

New approaches and solutions towards water management

Luca Rossi, VSA/EPFL
luca.rossi@vsa.ch
Luca.rossi@epfl.ch



VSA - Swiss water association

80 years old, 1600 members, turnover 6 Mio CHF

Supporting the development of innovative approaches to water management (micropollutants, sponge city, state of the art...)

Publication of guidelines, implementation tools

Training of professionals

Promotion of the next generation of professionals

<https://sponge-city.info/>



plate-forme d'information ville éponge // sponge-city.info
pour une gestion de l'eau adaptée au climat en milieu urbain

DE FR IT

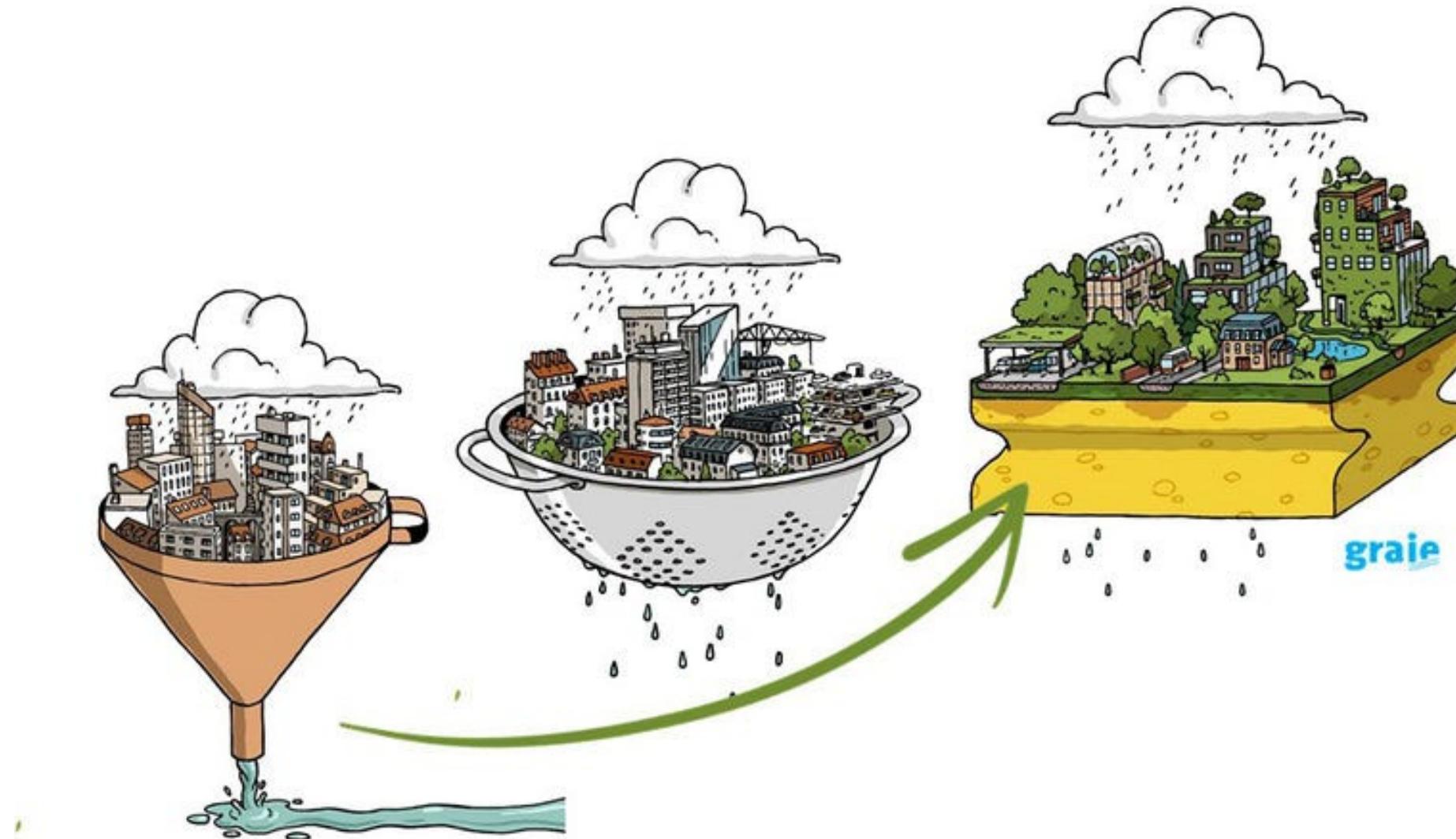
GLOSSAIRE CONTACT

BONS EXEMPLES OUTILS ÉVÉNEMENTS & FORMATIONS NOTRE RÉSEAU

Biotope avec fonction de retenue d'eau en cas de pluies intenses dans le Parco Casarico

AVEC LE CONCEPT VILLE ÉPONGE VERS UN ESPACE
URBAIN DE QUALITÉ ET ADAPTÉ AU CLIMAT

Sponge city concept



Urban hydrology (4 ECTS, since 2013)

MAS Urban and territorial Design - [Paola Viganò](#)

Master / Design Project / Bachelor supervision

VSA in the SIE advisory board

EPFL water management plan

Intervention in:

- ENV 462, Yves Kazemy, Urban Green&Blue infrastructure and global warming
- ENV 526, Gabriele Manoli, Climate and water sensitive urban design

Verband Schweizer
Abwasser- und
Gewässerschutz-
fachleute
Association suisse
des professionnels
de la protection
des eaux
Associazione svizzera
dei professionisti
della protezione
delle acque
Swiss Water
Association



Europastrasse 3
Postfach, 8152 Glattbrugg
sekretariat@vsa.ch
www.vsa.ch
T: 043 343 70 70

Rapport VSA EPFL

Plan de gestion global des eaux de l'EPFL



Luca Rossi, responsable romand VSA
Jeanne Estienne, Master EPFL

Lausanne, 05.12.2023

Sponge city concept



1. Overview of the EPFL case - analysis of potential objectives
2. Experimentation underway at EPFL: Dan Andersson
3. Example of a case study



Sponge campus EPFL: goals?

1. Conform to current legislation
2. Integrate EPFL into a broader context (watershed approach)
3. Limit the impact of climate change
4. Limit environmental impacts
5. Develop a pleasant living environment for students/researchers
6. Promote innovative technologies in water management
7. Develop/transform the campus in a sustainable manner
8. ...all at reasonable, controlled costs!

Verband Schweizer Abwasser- und Gewässerschutzfachleute
Association suisse des professionnels de la protection des eaux
Associazione svizzera dei professionisti della protezione delle acque
Swiss Water Association



Europastrasse 3
Postfach, 8152 Glattbrugg
sekretariat@vsa.ch
www.vsa.ch
T: 043 343 70 70

Rapport VSA EPFL

Plan de gestion global des eaux de l'EPFL



Luca Rossi, responsable romand VSA
Jeanne Estienne, Master EPFL

Lausanne, 05.12.2023

Sponge campus EPFL - Goal 1: legislation



Swiss constitution

Art. 74 Protection of the environment

¹ The Confederation shall legislate on the protection of the population and its natural environment against damage or nuisance. [...]

Art. 76 Water

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.



Sponge campus EPFL - Goal 1: legislation



Climate change → objectives well defined in Switzerland !

- Objectif climat 2050
- Objectif zéro net 2050

Which are expressed in laws:

- Loi CO₂ (RS 674.11), article 8
- LAT (RS 700), art. 1 al. 2a, art. 3 al.3b
- ...

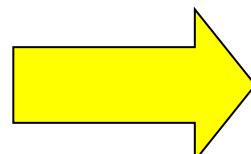


Sponge campus EPFL - Goal 1: legislation



LEaux objectives (Art. 1 RS 814.20), long before talking about “Sponge City”

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



Global vision, including both the Human being and the environment

Sponge campus EPFL - Goal 1: legislation



LEaux objectives (Art. 1 RS 814.20), long before talking about “Sponge City”

2019

Art. OEAUX – Discharge of water

² *Unpolluted water must be evacuated by infiltration in accordance with cantonal regulations. [...]*

1991

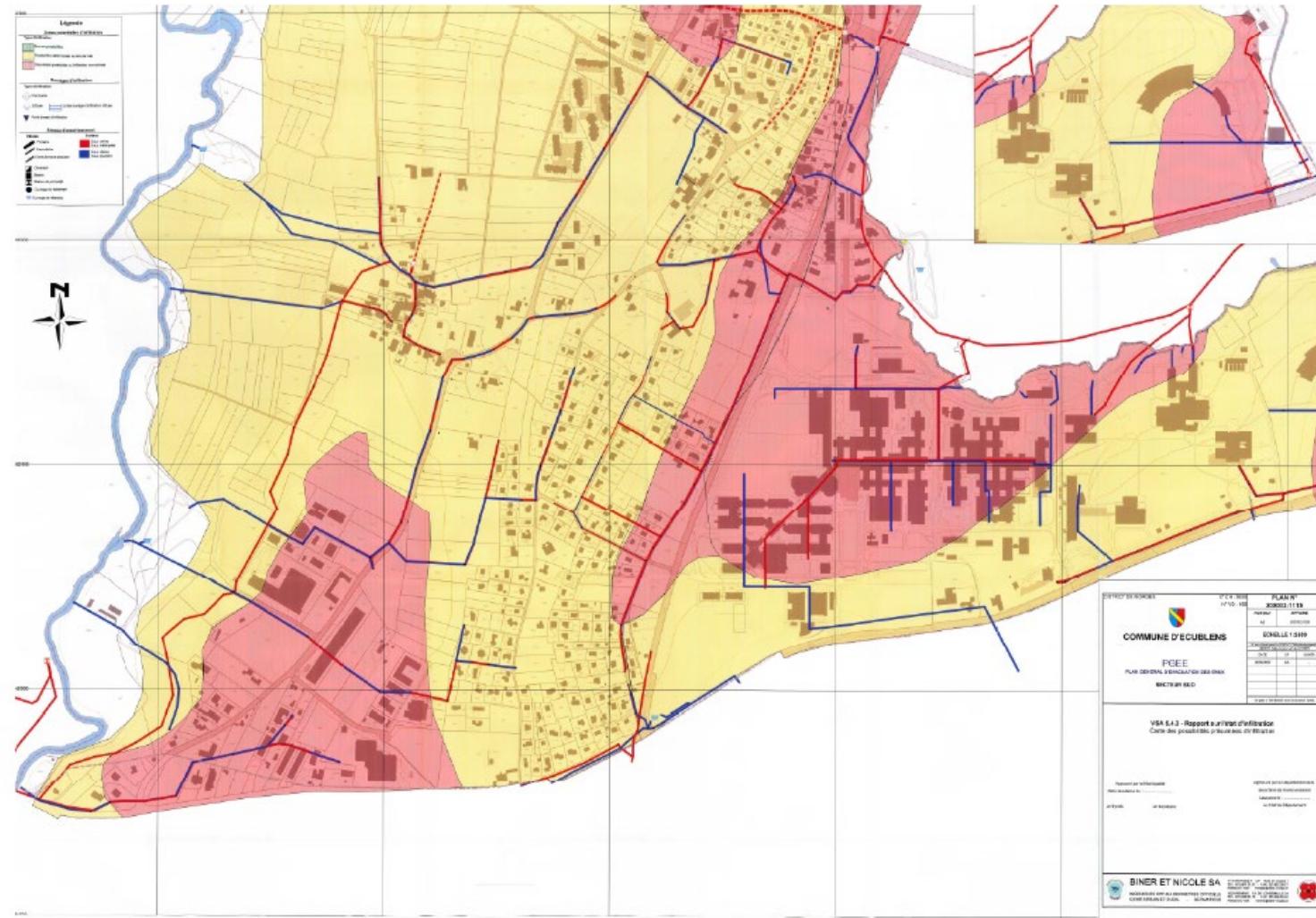
Zero priority: Check if stormwater runoff can be avoided or reduced



Sponge campus EPFL - Goal 1: legislation



Water management in Switzerland: municipal level (PGEE), LEaux Art. 5



Map of infiltration areas, PGEE Ecublens

Sponge campus EPFL - Goal 1: legislation

Unpolluted water? Infiltration ????

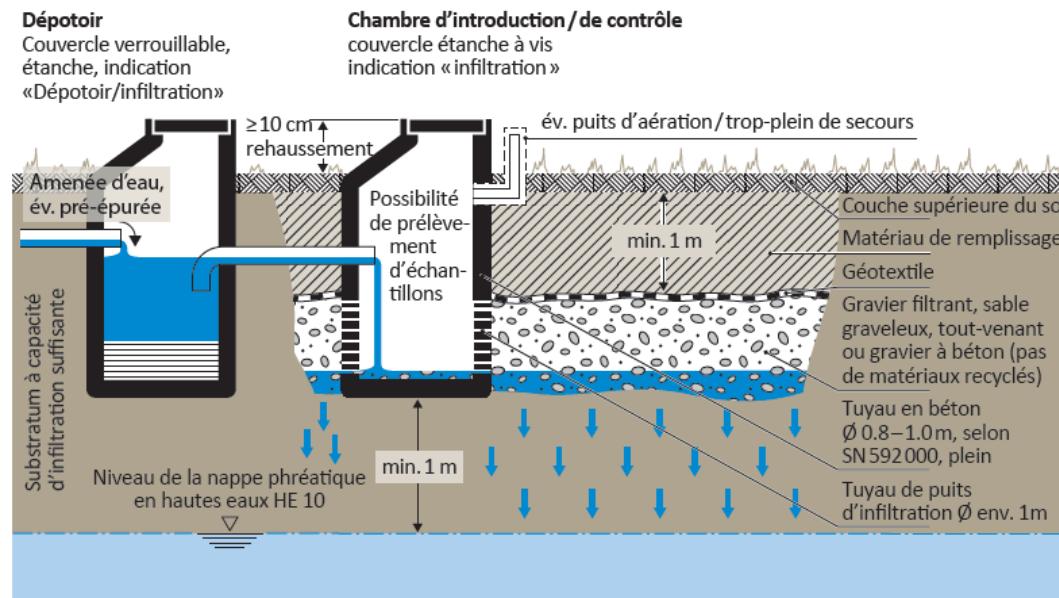
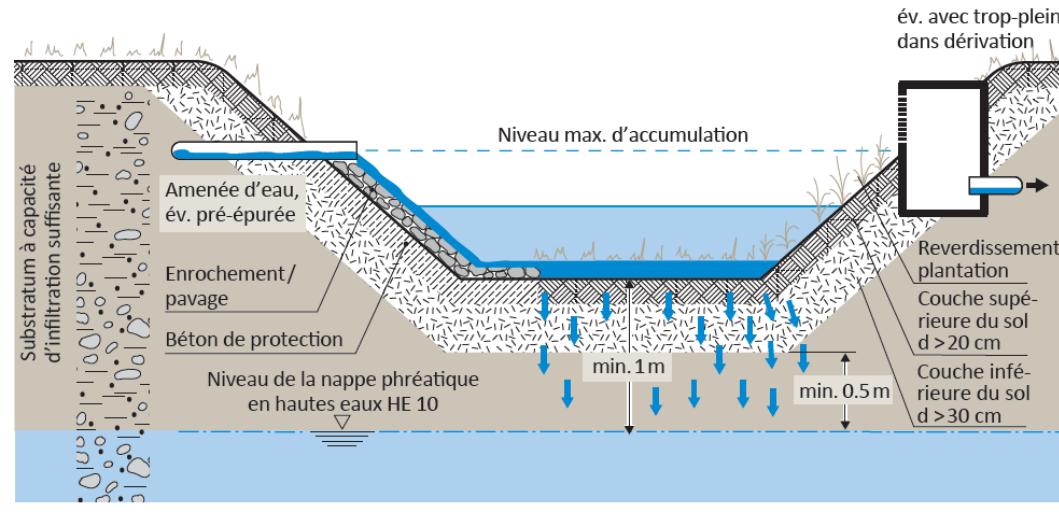


Classification	Somme des points	Classe de pollution
Pour les routes, le nombre de points de pollution est traduit par les classes de pollution suivantes	<5 points	faible
	5–14 points	moyenne
	>14 points	élevée
Pollution des eaux de ruissellement de chaussées		
Se compose des éléments suivants	Pollution de base + \sum (PP critères)	Points de pollution [PP]
1. Pollution de base	Points de pollution (PP)	Remarques
Fréquence du trafic	Pollution de base = DTV/1000	Pour l'horizon de planification (TJM = trafic journalier moyen)
2. Critères	Points de pollution (PP)	Remarques
Part de trafic lourd	1 pour part 4–8% 2 pour part >8%	Pour l'horizon de planification
Pente	1, si pente >8%	Pour l'horizon de planification
Tronçon de route à l'intérieur d'une localité	1	
Nettoyage des routes	Nombre de nettoyages mécaniques par mois	

Sol	Horizon A Couche supérieure	Couche meuble et friable de matière minérale désagrégée enrichie de matière organique (humus), intensément habitée et parcourue de racines, le plus souvent (brun-)noir.
	Horizon B Couche inférieure	Couche le plus souvent moins fortement désagrégée, nettement moins habitée, moins parcourue de racines, pas ou peu humique et le plus souvent plus claire (brun rouille à brun clair) et à densité plus élevée que l'horizon A.
	Horizon C Sous-sol	Matériel minéral initial peu ou pas désagrégé, à peine habité et parcouru de racines, à densité plus élevée que dans l'horizon B et sans matière organique.



Sponge campus EPFL - Goal 1: legislation



Sponge campus EPFL - Goal 1: legislation



Example Canton Basel City: Obligation to install green roofs



Tram-Depot Wiesenplatz in Basel, projet „Meadow Teppich“

Kanton Basel-Stadt

Bau- und Planungsgesetz

730.100

Bau- und Planungsgesetz (BPG)

Vom 17. November 1999 (Stand 1. August 2022)

5. Dachflächen

§ 72. Ungenutzte Flachdächer sind mit einer Vegetationsschicht zu überdecken.

«Any unused flat roofs must be covered with a layer of vegetation»

NEW (18.09.2024): new water law that respects water resources and is adapted to climate change.

Sponge campus EPFL - Goal 1: legislation



New PGEE – WWTP watershed

2025

PGEE 2025

«...Climate-appropriate drainage planning, which follows the concept of the "sponge city" and integrates rivers more broadly, thematizing surface runoff. Groundwater protection is more taken into account....»

Verband Schweizer Abwasser- und Gewässerschutz-
Föderation
Association suisse des professionnels de la protection des eaux
Associazione svizzera dei professionisti della protezione delle acque
Swiss Water Association

Guide du PGEE 2023



2023

Sponge campus



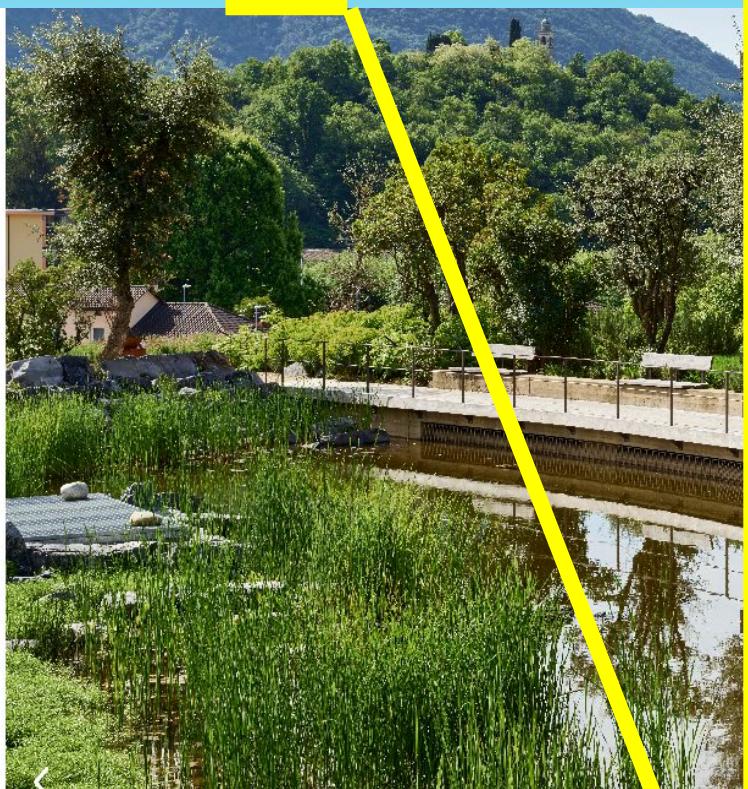
plate-forme d'information ville éponge

pour une gestion de l'eau adaptée au climat en milieu urbain

BONS EXEMPLES

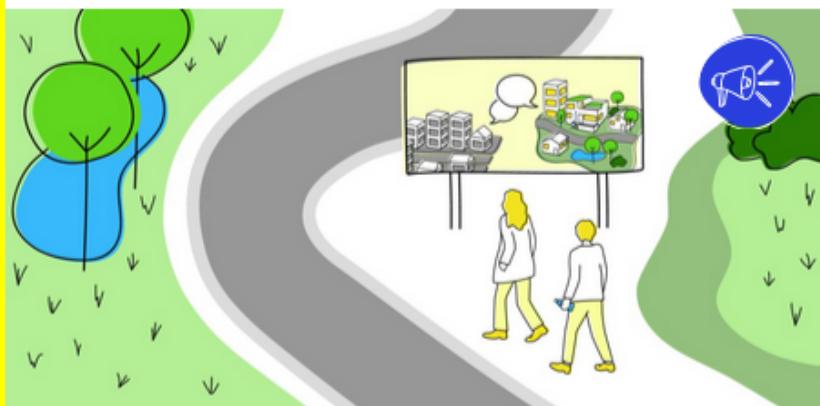
OUTILS

ÉVÉNEMENTS & FORMATIONS



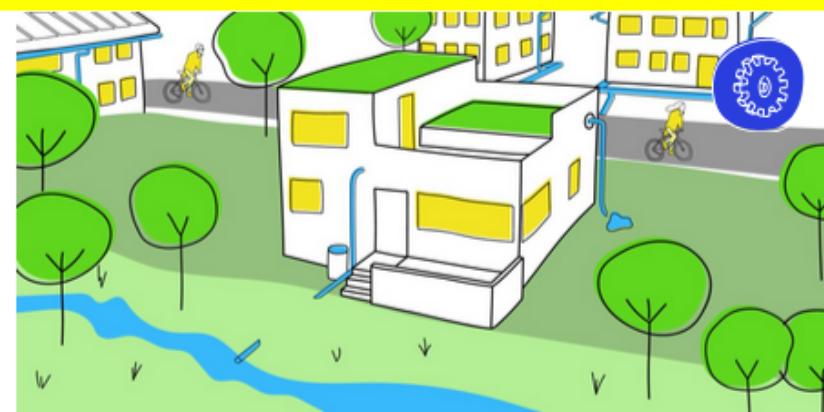
Instruments formels

Recommandations pour les plans directeurs, les plans d'affectation et les plans d'affectation spéciaux, dispositions types, modèles de financement et autres indications sur les instruments contraignants pour les autorités ou les propriétaires.



Outils de conseil et de sensibilisation

Matériel de sensibilisation du public et de formation tel que des flyers, des fiches techniques, des vidéos et des podcasts, des indications sur des pièces pour des expositions, etc.



Gestion et entretien

Documents et liens vers des portails de connaissances en ligne contenant des indications sur l'entretien, le contrôle des résultats, le service hivernal et autre.



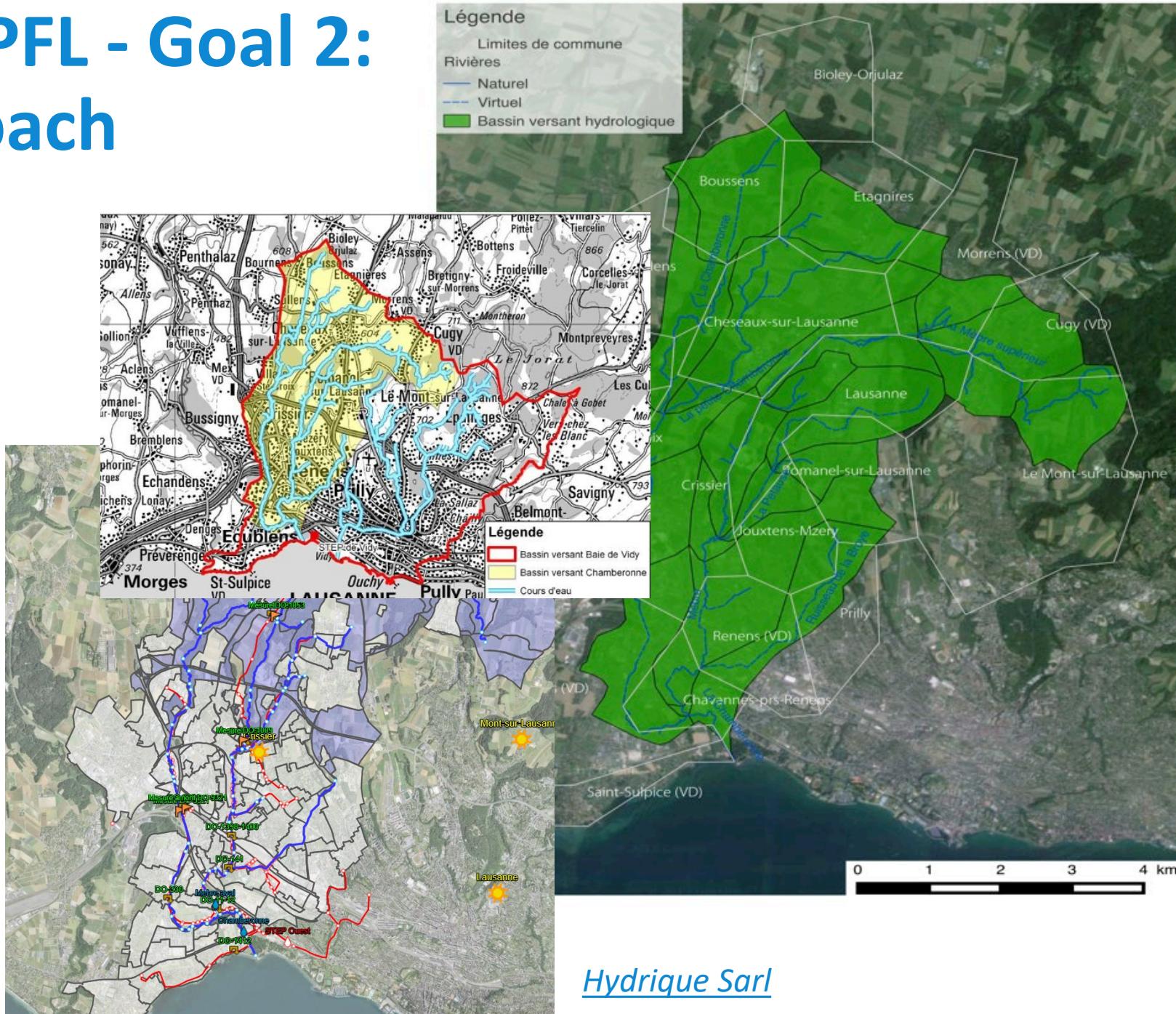
Planification

Aides à la planification, guides, recommandations, fiches techniques sur des questions fréquentes, liens vers différents outils numériques (outils en ligne, logiciels, etc.).

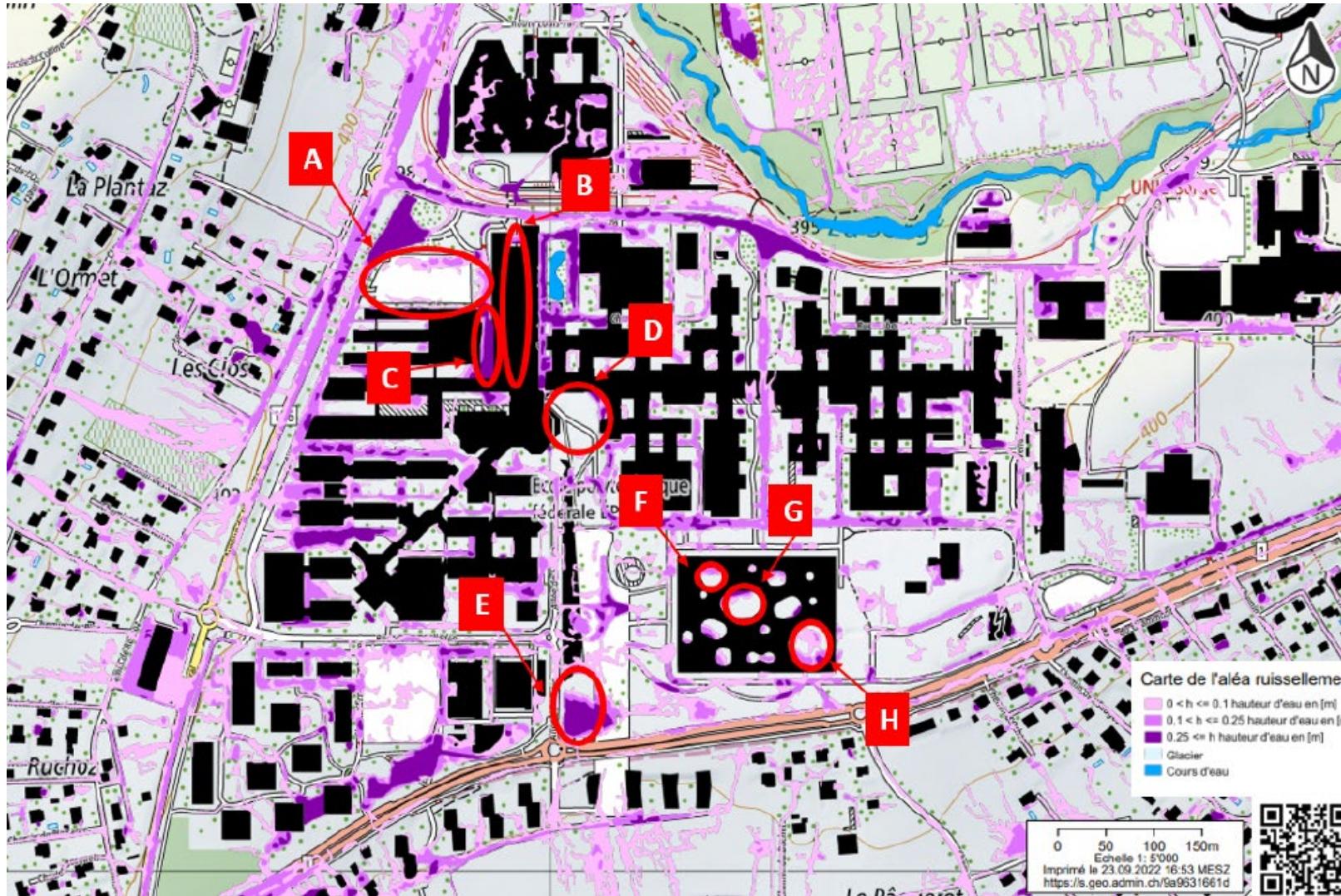
Sponge campus EPFL - Goal 2: Larger scale approach

Canton Vaud: 1st regional approach (Chamberonne PREE)

- Watershed: 41 km²
- 21 municipalities
- ~77'000 inhabitants connected to the Vidy WWTP
- 19% impermeable areas



Sponge campus EPFL: Goal 3: To limit climate change impacts

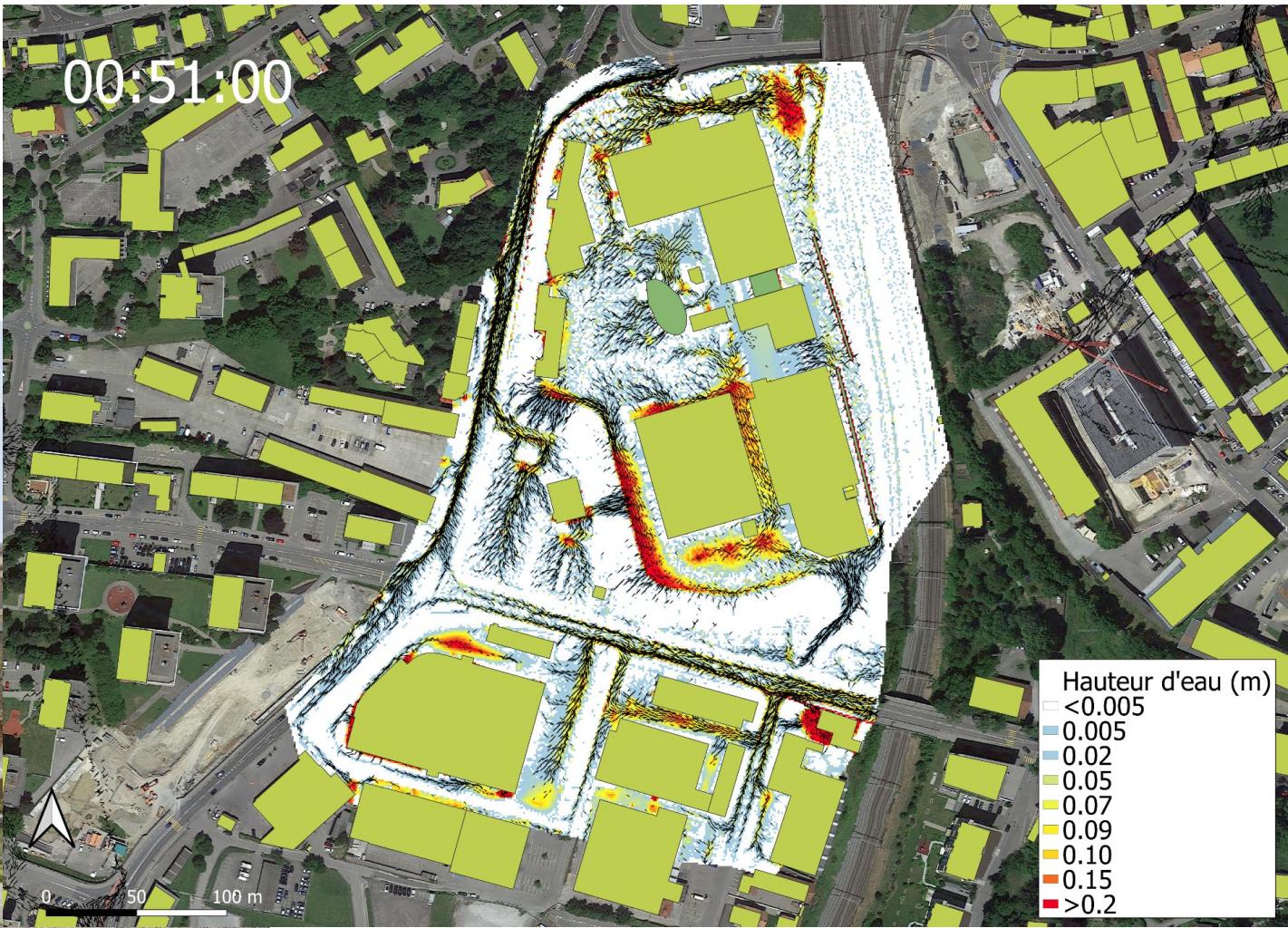


<https://www.bafu.admin.ch/bafu/fr/home/themes/dangers-naturels/dossiers/carte-dangers-alea-ruissellement.html>

Sponge campus EPFL: Goal 3: To limit climate change impacts



Example of an innovation district
Bluefactory (Fribourg): Sponge city
approach “absorbs” a 300-year return
period rainfall → **Gain one floor on a
building !**

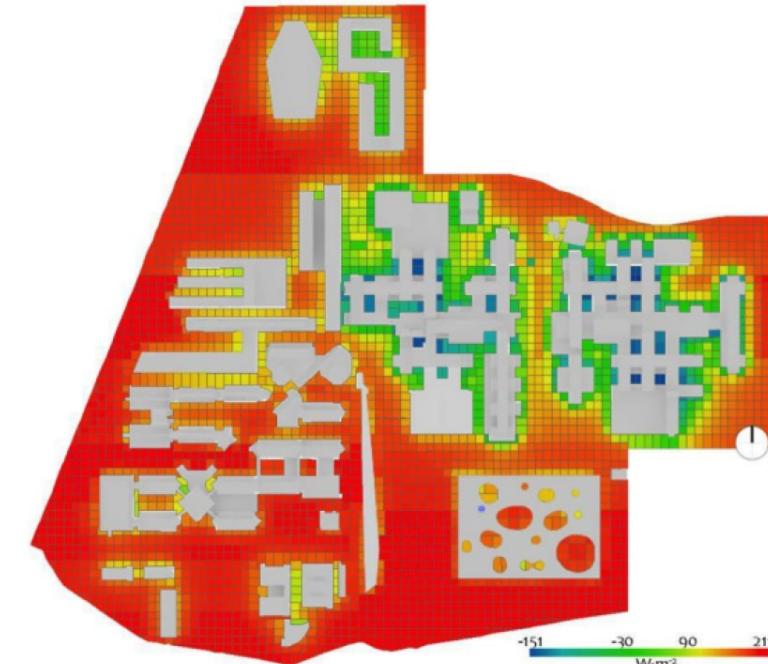


Sponge campus EPFL: Goal 3: To limit climate change impacts



Canton de Vaud, 2021

Commune d'Ecublens: températures supérieures à la moyenne



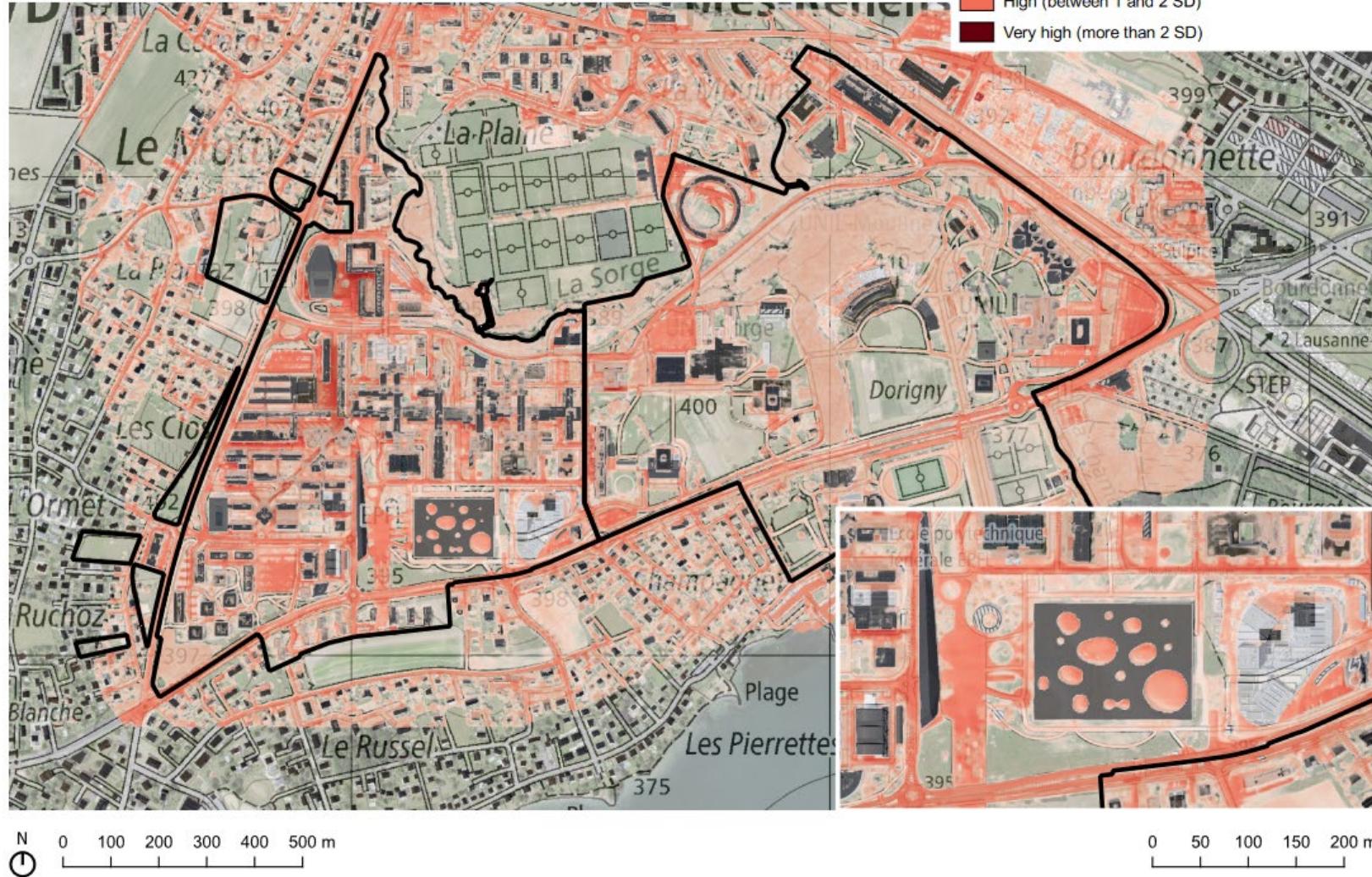
LESO ([Evangelista, 2018](#))

Sponge campus EPFL: Goal 3: To limit climate change impacts

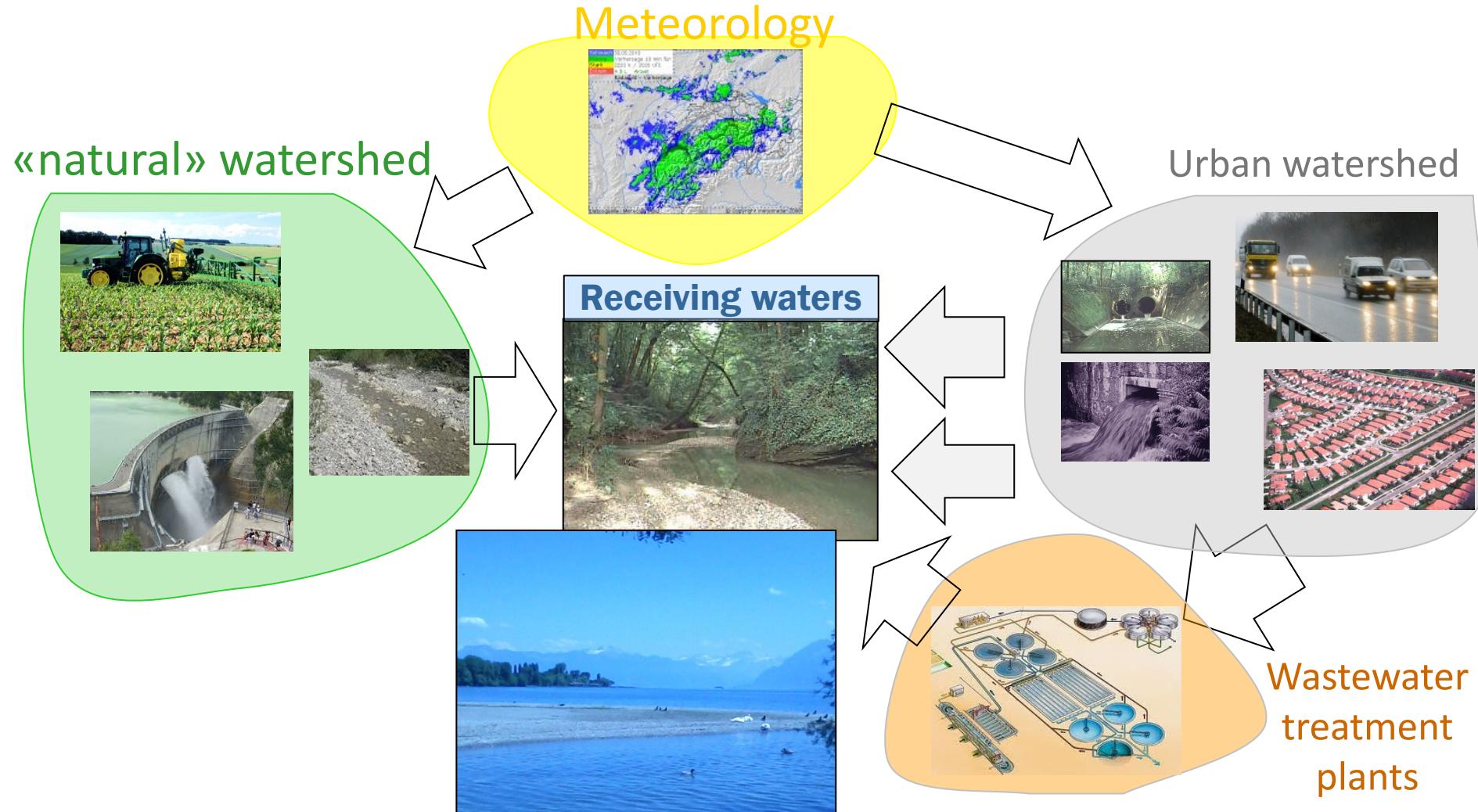


ENV- 462 Urban Ecology

4. Surface temperature at night



Sponge campus EPFL - Goal 4: To limit environmental impacts



Sponge campus EPFL - Goal 4: To limit environmental impacts

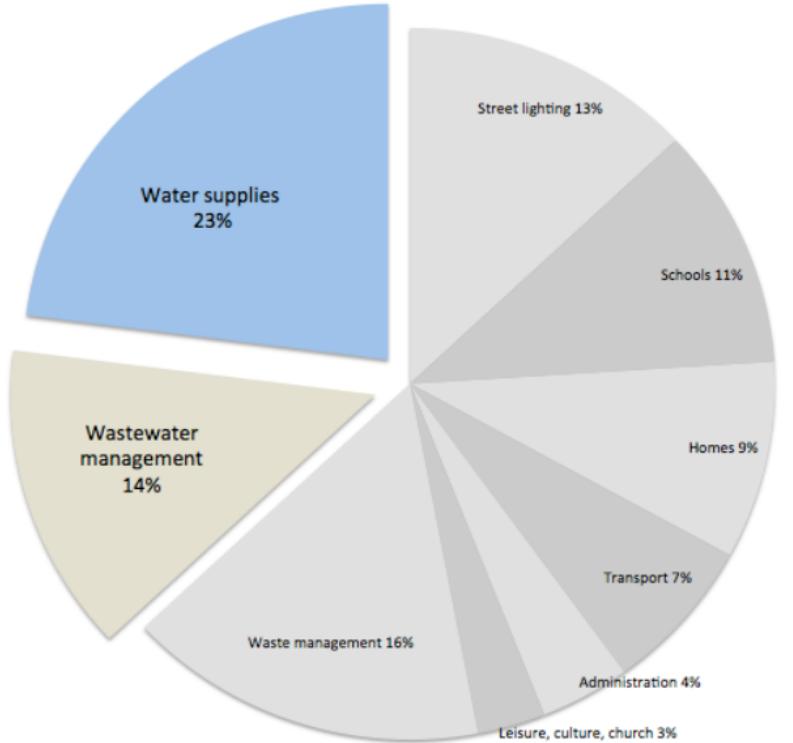
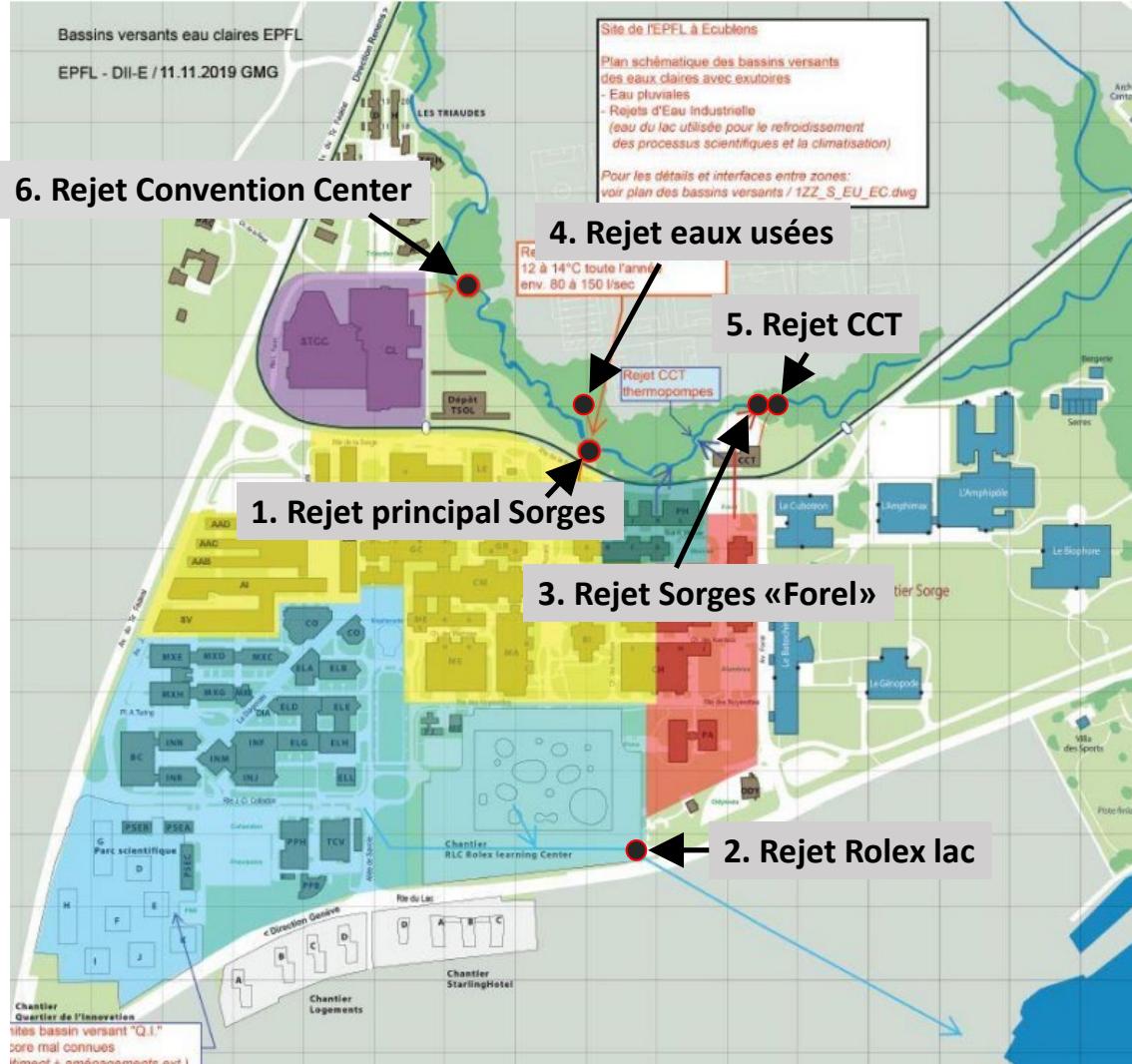
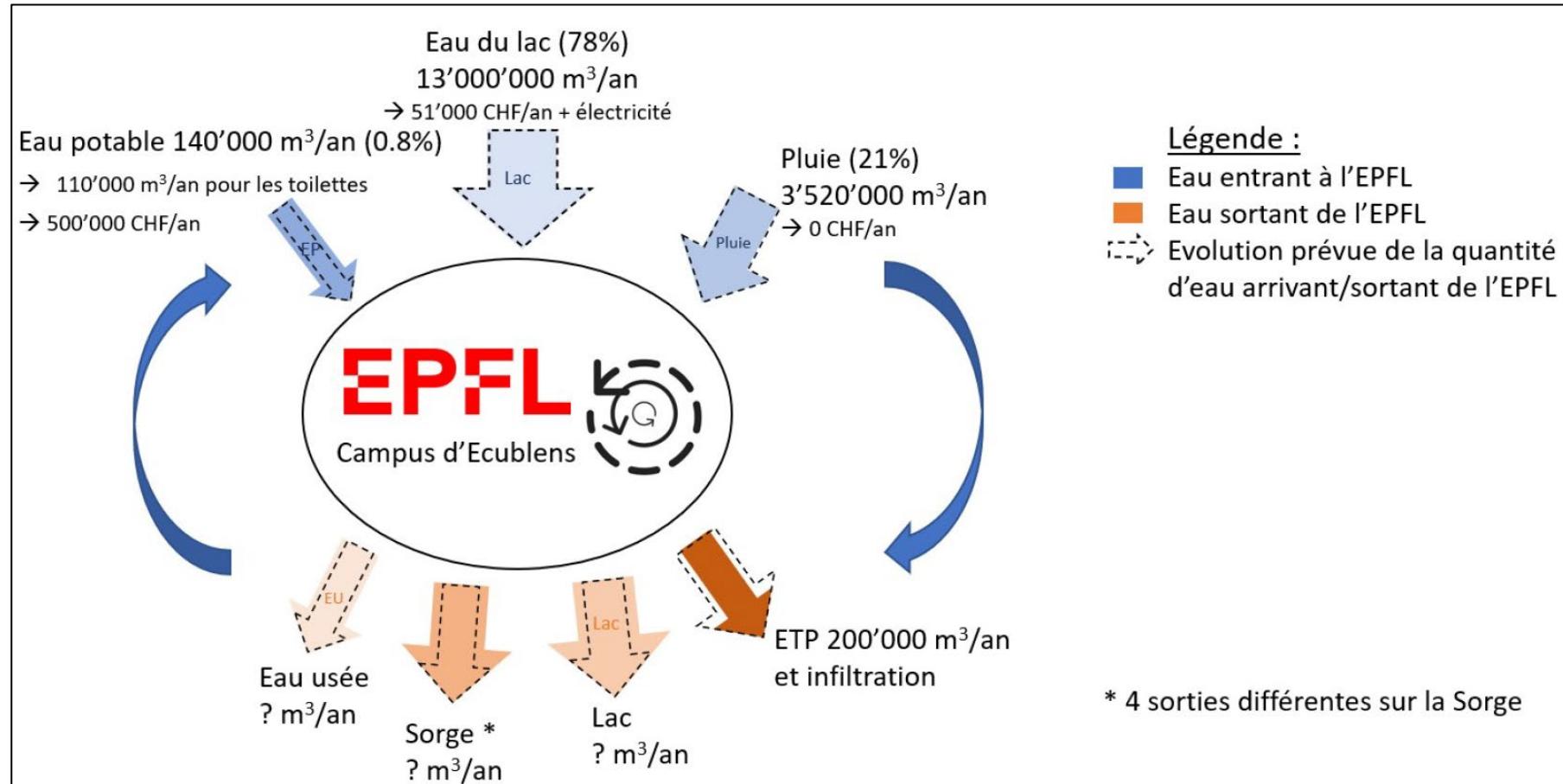


Figure 1.10: Electricity consumption in the public municipal sector in Switzerland (rough estimates).

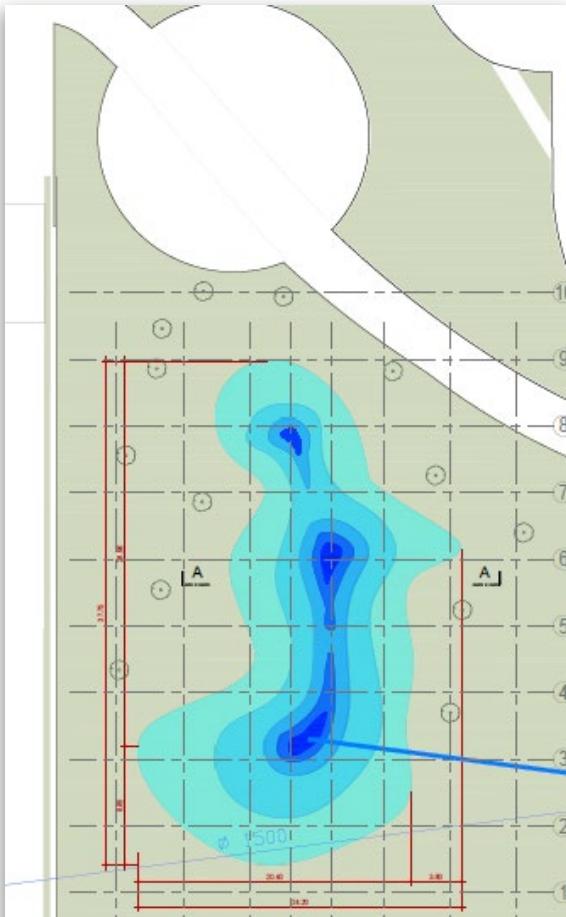
Source: Factsheet Water and energy, EAWAG, 2011.



Sponge campus EPFL - Goal 4: To limit environmental impacts



Sponge campus EPFL - Goal 5: To develop a pleasant living environment for students/researchers



Where is water at EPFL ???

Sponge campus EPFL - Goal 5: To develop a pleasant living environment for students/researchers

Greenspaces and Health: Scoping Review of studies in Europe

Public Health Rev, 20 May 2024

Volume 45 - 2024 | <https://doi.org/10.3389/phrs.2024.1606863>

Impact group (quintile)	City ranking	NDVI (mean)	Target NDVI	Population below target NDVI (%)	Annual preventable deaths (n; 95% CI)	Annual preventable age-standardised mortality rate (deaths per 100 000 inhabitants; 95% CI)	Annual preventable impact on deaths, (%; 95% CI)	Years of life lost (per 100 000 inhabitants; 95% CI)
Brussels (Belgium)	1	5	0.47	0.52	78.5	426 (321-632)	54 (41-80)	5.0% (3.8-7.4)
Copenhagen (Denmark; greater city)	1	9	0.53	0.55	76.5	437 (329-649)	46 (35-69)	4.0% (3.0-5.9)
Budapest (Hungary)	1	12	0.49	0.51	76.6	746 (562-1109)	50 (37-74)	3.5% (2.6-5.2)
Paris (France; greater city)	1	17	0.42	0.48	86.4	1918 (1446-2850)	36 (27-53)	4.9% (3.7-7.3)
Athens (Greece; greater city)	1	18	0.29	0.32	87.7	1413 (1074-2141)	42 (32-63)	3.5% (2.6-5.2)
Riga (Latvia)	1	19	0.50	0.50	72.4	277 (170-338)	32 (23-43)	2.9% (2.2-4.3)
Tallinn (Estonia)	1	20	0.49	0.51	73.5	171 (114-228)	31 (23-37)	3.5% (2.7-4.9)
Vienna (Austria)	1	21	0.47	0.49	75.5	171 (114-228)	31 (23-37)	3.6% (2.7-4.9)
London (UK; greater city)	1	22	0.41	0.44	78.5	470 (353-703)	38 (29-57)	2.7% (2.1-4.1)
Bucharest (Romania)	1	77	0.40	0.44	78.5	187 (141-279)	33 (25-49)	3.0% (2.3-4.5)
Amsterdam (Netherlands)	1	108	0.49	0.51	69.5	247 (185-371)	35 (26-52)	2.2% (1.6-3.6)
Sofia (Bulgaria)	1	146	0.48	0.48	73.7	105 (79-156)	29 (22-43)	2.4% (1.8-3.6)
Stockholm (Sweden; greater city)	1	150	0.47	0.54	54.4	374 (261-490)	37 (28-56)	1.2% (0.2-2.4)
Paris (France)	1	161	0.49	0.44	59.6	488 (370-707)	46 (30-62)	6.0% (4.0-15.2)
Rome (Italy)	1	165	0.53	0.54	59.2	765 (573-1139)	58 (41-122)	2.4% (1.8-3.6)
Berlin (Germany)	1	168	0.53	0.54	59.2	28 (21-42)	26 (19-49)	2.0% (1.4-3.0)
Oslo (Norway)	2	239	0.53	0.53	55.3	105 (79-156)	29 (22-43)	2.1% (1.6-3.1)
Zurich (Switzerland; greater city)	2	268	0.56	0.55	60.1	197 (131-360)	22 (17-53)	2.4% (1.8-3.6)
Vilnius (Lithuania)	2	269	0.55	0.44	55.9	26 (19-38)	1.9% (1.4-2.8)	2.0% (1.3-3.0)
Dublin (Ireland; greater city)	2	282	0.62	0.57	58.8	26 (19-38)	2.7% (1.7-3.3)	1.7% (1.3-2.6)
Lisbon (Portugal; greater city)	2	303	0.38	0.38	57.1	22 (16-33)	1.0% (0.7-1.3)	2.3% (1.7-3.1)
Bratislava (Slovakia)	2	314	0.51	0.51	61.2	68 (53-102)	26 (19-39)	1.8% (1.4-2.7)
Luxembourg (Luxembourg)	3	359	0.52	0.49	50.8	14 (11-21)	21 (16-31)	2.1% (1.6-3.2)
Zagreb (Croatia)	3	366	0.60	0.53	52.7	143 (107-214)	23 (18-35)	1.7% (1.3-2.6)
Warsaw (Poland)	3	495	0.49	0.47	62.6	271 (203-406)	18 (14-27)	1.5% (1.2-2.3)
Vallletta (Malta)	3	518	0.24	0.25	75.0	24 (18-37)	19 (14-28)	1.6% (1.2-2.4)
Helsinki (Finland; greater city)	4	521	0.52	0.47	55.3	128 (96-191)	17 (13-26)	1.7% (1.3-2.6)
Madrid (Spain; greater city)	4	538	0.32	0.32	66.6	620 (465-932)	15 (12-23)	1.7% (1.3-2.5)
Ljubljana (Slovenia)	4	561	0.58	0.51	49.0	34 (26-51)	15 (11-23)	1.6% (1.2-2.4)
Prague (Czech Republic)	4	562	0.55	0.51	44.1	175 (132-262)	17 (13-26)	1.4% (1.0-2.2)
Reykjavik (Iceland)	4	616	0.37	0.38	64.9	20 (15-29)	15 (11-23)	1.6% (1.2-2.4)
Nicosia (Cyprus)	5	835	0.23	0.23	68.2	11 (8-17)	8 (6-12)	0.7% (0.5-1.0)

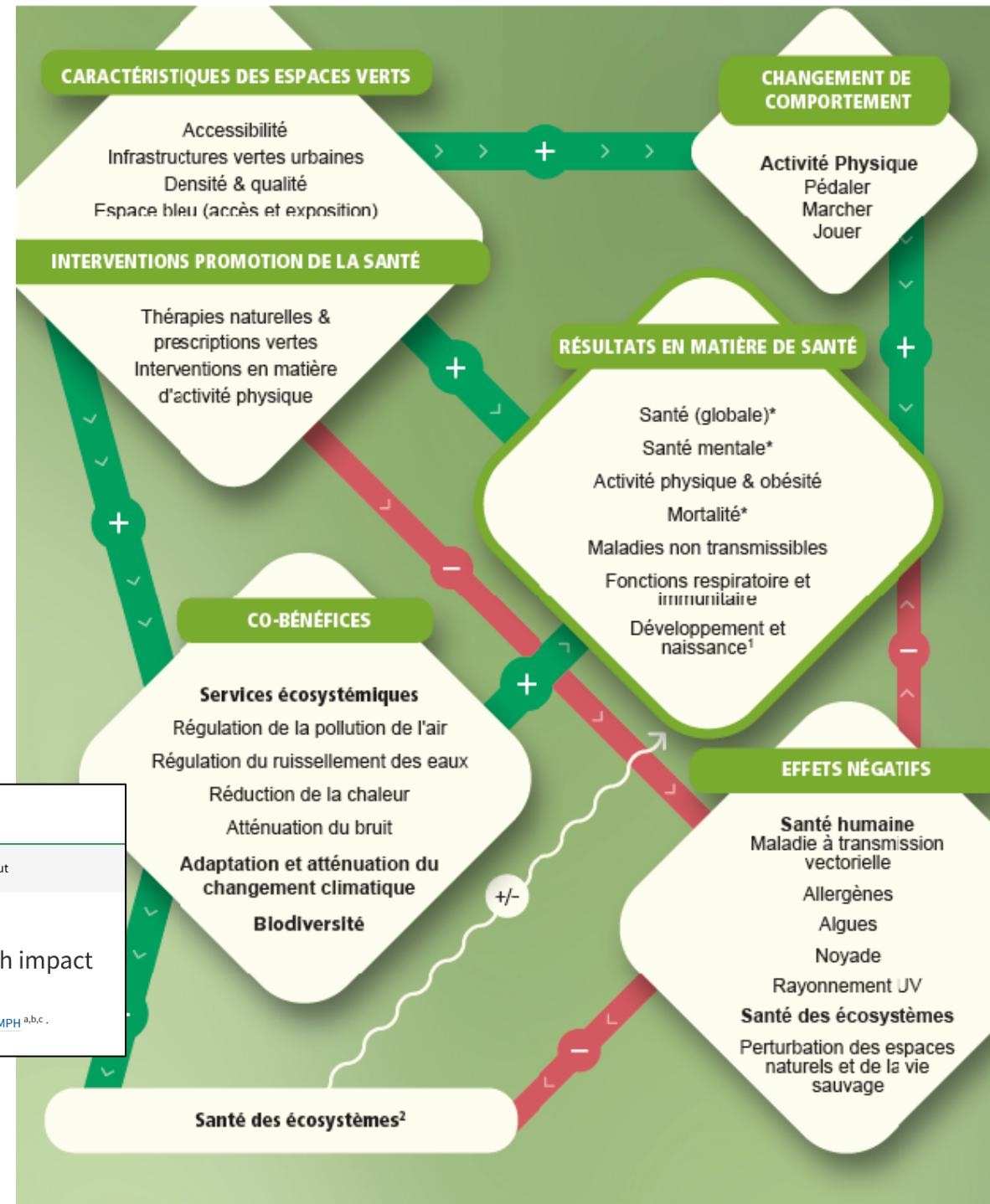
THE LANCET
Planetary Health

This journal Journals Publish Clinical Global health Multimedia Events About

ARTICLES · Volume 5, Issue 10, E718-E730, October 2021 · Open Access [Download Full Issue](#)

Green space and mortality in European cities: a health impact assessment study

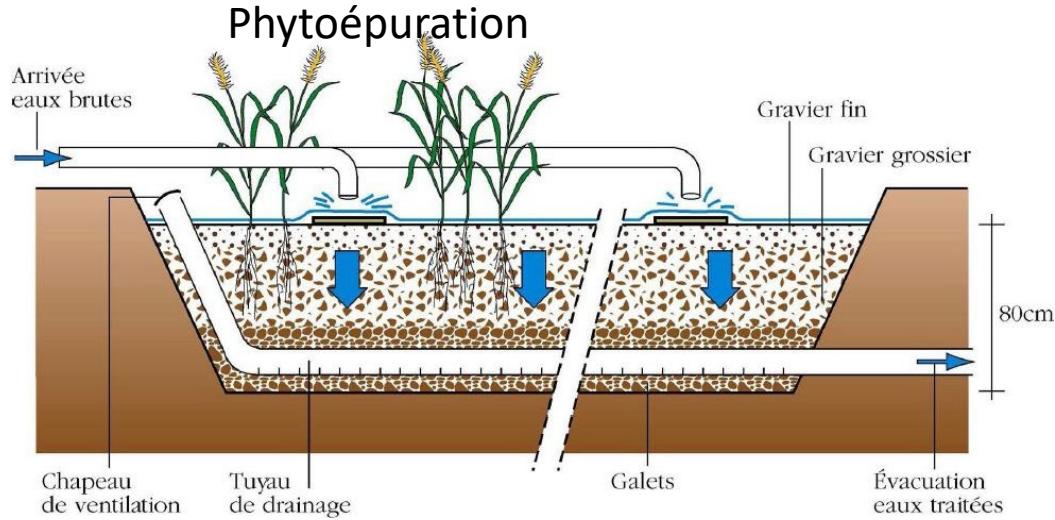
Eveline Pereira Barboza, MPH ^{a,b,c} · Marta Cirach, MSc ^{a,b,c} · Sasha Khomenko, MSc ^{a,b,c} · Tamara Lungman, MPH ^{a,b,c} · Natalie Mueller, PhD ^{a,b,c} · Jose Barrera-Gómez, MSc ^{a,b,c}, et al. [Show more](#)



Sponge campus EPFL - Goal 6: Promote innovative technologies in water management



Separate toilets
LAUFEN «SAVE»



Sponge campus EPFL - Goal 6: Promote innovative technologies in water management



Energy and water !!!!



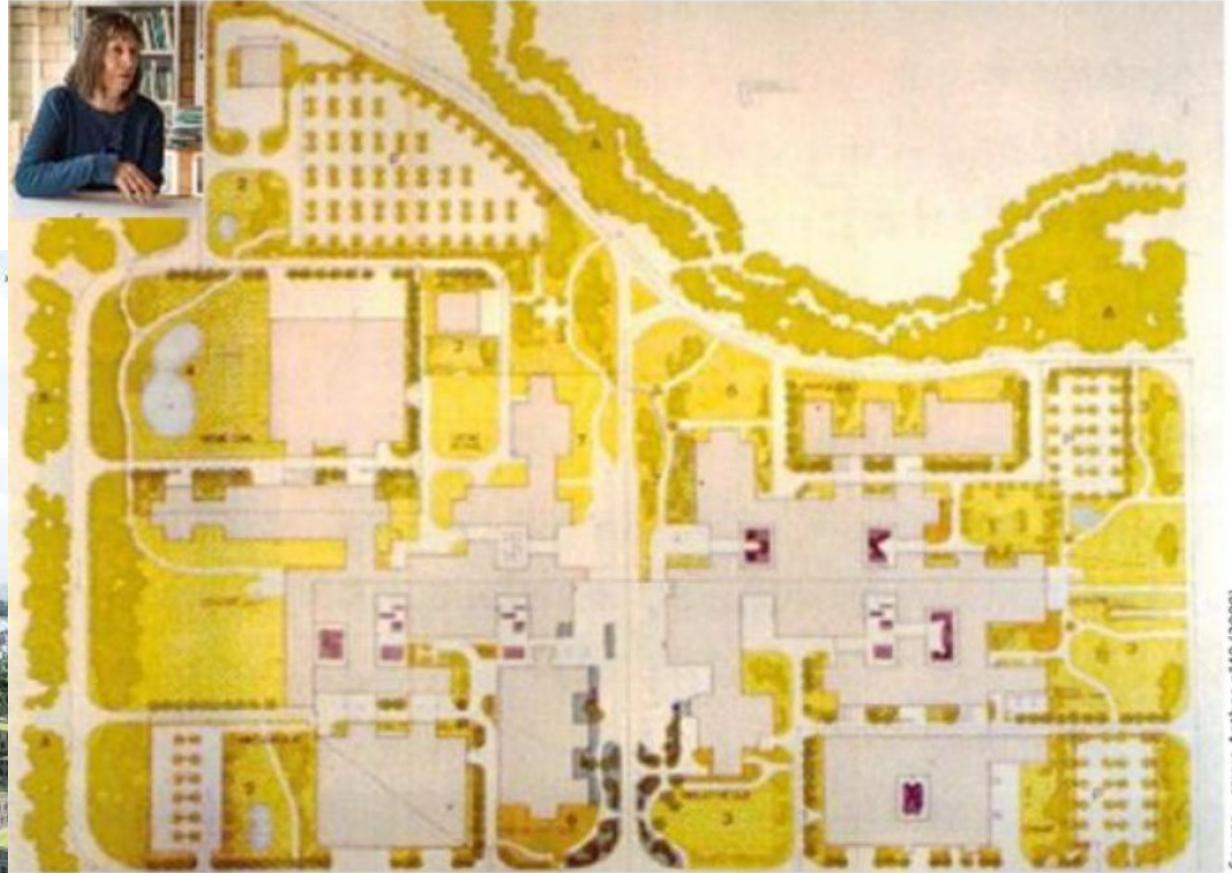
Sponge campus EPFL - Goal 7: To develop/transform the campus in a sustainable manner



www.auxcedres.ch/



Back to the origin...



Concept paysager de l'EPFL (extrait), Ursula Schmocker-Willi, 1972-1984

Source : revue Anthos n°49 (2008)

Sponge campus EPFL - Goal 7: To develop/transform the campus in a sustainable manner

bluefactor



Sponge campus EPFL - Goal 7: To develop/transform the campus in a sustainable manner



Parco Casarico Sorengo

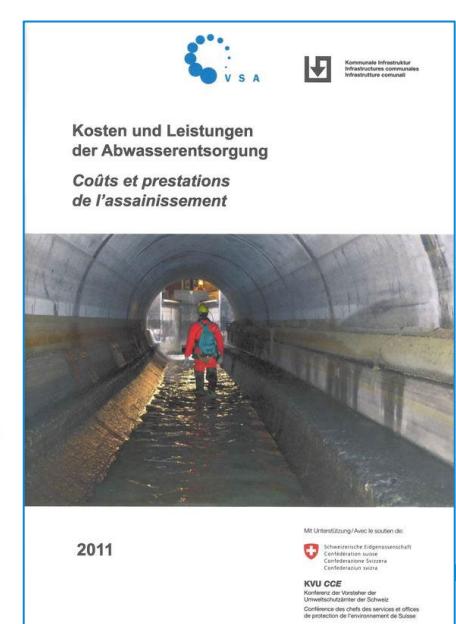
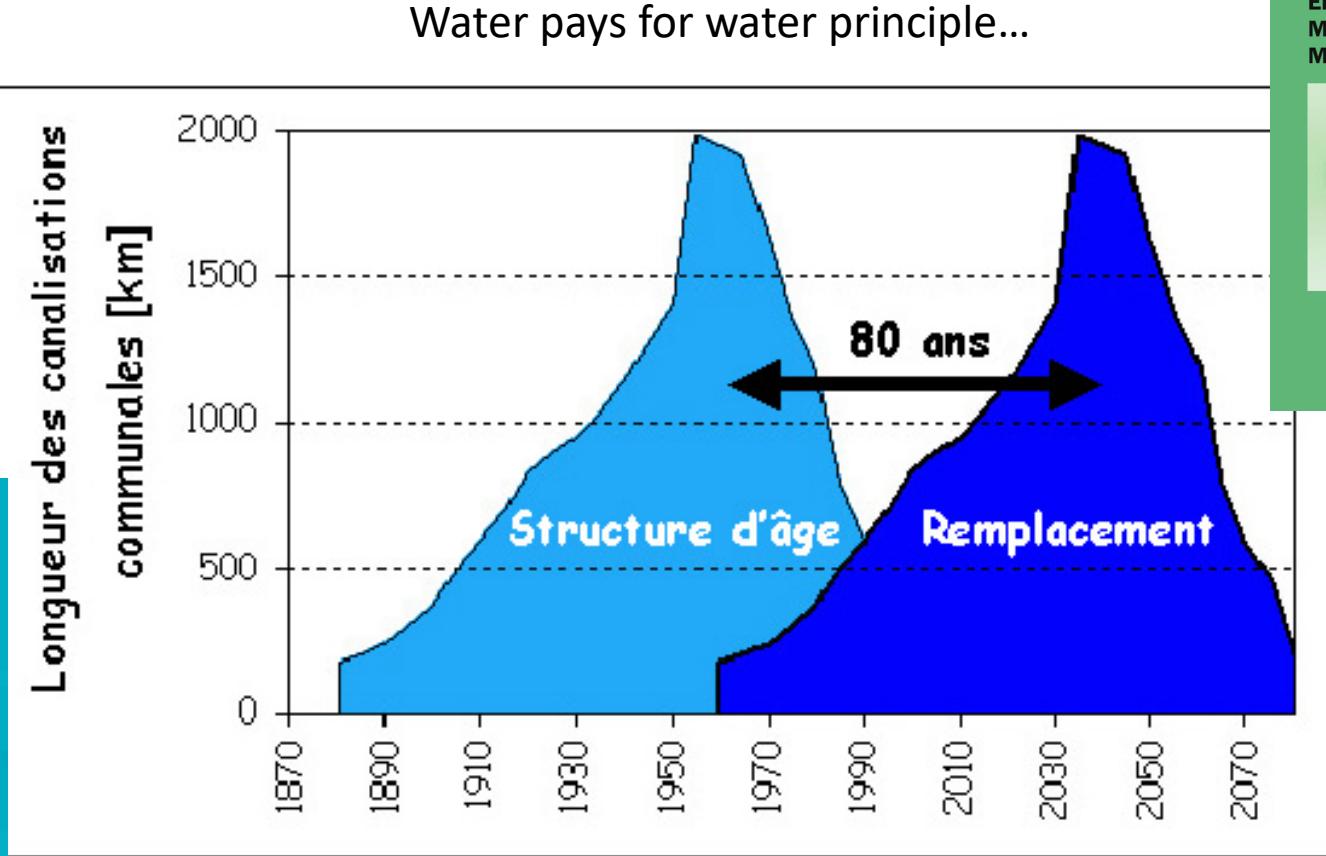
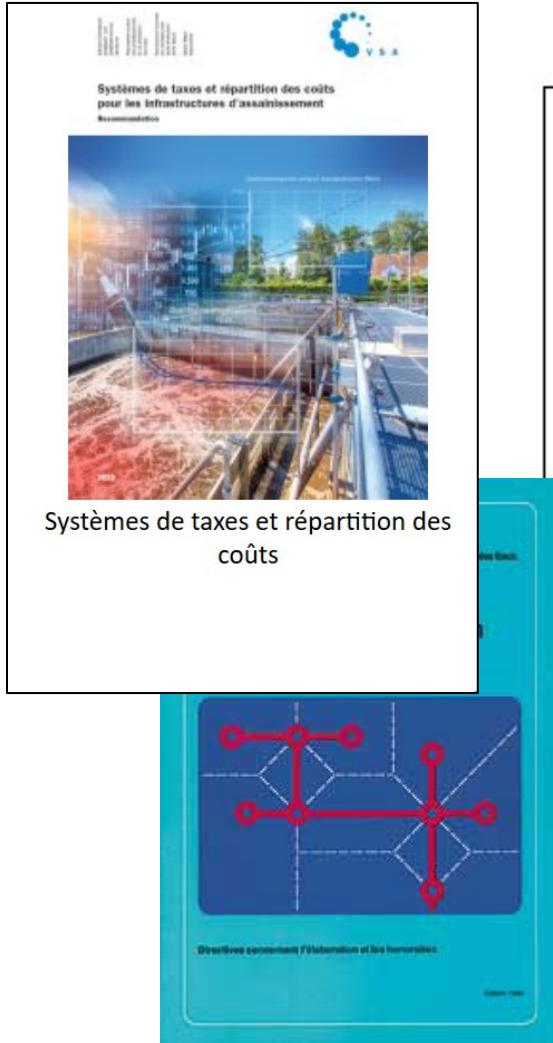




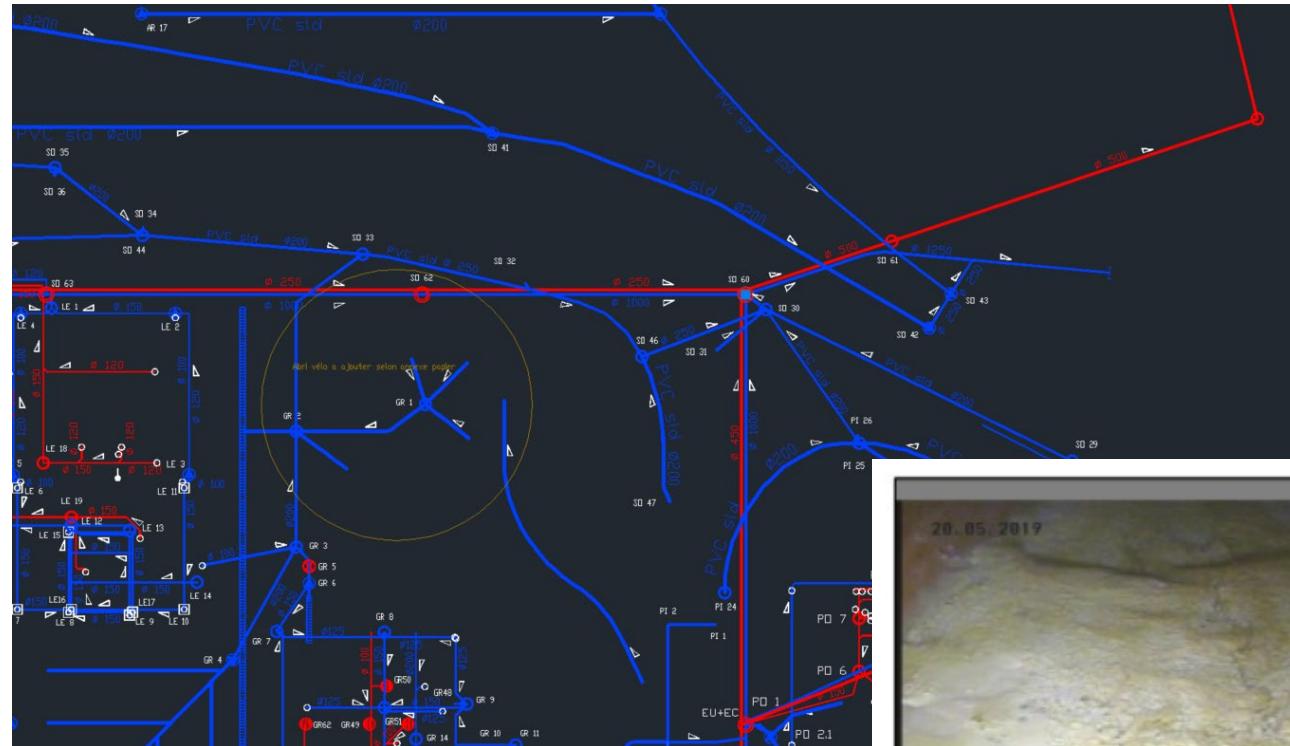
Sponge campus EPFL - Goal 7: To develop/transform the campus in a sustainable manner



Sponge campus EPFL - Goal 8: ...at reasonable, controlled costs!



Sponge campus EPFL - Goal 8: ...at reasonable, controlled costs!



Map available at:

<https://support.epfl.ch/epfl>

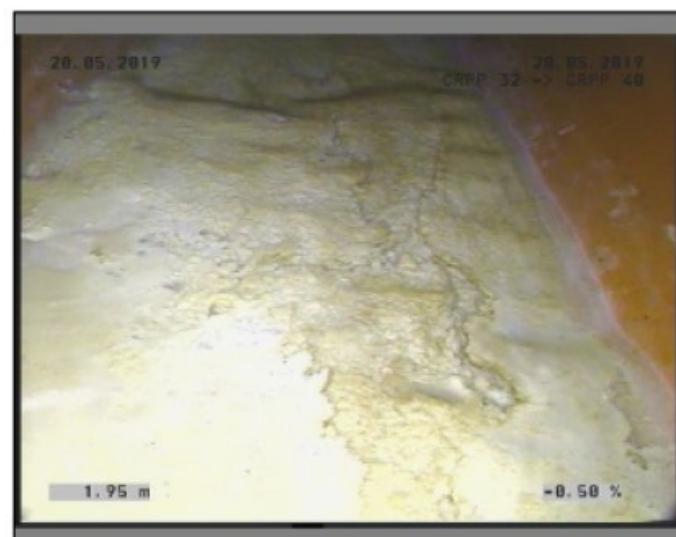


Photo: 1_4B
1.95m. Formation de calcaire au radier

Importance of maintenance!

For existing infrastructures and blue/green infrastructures...



Photo: 1_5A
2,51m. Paroi du tuyau, perforée à 12 h. et formation de calcaire

Sponge campus EPFL



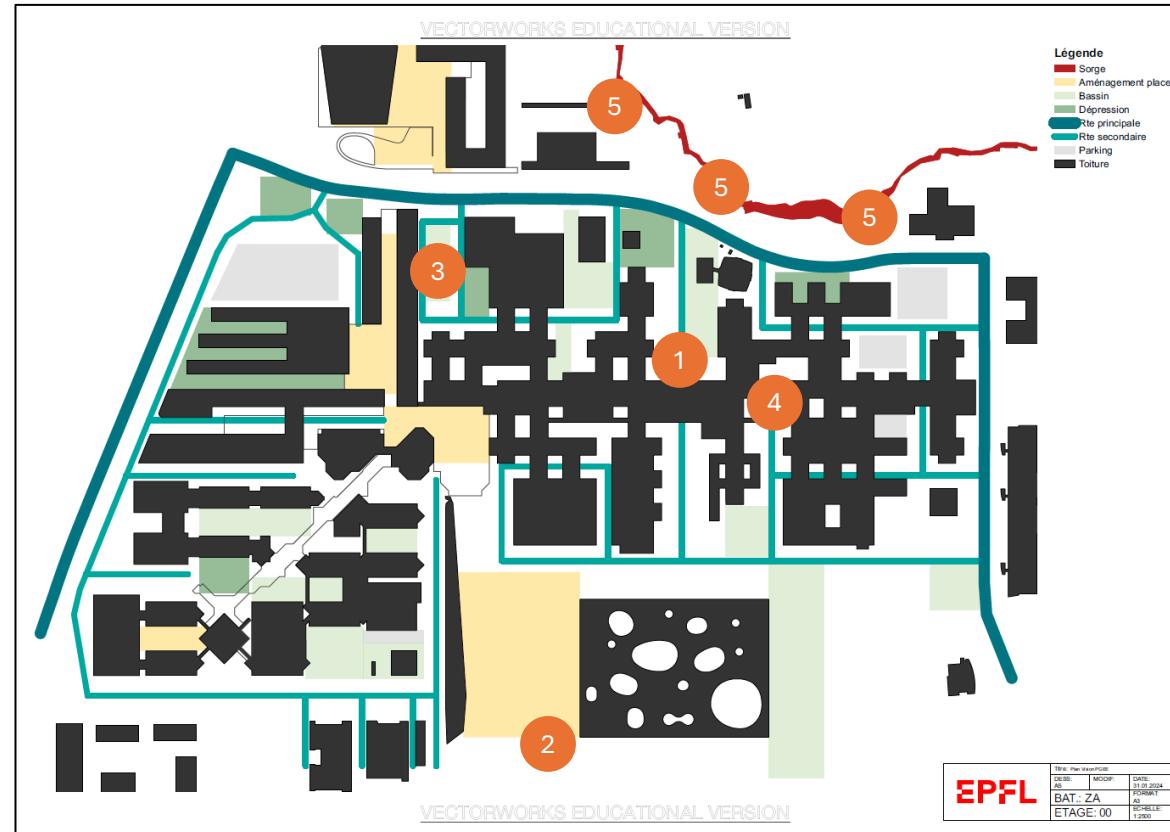
PGEE EPFL Water master plan

General rules:

- Max. 30-40% imperviousness
- Green roofs
- Infiltration of road runoff
- Heat management on urban places
- Water reuse (goal: 50% less drinking water)

Example of realizations:

1. Allée Piccard: no more vehicles, water infiltration (infiltration trenches)
2. wetland biotope to the south-west of the Rolex Learning Center
3. Increase of capacity of the GC pond
4. NoMix toilets with recovery of the urine collected in the form of fertilizer
5. Installation of flow/temperature measurement systems on the main discharges into the Sorge



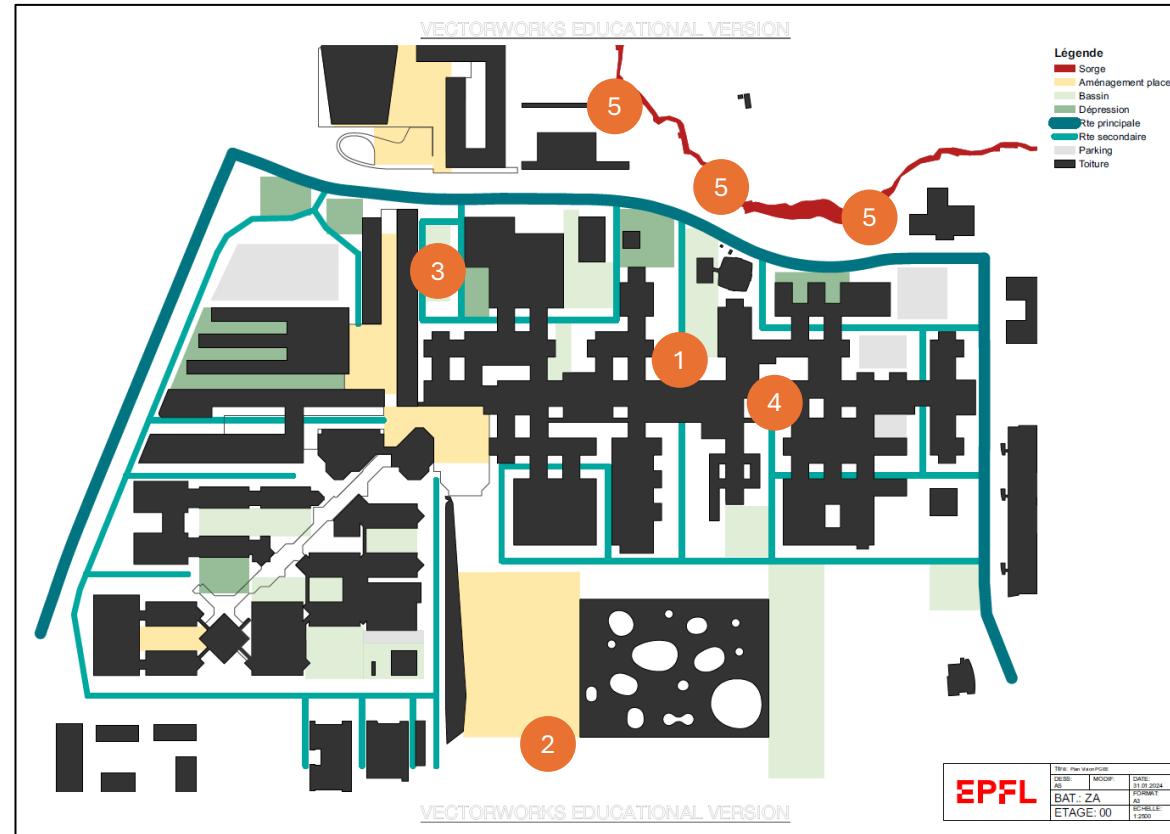
Alexandre St-Amour, François Dupuy, VPT EPFL [2024]

Sponge campus EPFL

PGEE EPFL Water master plan



WE NEED YOU



Alexandre St-Amour, François Dupuy, VPT EPFL [2024]



vsa.ch/YP

YOUNG PROFESSIONAL

Das junge Netzwerk

Le réseau jeune | La rete dei giovani



Young professionals
www.vsa.ch/YP



Werde Teil
unserer
Community



vsa.ch/YP



