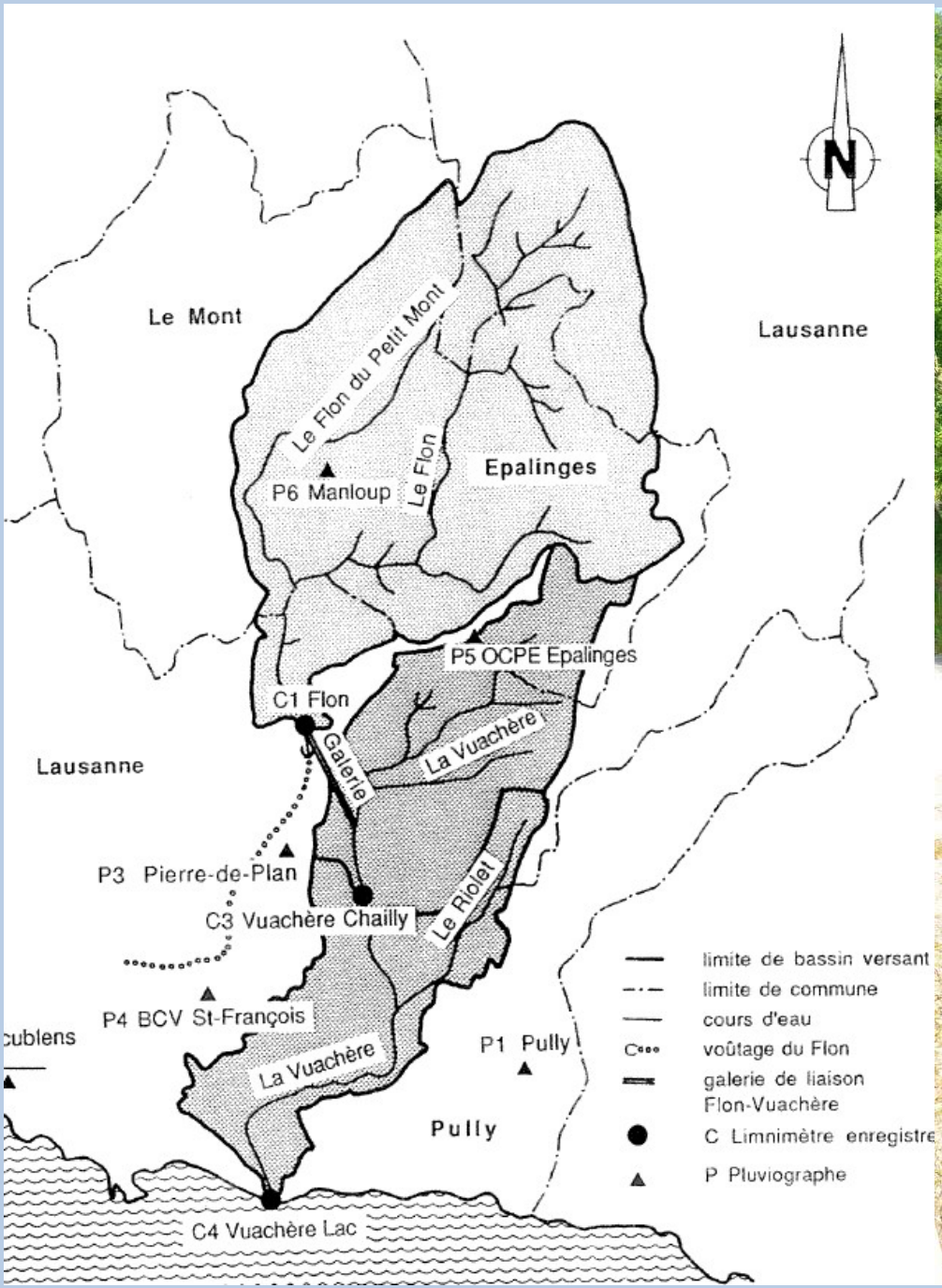
2.4 Not polluted water

Restitution of water in natural environment
(Act on water protection)

Quality of watercourses downstream of restitution

No	Paramètres	Exigences
1	Demande biochimique en oxygène *(DBO_5)*	2 à 4 mg/l O_2 La valeur inférieure est valable pour les eaux naturellement peu polluées.
2	Carbone organique dissous *(COD)*	1 à 4 mg/l C La valeur inférieure est valable pour les eaux naturellement peu polluées.
3	Ammonium *(somme de $N\text{-}NH_4+$) et $N\text{-}NH_3$)*	Pour une température: – supérieure à 10° C: 0,2 mg/l N – inférieure à 10° C: 0,4 mg/l N
4	Nitrate *($N\text{-}NO_3$-)*	Pour les cours d'eau qui servent à l'approvisionnement en eau potable: 5,6 mg/l N *(correspond à 25 mg/l NO_3-)*
5	Plomb *(Pb)*	0,01 mg/l Pb (total)[a] 0,001 mg/l Pb (dissous)
6	Cadmium *(Cd)*	0,2 µg/l Cd (total)[a] 0,05 µg/l Cd (dissous)
7	Chrome *(Cr)*	0,005 mg/l Cr (total)[a] 0,002 mg/l Cr (III et VI)
8	Cuivre *(Cu)*	0,005 mg/l Cu (total)[a] 0,002 mg/l Cu (dissous)
9	Nickel *(Ni)*	0,01 mg/l Ni (total)[a] 0,005 mg/l Ni (dissous)
10	Mercure *(Hg)*	0,03 µg/l Hg (total)[a] 0,01 µg/l Hg (dissous)
11	Zinc *(Zn)*	0,02 mg/l Zn (total)[a] 0,005 mg/l Zn (dissous)
12	Pesticides organiques (produits biocides et produits phytosanitaires)	0,1 µg/l pour chaque substance. Sont réservées les autres exigences fixées sur la base de l'appréciation des différentes substances dans le cadre de la procédure d'autorisation.

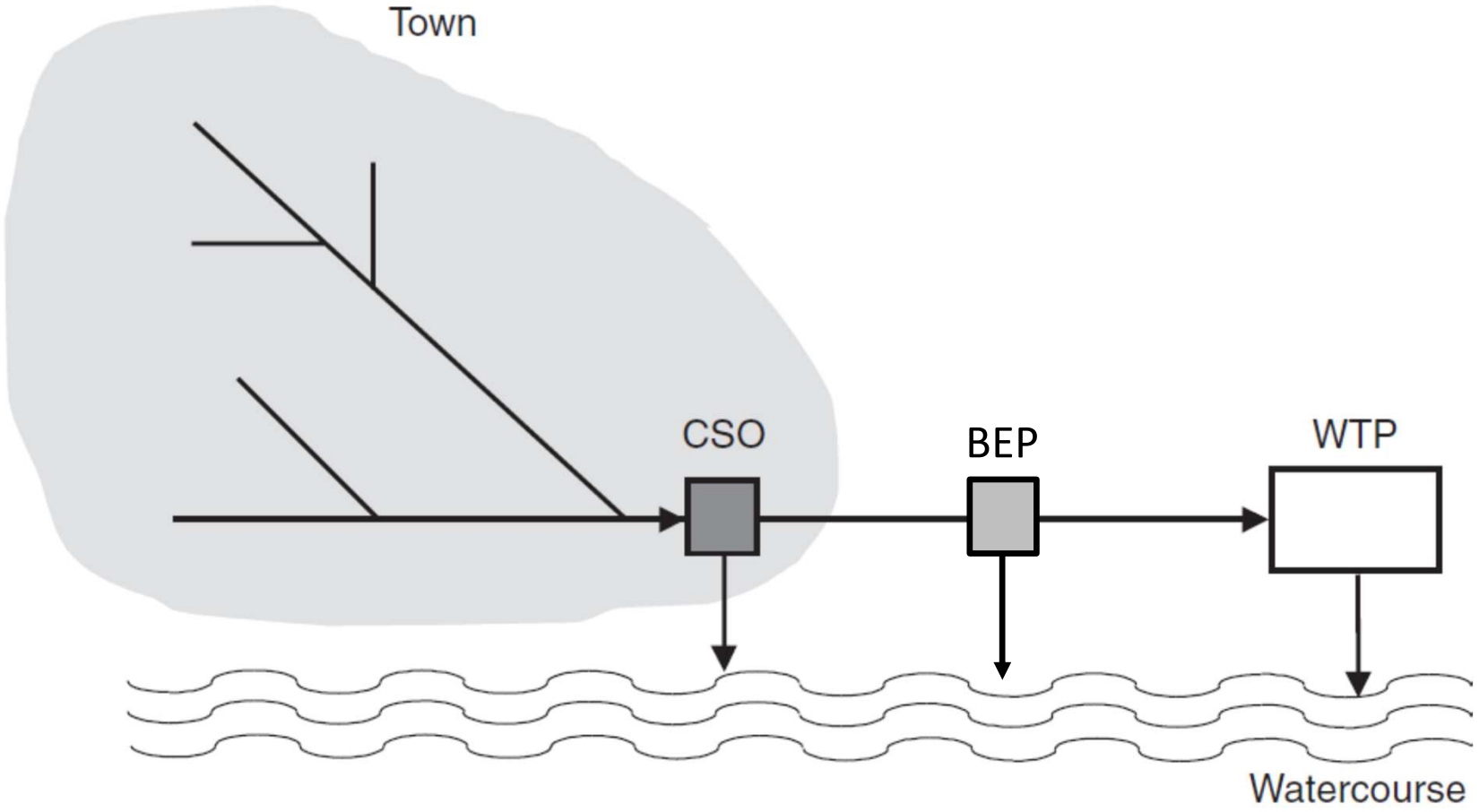
2.4 Bypass Flon-Vuachère



2.5 Sewer systems

2.5 Sewer systems

Combined system (Butler and Davies)
One single conduit for both, waste and storm water

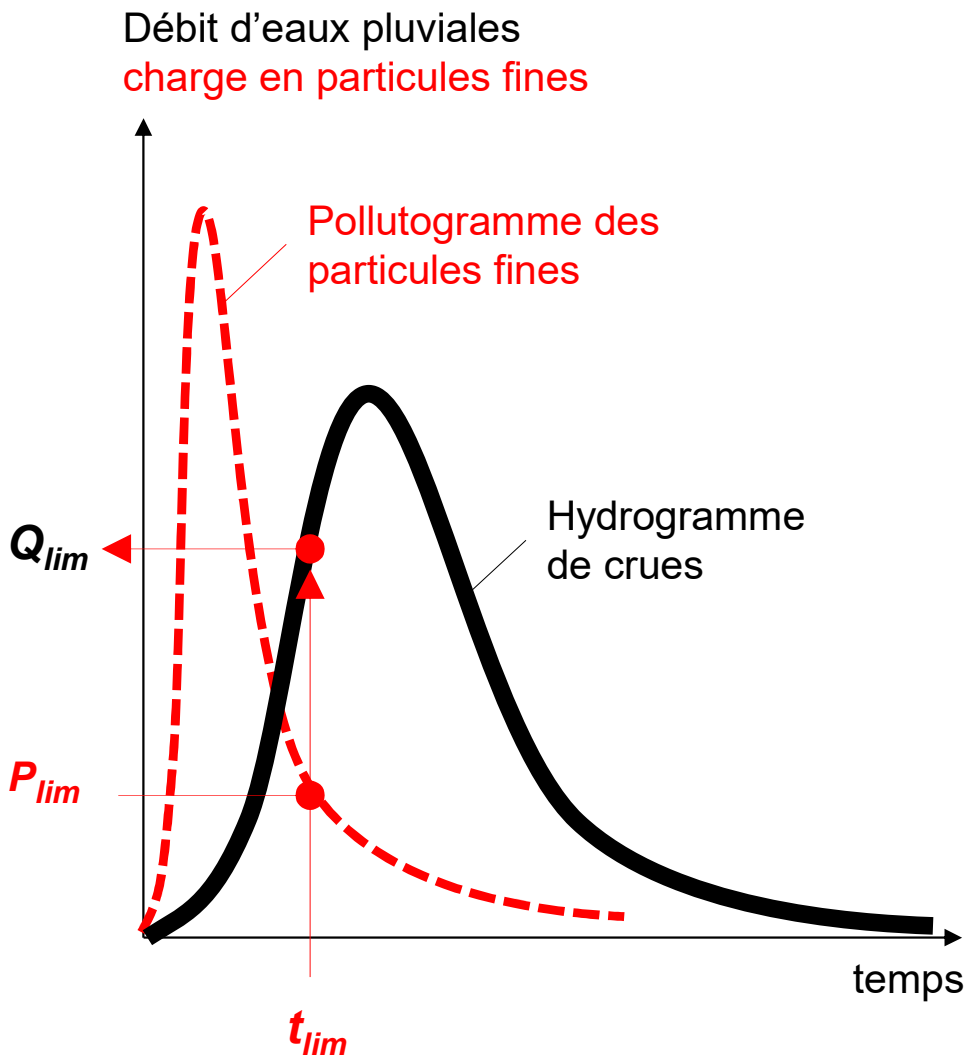


2.5 Sewer systems

Combined system
Challenge: First flush

Description schématique du phénomène de lavage des surfaces urbaines par les eaux pluviales

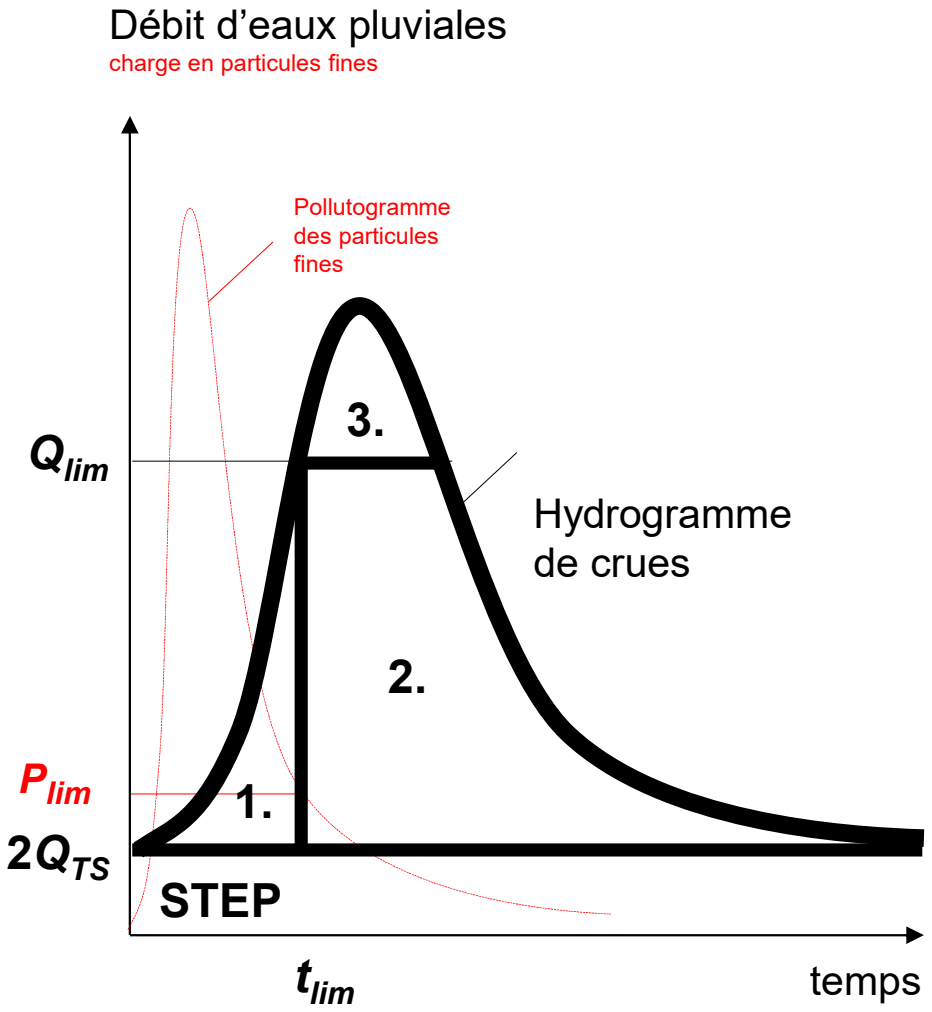
1. Durant les 1ers instants de la pluie les eaux sont très chargées
2. Puis par lessivage et dilution, la charge polluante diminue
3. Elle atteint un seuil admissible par le milieu naturel à t_{lim}
4. A ce moment, le débit correspondant est Q_{lim}



2.5 Sewer systems

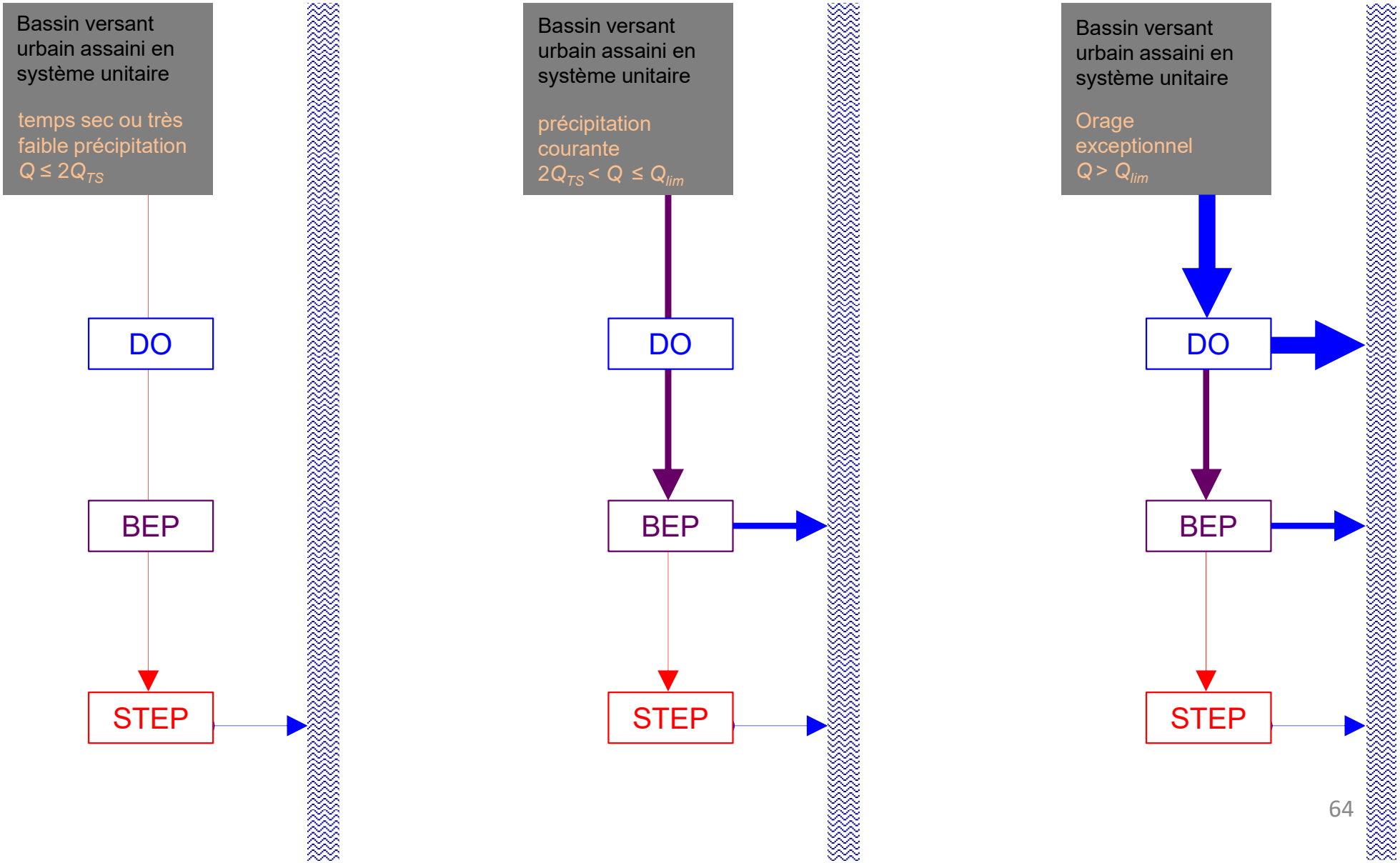
Combined system
Challenge: First flush

1. Le volume qui s'écoule durant $t \leq t_{lim}$ est piégé dans le BEP pour traitement différé à la STEP
2. Le volume qui s'écoule durant $t > t_{lim}$ et avec $Q \leq Q_{lim}$ est déversé sur le BEP après décantation ou dégrillage
3. Le volume qui s'écoule durant $t > t_{lim}$ et avec $Q > Q_{lim}$ est déversé sur un DO amont sans prétraitement



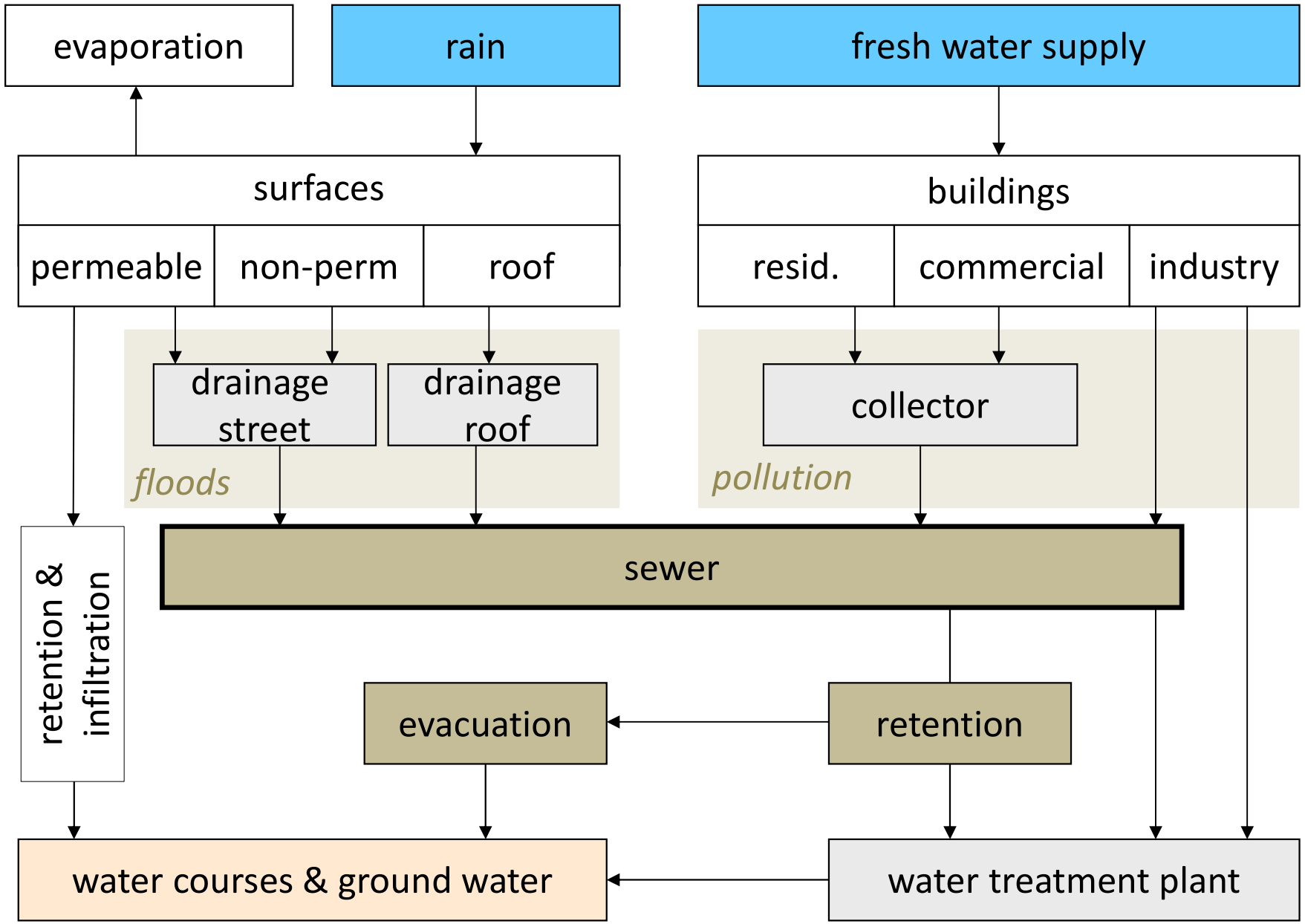
2.5 Sewer systems

Combined system



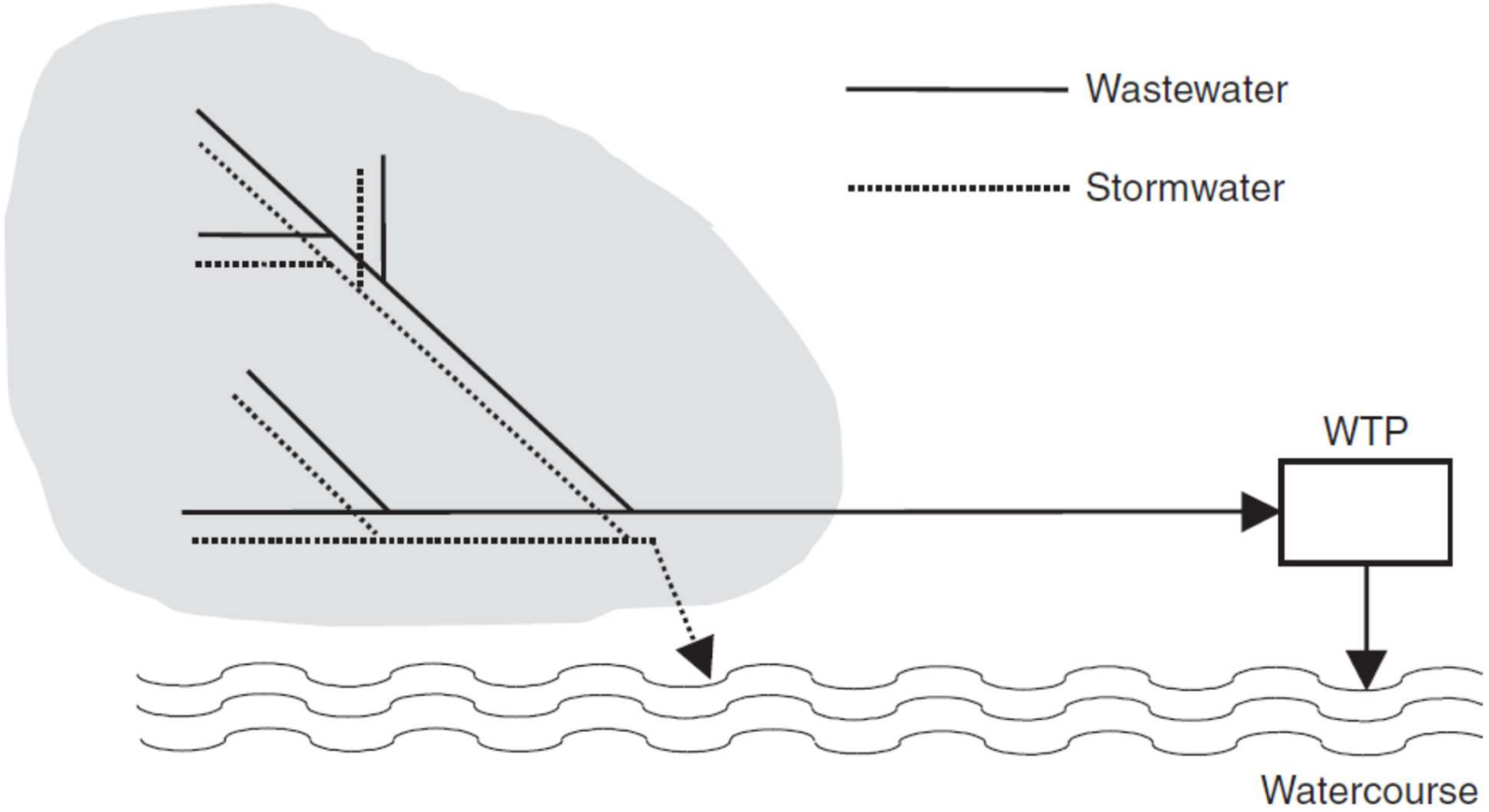
2.5 Sewer systems

Combined system (Butler and Davies)



2.5 Sewer systems

Separate system (Butler and Davies)
One conduit for wastewater, a second conduit for storm water

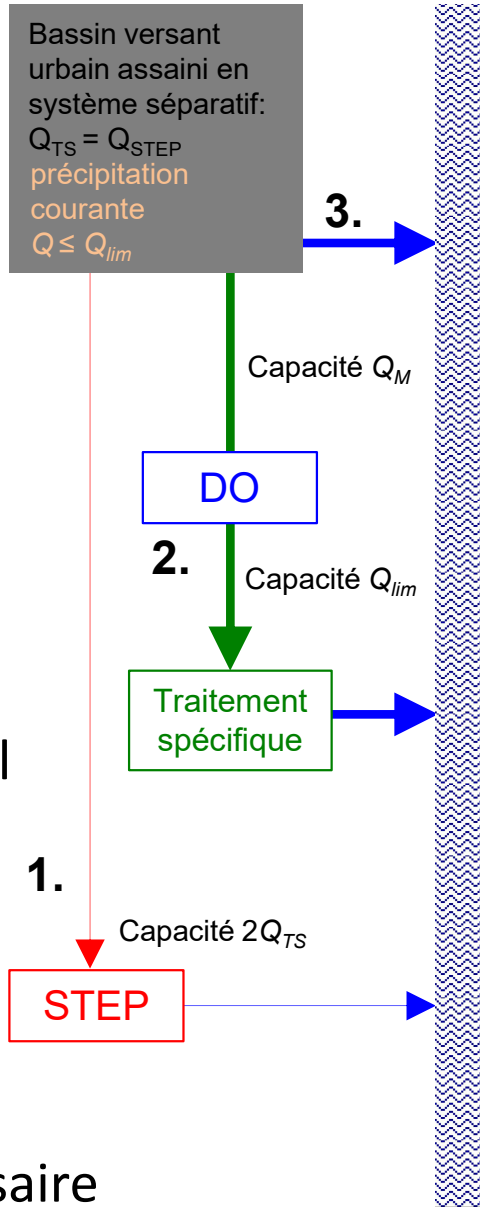


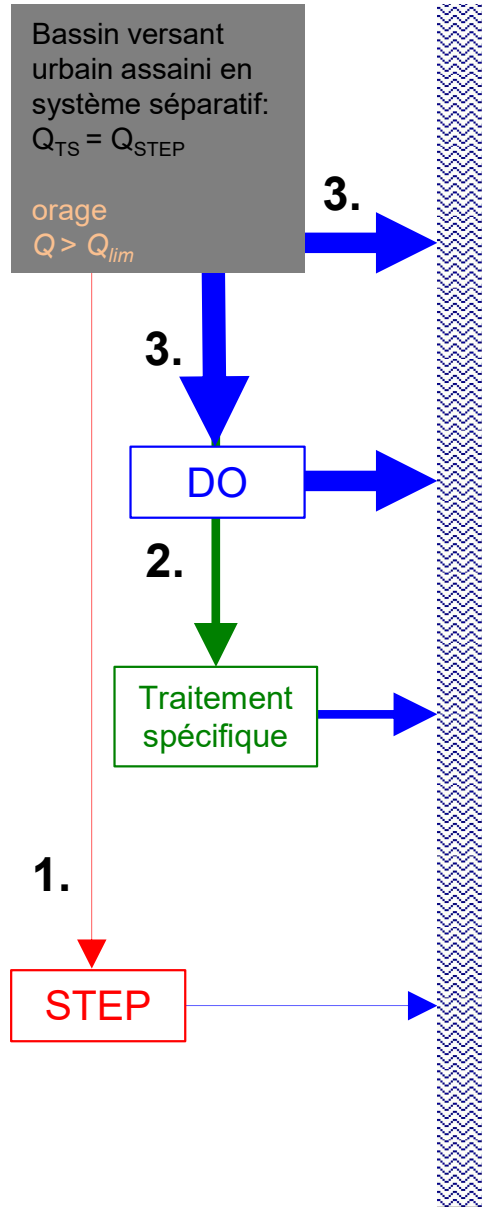
2.5 Sewer systems

Separate system

1. Les eaux usées sont évacuées à la STEP (Q_{TS})
2. Les eaux pluviales à forte charge polluante sont traitées de manière spécifique, si possible « à la source »
3. Les eaux pluviales à faible charge polluante sont restituées au milieu naturel sans traitement

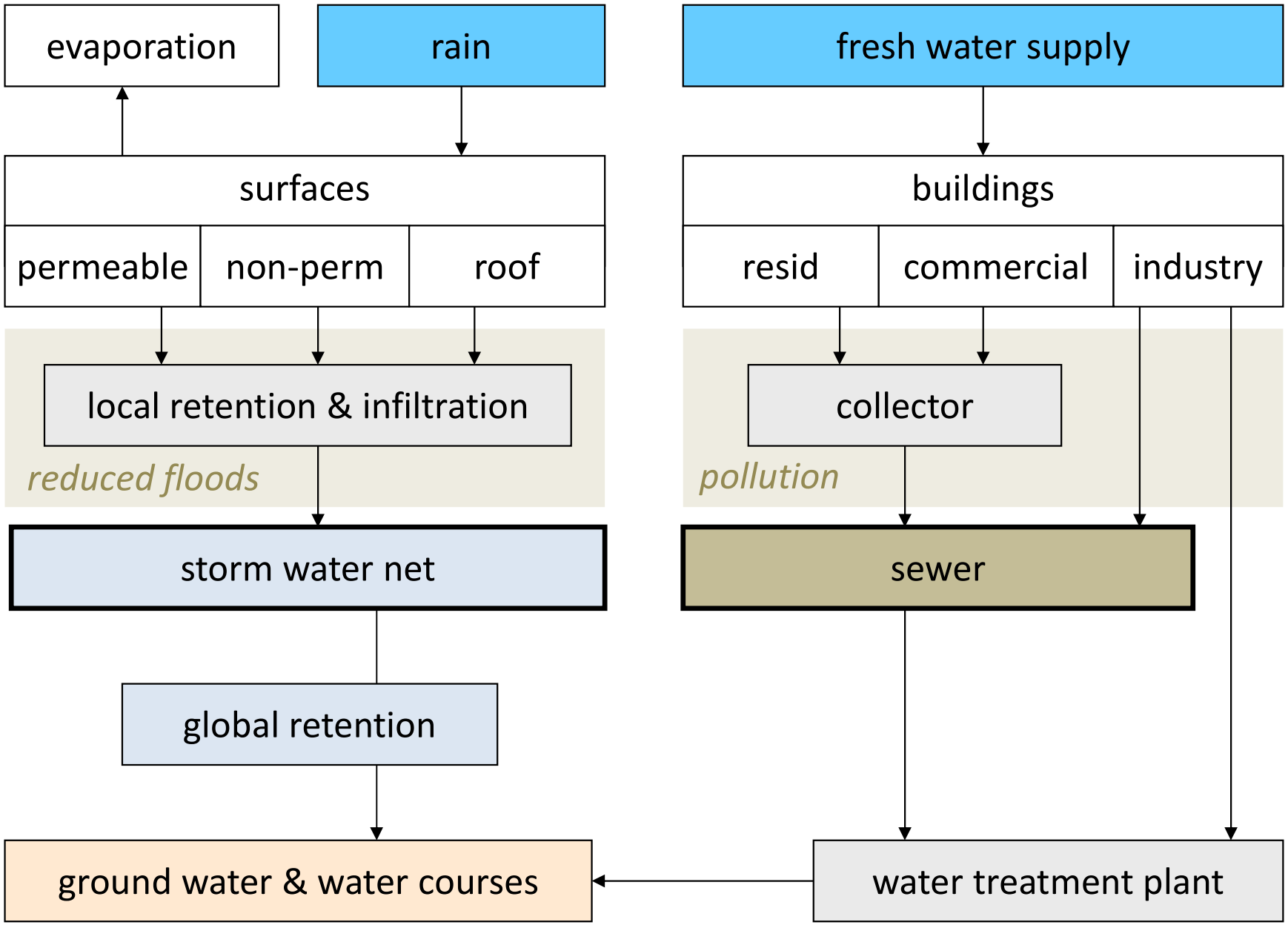
Si les débits de pointe d'eaux pluviales sont dommageables pour le cours d'eau, un système de laminage est nécessaire





2.5 Sewer systems

Separate system (Butler and Davies)



2.5 Sewer systems

Combined vs. separate system (I) (Hingray 2009)

separate	combined
✓ No retention or evacuation of wastewater	× Retention and evacuation of wastewater
✓ Approx. constant wastewater *Q*	× Variable wastewater *Q*
✓ +/- constant pollution in sewer	× Large variation of pollution
✓ Small treatment plant capacity	× Large treatment plant capacity
✓ Limited storm water pumping on demand	× Powerful wastewater pumping (if required)
✓ Optimal route for individual systems	× Same route for both systems, long connections and deviations
✓ Small sewer with large min. velocity, few deposits	× Large system with deposits in dry periods

2.5 Sewer systems

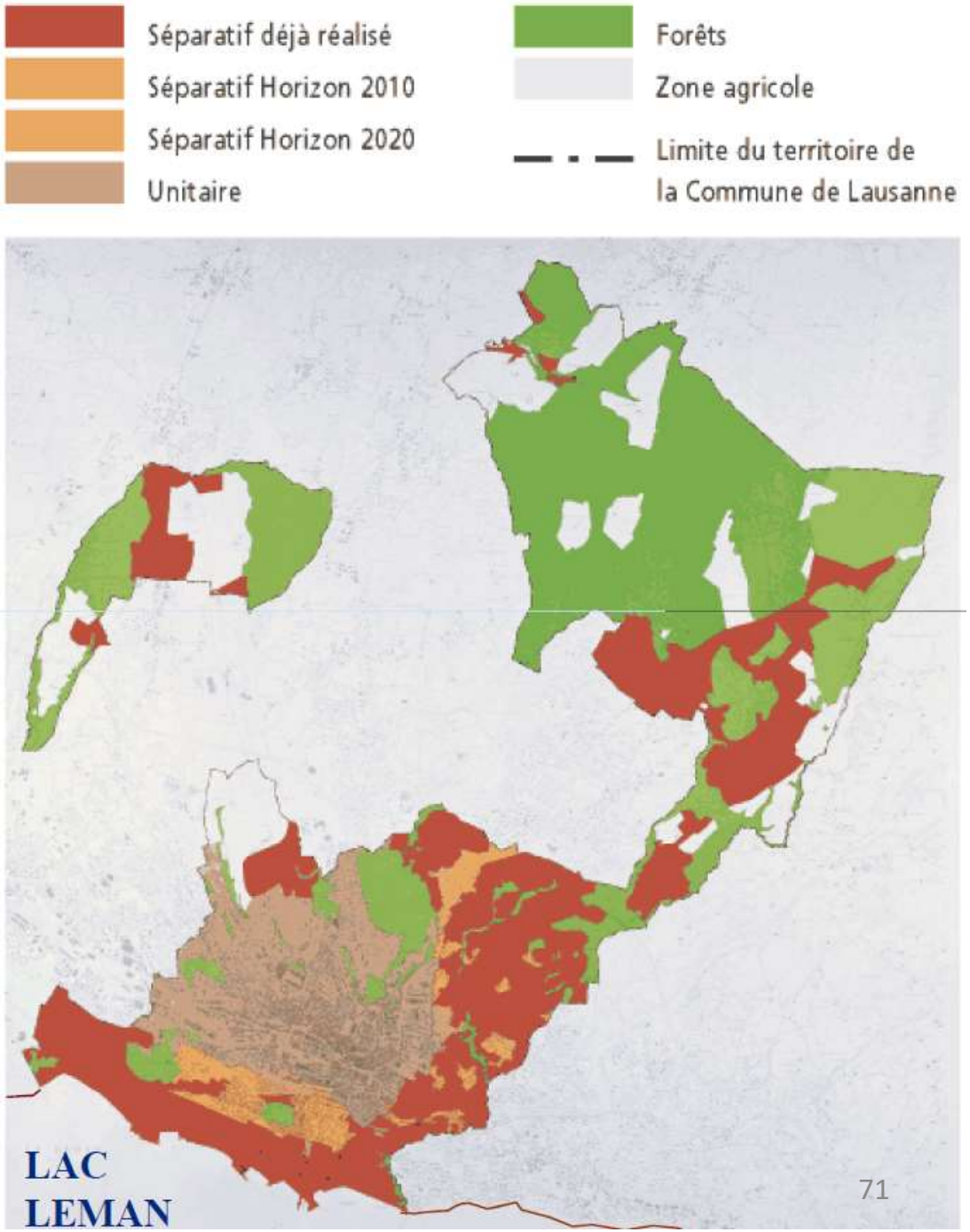
Combined vs. separate system (II) (Hingray 2009)

separate	combined
✓ No rack cleaning for storm water	× Rack cleaning
✓ Inundation with not polluted storm water	× Inundation of wastewater plus storm water
× Space for two systems needed	✓ One system, less space needed
× Expensive modification in city centre (combined → separated)	✓ Existing (historic) system is used
× More connections to houses, risk of faulty connections	✓ Simple connection to houses
× No sewer flushing by storm rain	✓ Sewer flushing during floods
× No treatment of first-flush water	✓ Partial treatment of storm water
× Two systems	✓ One system

2.5 Sewer systems

Combined vs. separate system:
Example Lausanne

Historically, the sewers are combined systems
Why?



2.6 PGEE

2.6 PGEE

Waters Protection Ordinance (814.201)

Art. 5 Communal drainage planning
The cantons shall ensure that general drainage plans (GDP) are drawn up which guarantee adequate waters protection in communes and effective drainage of housing areas.

The GDP shall specify as a minimum:

- areas that must be served by public sewers
- areas in which non-polluted water must be allowed to infiltrate
- areas in which non-polluted water must be discharged into surface waters
- measures by which non-polluted water with permanent flow must be kept away from treatment plants
- the locations where treatment plants must be set up, and with which treatment system and capacity

2.6 PGEE

Main goal of PGEE (VSA)

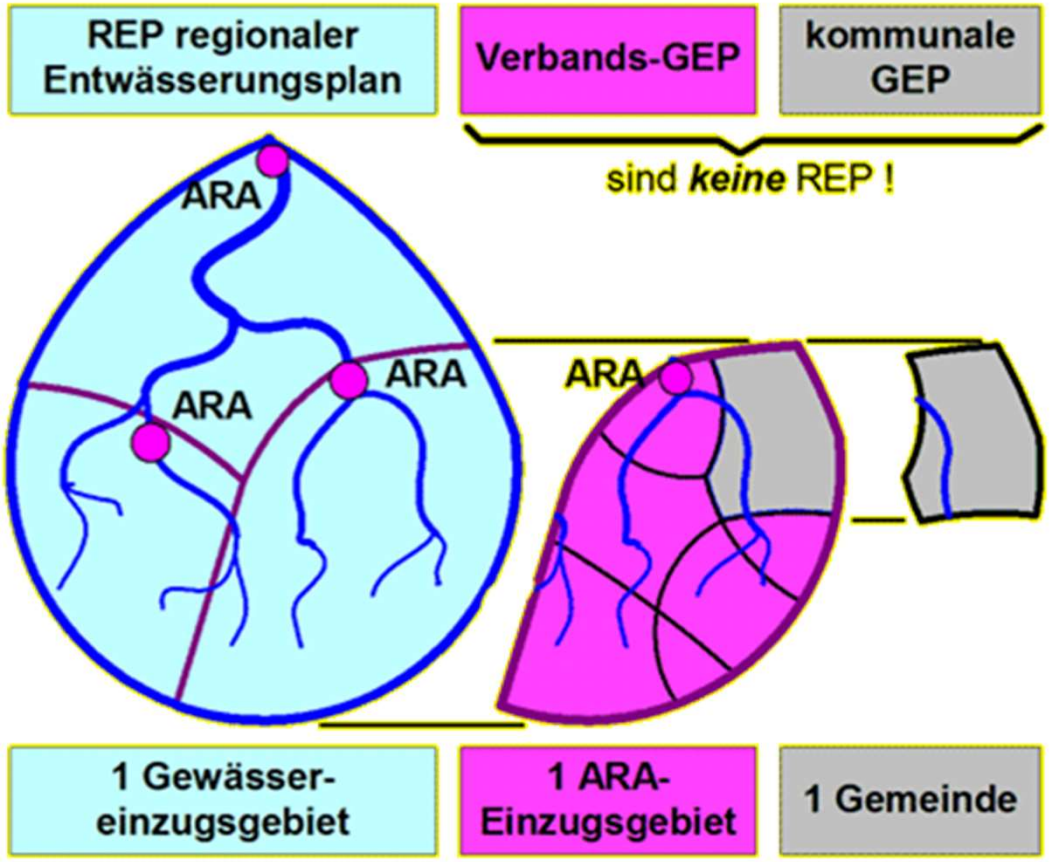
- Rain and wastewater are collected in a economic and save way, so that they are spilled directly to restitution or a treatment plant
- Regulates all aspect of urban hydraulic systems related to precipitation and wastewater
- Documentation of systems and their characteristics

Two project phases

- Collection of basic data: land map, status of present systems, catchment, precipitation, water courses, sewer system, infiltration, risks, relevant discharges
- Elaboration of project: evacuation concept, pre-project, sewer system with special elements, clear water retention and infiltration, regulation of discharges, maintenance and realization.

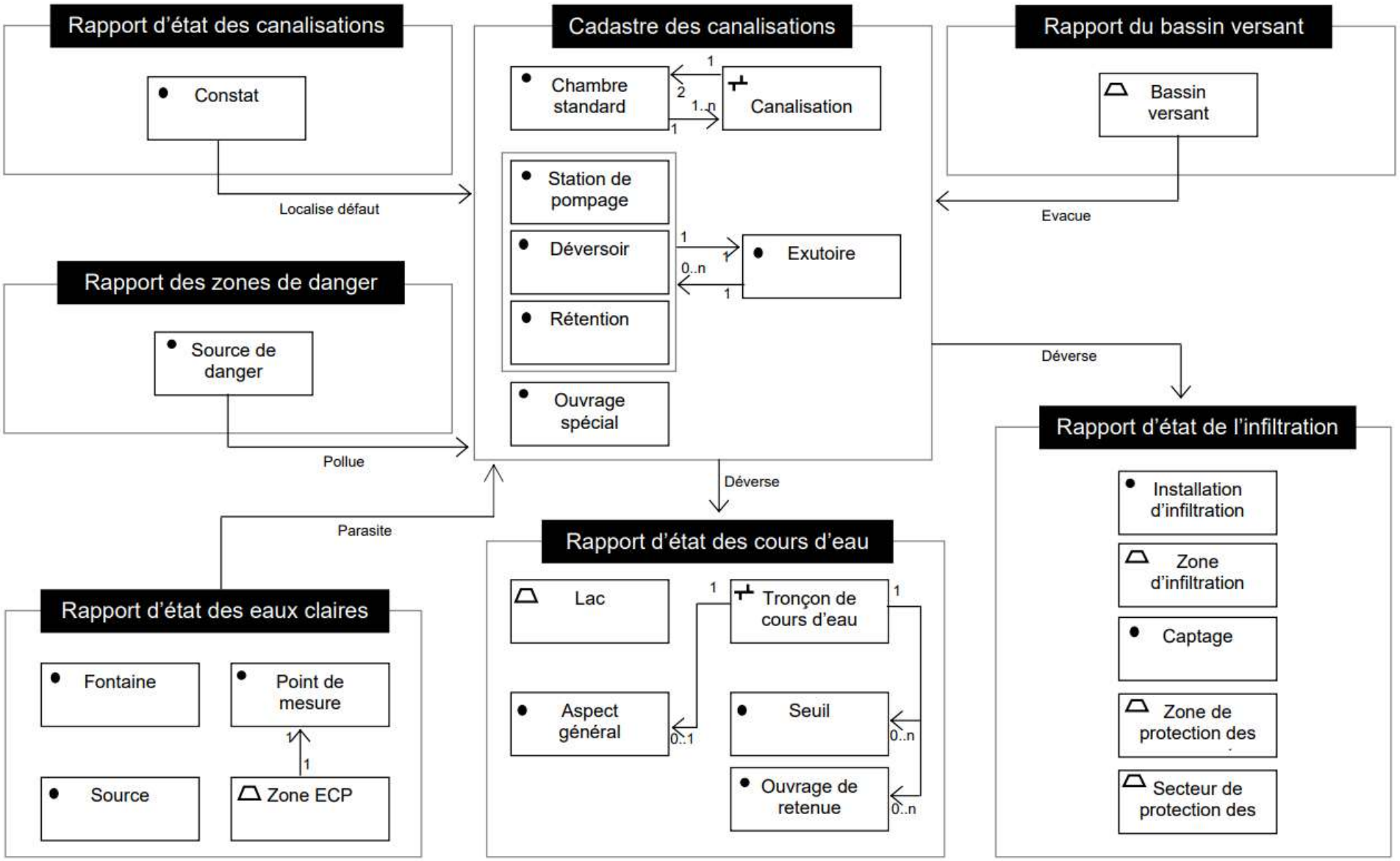
2.6 PGEE

Définition (Der regionale Entwässerungsplan, VSA 2000)



2.6 PGEE

Schéma général de structuration des données des PGEE (Canton du Valais)



Exercice

Presentations

1. Federal Act on water protection (814.20)
2. Federal Ordinance on water protection (814.201)
3. SIA Code 190 Sewers (library)
4. Book “Die Canalsiation von Berlin”

2.7 Pro memoria

2.7 Pro memoria

Legal aspects

- The pollution of the water courses drastically increased in 1970 to 1980
- Law and act on the protection of water were established in 1991 and 1998. They:

… regulate financing of water treatment
… protect water from pollution
… maintain the natural characteristic of water courses
… allow use of water
… regulate the water quality of water courses and of treatment plant restitution into natural environment

- Polluted water has to be supplied to the sewer and to be treated
- Surface run-off is considered as not contaminated and has to be infiltrated

2.7 Pro memoria

Conceptual aspects

- Overview of systems: storm water drainage/retention/infiltration, fresh water net, sewer (circuit of urban water)
- Combined sewer: one system for storm and waste water. High discharge peaks (retention u/s of STEP) and polluted discharge. Suboptimal regime in treatment plant, evacuation of polluted water
- Separate sewer: one system for storm water and one for waste water. Separation of flood peaks and polluted discharge. Constant inflow of STEP, infiltration and partial retention of storm water
- plans généraux d'évacuation des eaux PGEE as frame for flood protection and sewer systems: as guide line for all related projects and requested by law

Questions?