Design Project SIE 2026 – Water Flow Diagram of EPFL Campus

Students: Fabien Cabassu, Léa Rommelaere

Supervisors: Claudia Binder, *HERUS laboratory*

Bastian Etter, *Vuna* Dorothee Spuhler, *OST*

Introduction & Motivation

130 mio L It's the amount of drinking water used each year on the campus. Of this quantity, more than 60 % is used only for toilet flushing.

Beside this issue, lot of rainwater ends up in the river without benefiting the site. The runoff coefficient of the campus is currently at 0.8, and the EPFL has the ambition to lower it to 0.35

The water collection of the campus is separative, meaning that stormwater goes to a separate network from the sewer system. This means a large potential for reusing the rainwater and several challenges to deal with these multiple networks.

System

EPFL campus

year 2025

45 hectares

Research questions

1 - Where are the key issues of water management at EPFL ?

2 - What is the potential for using either rainwater of industrial water for toilet flushing ?

3 - How can a tool like the WFD foster dialogue between subdivisions that sometimes lack dialogue ?

Objectives

Develop a water flow diagram that:

- Acts as a visual synthesis of the technical VSA diagnoses
- Identifies potential circularity pathways
- Facilitates dialogue among the institution's diverse actors

Results

Flows were mapped on a Sankey diagram, from sources to sinks. Intermediate nodes indicate either water pathways or uses.

Units are 10^3 m^3

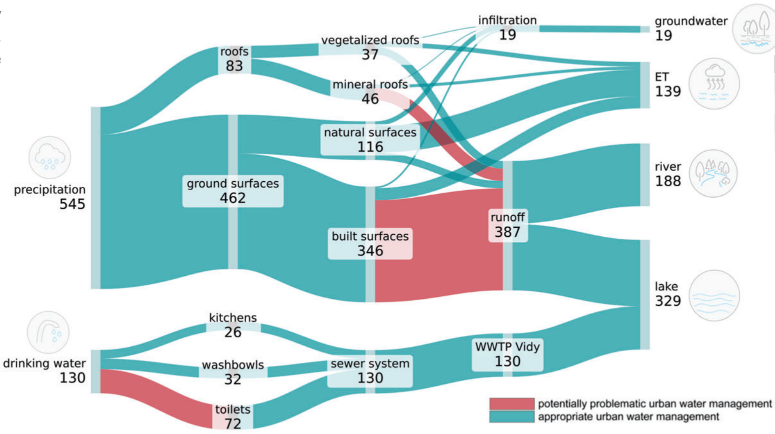
Potentially problematic flows (those marked in red)

- Runoff from mineral roofs or build surfaces

represent large amounts of water lost to the river and the lake with no benefit for the campus

- Drinking water use for toilets

a system that works but puts unnecessary constraints on the drinking water supply



Made at SankeyMATIC.com, edited with Inkscape

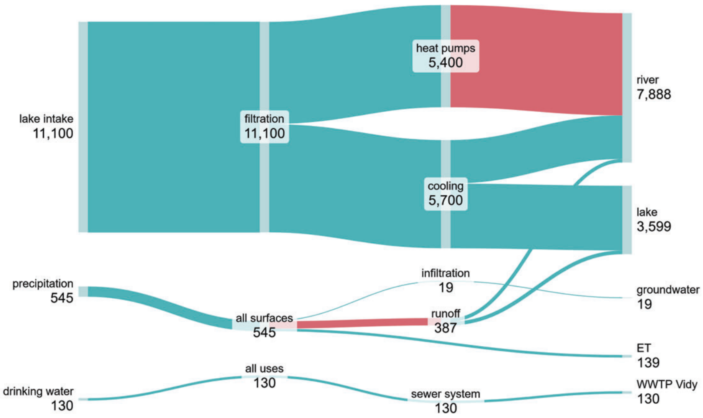
This second graph also includes industrial water uses: water that is taken from the lake to either produce energy with heat pumps, either circulates in the buildings to cool them down.

It shows how large the amounts of lake water are compared to the two other sources.

Additional potentially problematic flows

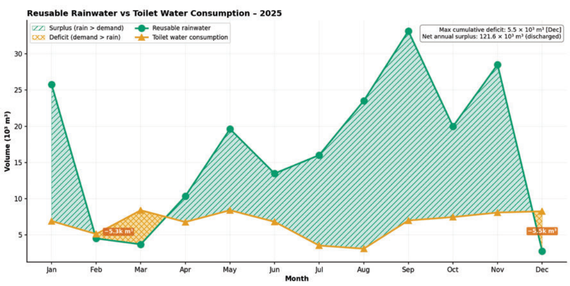
- CCT industrial water discharge into the Sorge

Impacts sometimes the Sorge temperature and huge load on Sorge flow regime



Made at SankeyMATIC.com

This graph compares the amount of water needed for the toilets with the available rainwater. A monthly breakdown reveals that the variability of the supply creates periods of deficit. A reservoir would be needed in those case, even though the total rainwater amounts largely exceed the demand.



Methods

Rainwater

Separation by surface type with a QGIS surface layer

Coefficients of runoff, evapotranspiration and infiltration by surface type found in literature and swiss standards

Monthly 2025 precipitation from MeteoSwiss

$$V_{rain} = P * 10^{-3} * A * c$$

P = precipitation depth [mm]

A = area [m2]

C = coefficient of interest

Surface Type	Runoff	Evapotranspiration	Infiltration
Vegetalized roofs	0.6	0.4	0
Mineral roofs	0.8	0.2	0
Natural surfaces	0.2	0.7	0.1
Built surfaces	0.9	0.1	0

Industrial water

Official data from the VPO split into heat pump and cooling needs.

Used with Hydrique real-time hydrological model of the campus to determine the discharge of these waters split in either the Sorge or the lake.

Drinking water

Overall consumption split by usages. Irrigation and labs were neglected. These were checked by a bottom-up approach starting from the presence rate of the campus population.

Use	Total volume [m3]	Per person [L/day]
Toilets	55 %	27.2
Kitchens	20 %	9.9
Washbowls	25 %	12.4

Key observations from the Sankey

387 (71% of precipitation)	130	72 (55% of drinking water)	11,100	7,700 (52% of Sorge flow)
10^3 m^3	10^3 m^3	10^3 m^3	10^3 m^3	10^3 m^3
Total runoff (river + lake)	Drinking water input	Toilet water consumption	Industrial water needs (cooling + heating)	Industrial water discharged annually into the Sorge river

Tool Improvements

- Differentiate consumptive and non consumptive uses
- Figurate un-quantifiable flows to mark their existence (irrigation, lab uses)

Discussion

EPFL campus is in transition (construction work, sustainability strategy). In this changing context, this tool helps to identify future problems. For example, the projected closure of the industrial water circuit triggers the questions of which alternate sources would be available for industrial uses or simply energy. The diagram gives quantitative indications on the whole system.

Possibility of using rainwater for toilet consumption. This doesn't replace the need to make the campus more permeable.

Conclusion

This project demonstrates the possibility of applying the WFD tool to a campus context. The diagram obtained helps to bring a general perspective on the whole system and identify critical flows. Having this general understanding of the system is a step forward in building an integrated water management that goes beyond disciplinary frontiers and organizational subdivisions.

École Polytechnique Fédérale de Lausanne (EPFL), Section of Environmental Sciences and Engineering (SIE)

Data Sources

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