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Intergovernmental Hydrological Programme

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Katedra za zmanjševanje tveganj ob vodnih ujmah

The celebration of the 50th Anniversary of the IHP UNESCO
Pre-event on June 10, 2025
UNESCO Headquarters, Paris, France – Room VII
Workshop „Scientific Research and Innovation for Water Security“
Session II: Remote Sensing and IoT

DEMONSTRATION CENTER FOR URBAN WATER CYCLE AT A UNIVERSITY BUILDING SCALE

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IHP Slovenia &
UNESCO Chair on Water-Related Disaster Risk Reduction, University of Ljubljana

Why a Demonstration Center?

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Due to COVID-19 a Slovenian National Recovery and Resilience Program was accepted

- **This RRP Fund is co-funding the Demonstration Center together with the NextGenerationEU program and Ministry of Higher Education, Science and Innovation of the Republic of Slovenia**
- **All public universities in Slovenia received financing (2022-2025) to reform higher education curricula of professional study programs – the university and master programs will follow after 2025.**
- **The curricula reform for a green and resilient transition to society 5.0 - Green Transition & Digitalization & Micro credentials (Long-Life Learning)**
- **At University of Ljubljana, the UNESCO Chair for Water-Related Disaster Risk Reduction, hosted at the Faculty of Civil and Geodetic Engineering, as a part of the NOO pilot project to renew study programs, is working on a development of a Demonstration Centre at three faculty buildings that should support the learning process of selected courses at different faculties at the University of Ljubljana.**
- **At our Demonstration Centre University of Ljubljana Faculties of mechanical engineering, electrotechnical engineering, economics, health studies, and architecture are collaborating on the project.**

NAČRT ZA OKREVANJE IN ODPORNOST

Financira Evropska unija
NextGenerationEU

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA VISOKO ŠOLSTVO, ZNANOST IN INOVACIJE

Location of the Demonstration Centre

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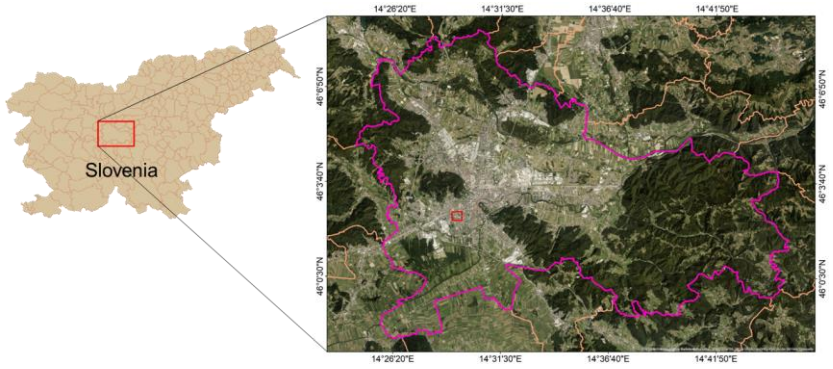
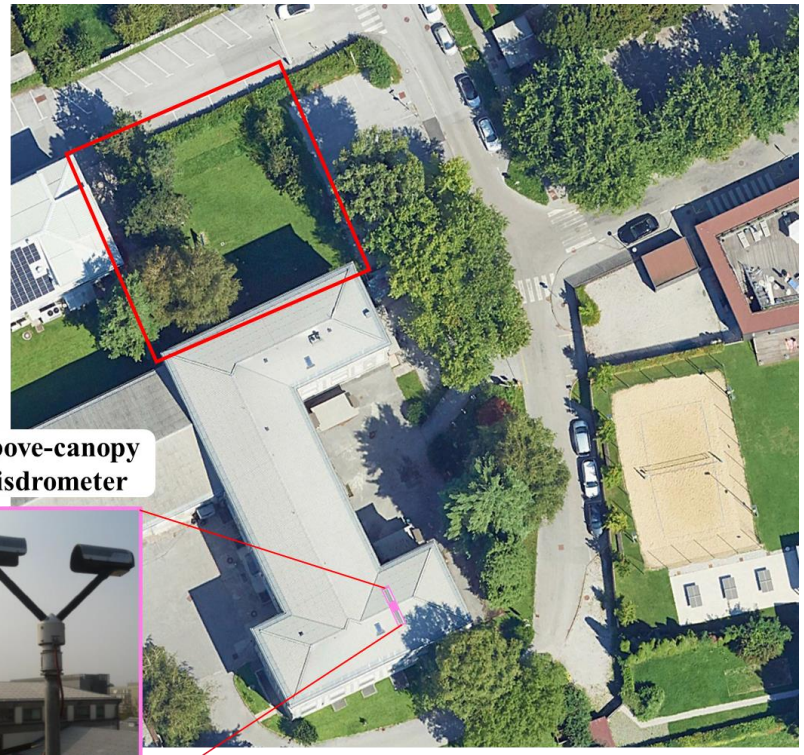
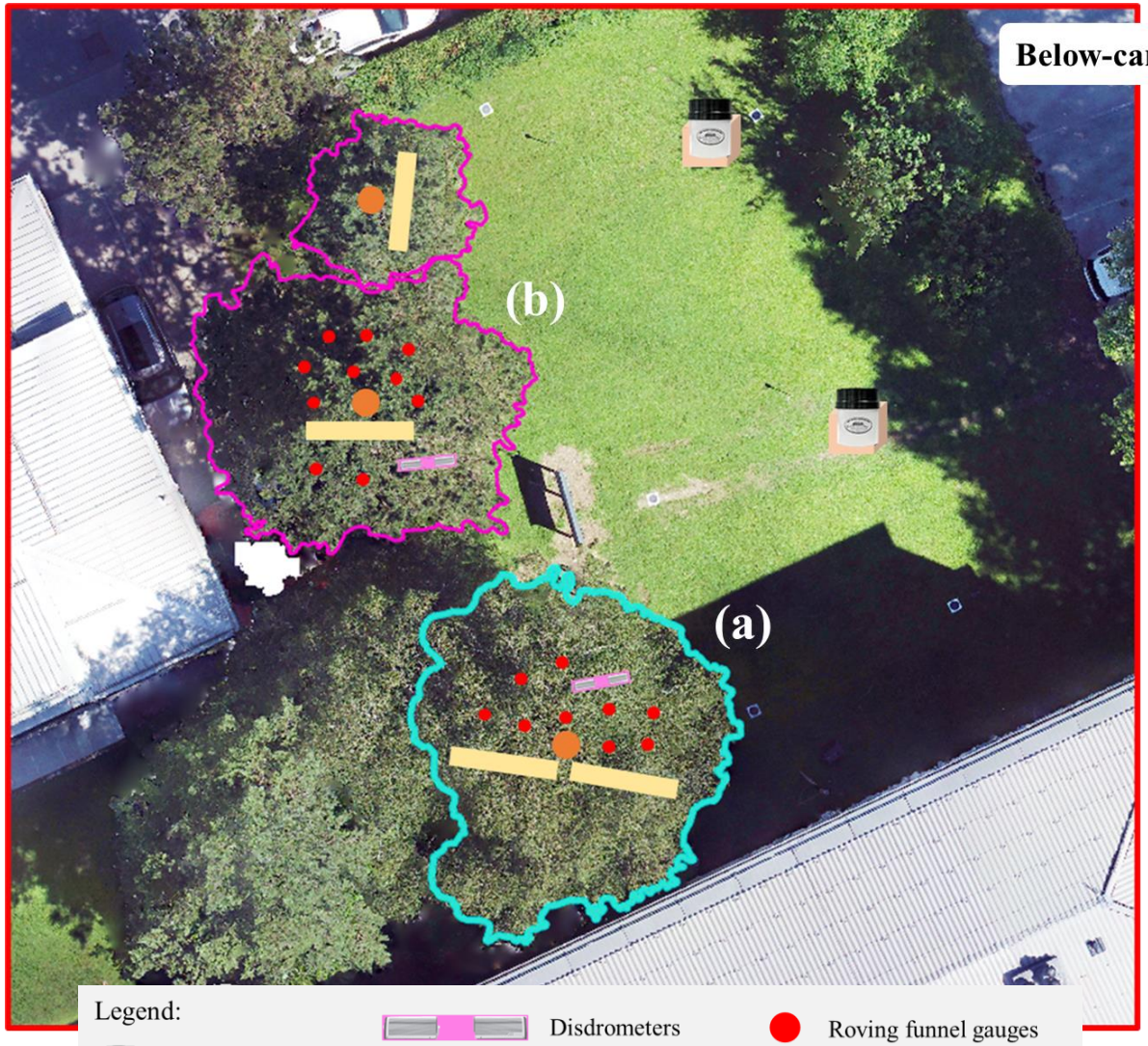




Above-canopy disdrometer



Below-canopy disdrometer

Under the birch

Under the pine

Rainfall partitioning setup

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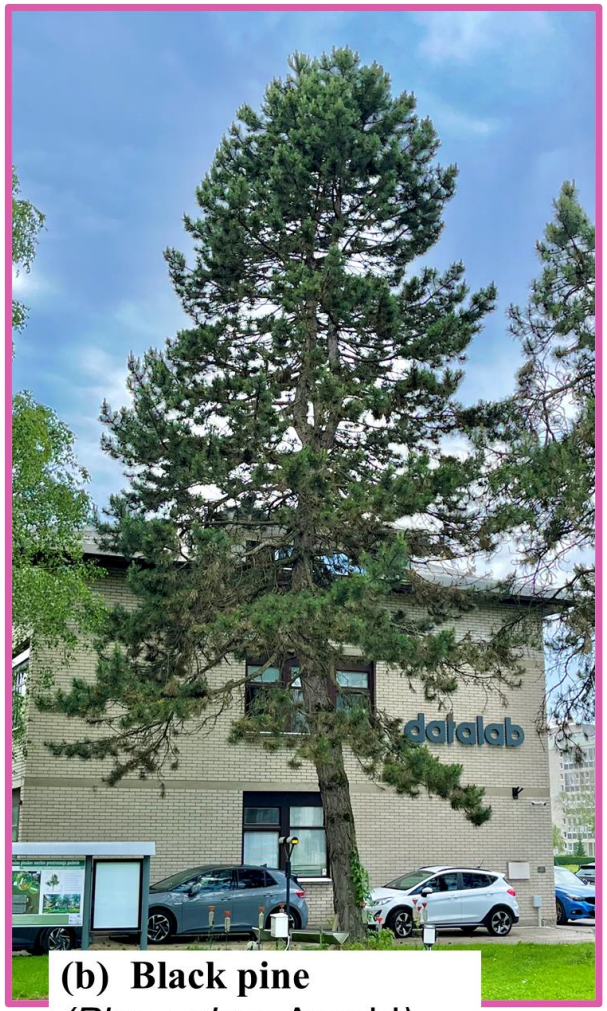
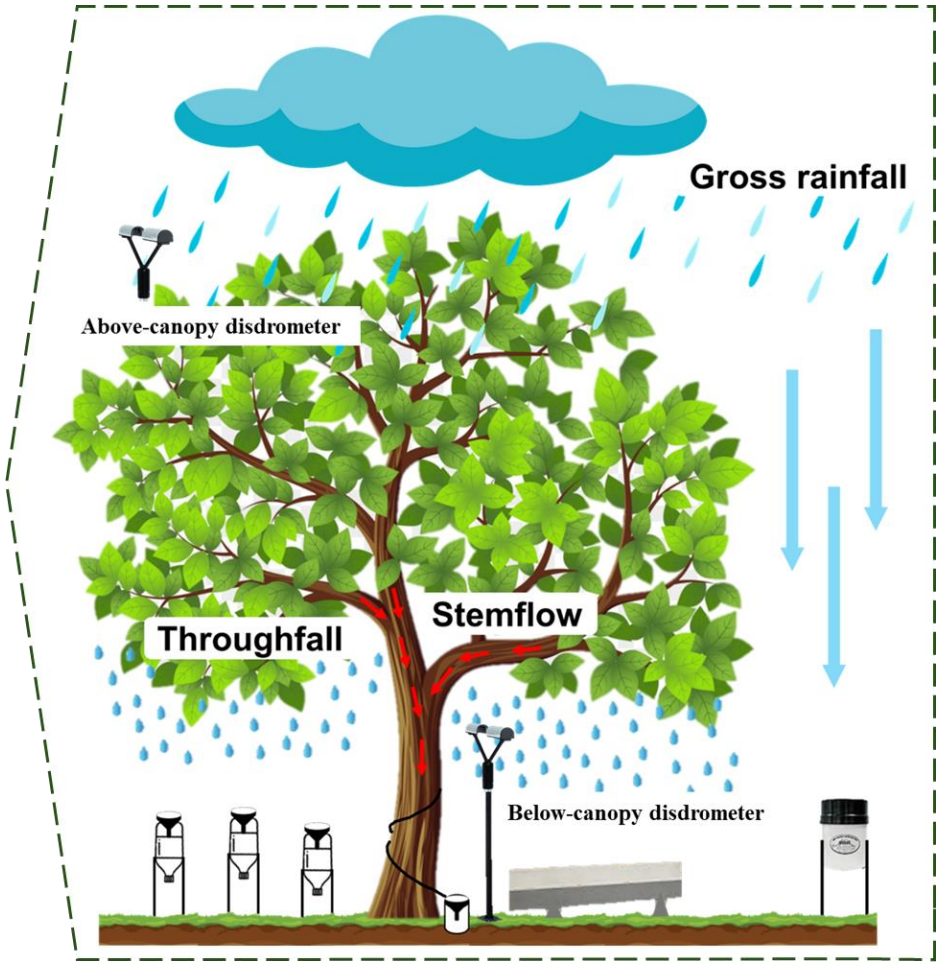
(a) Silver birch
(Betula pendula Roth.*)*



(b) Black pine
(Pinus nigra Arnold*)*



Rainfall partitioning measurements

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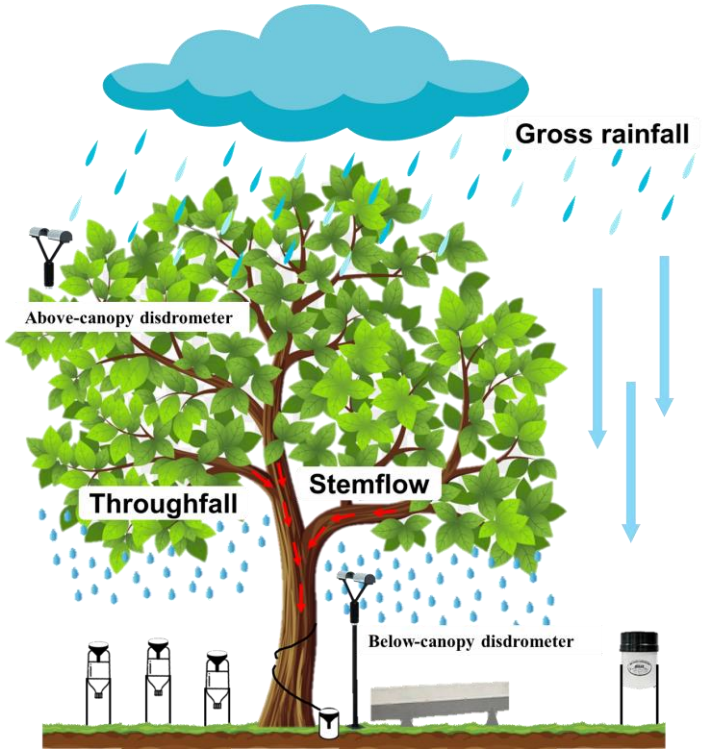

1. Gross Rainfall, P_g

HOBO tipping bucket (0.2 mm/tip)

2. Stemflow, S_f

Spiral-type gauge (rubber hose)

3. Throughfall, T_f

2 V-shaped steel trough gauges

10 roving gauges

Rainfall/Throughfall microstructure

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OTT Parsivel optical disdrometer – Drop Size Distribution – 1min resolution

Roof

Birch

Pine

ABOVE
(gross rainfall)

BELOW
(throughfall)

Soil moisture measurement

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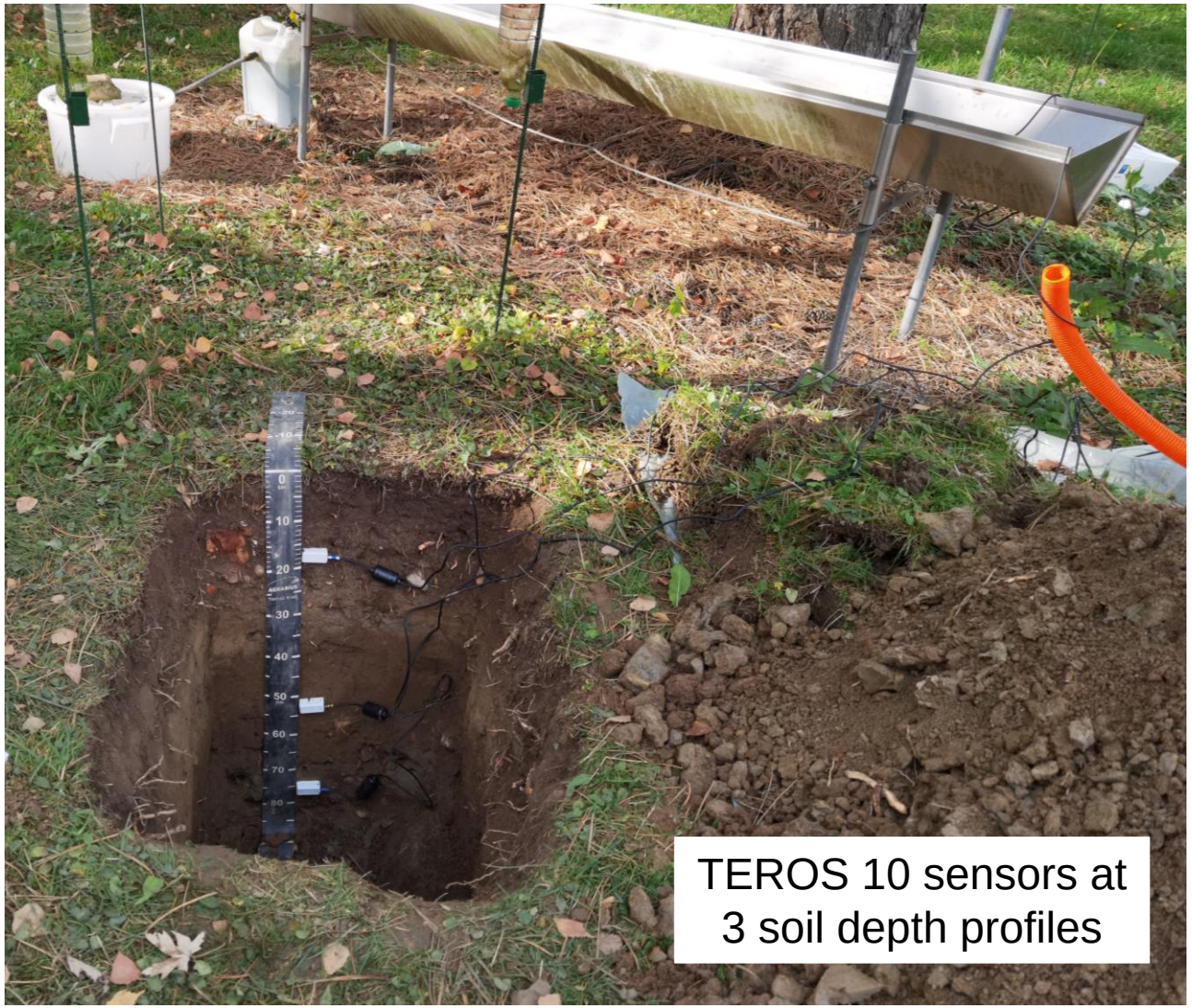

TEROS 10 sensors at 3 soil depth profiles

ZL6
data logger

Mini-disk infiltrometer (soil infiltration)

Virtual Demonstration Center

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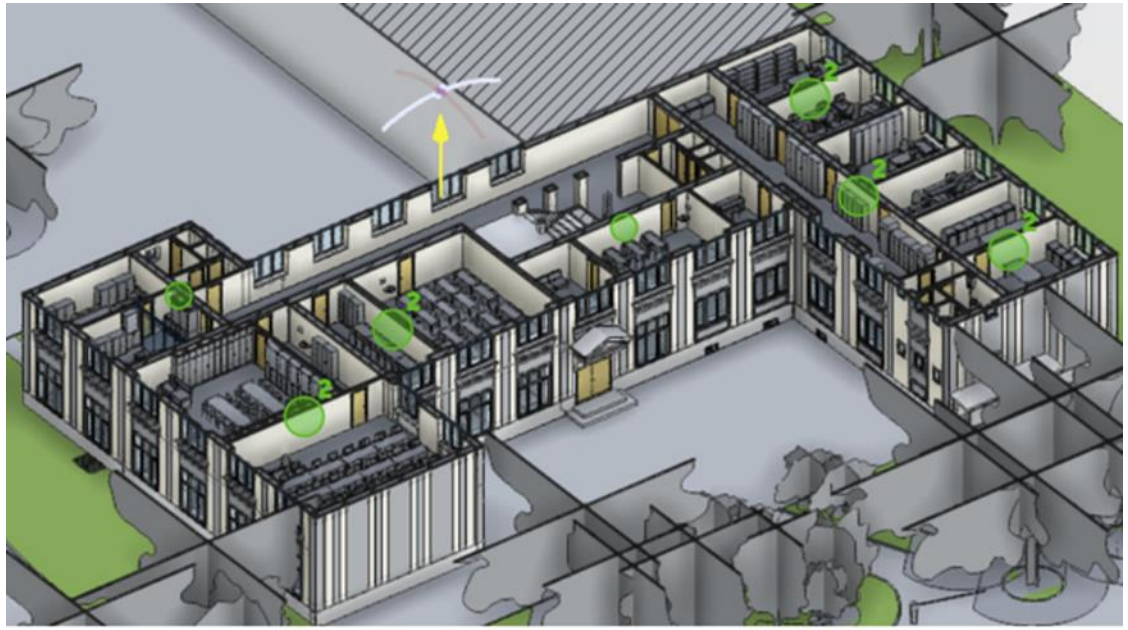
The Centre has its built environment and its water-cycle component

- **The Built Environment component encompasses the 3D Building Information Model (BIM, below right) of the buildings (below left) and their immediate surroundings. All data are dynamically visualized and analyzed within the digital twin platform, enabling a deeper understanding of the system's behavior. We use IoT-based system (HoboLink from Onset now Licor).**
- **The indoor residential parameters include air quality parameters (temperature, relative humidity, dew point, velocity, CO2) as well as light intensity to be used in courses on Building Physics, Daylight, Structural Building Physics, Smart House or Building Architecture.**



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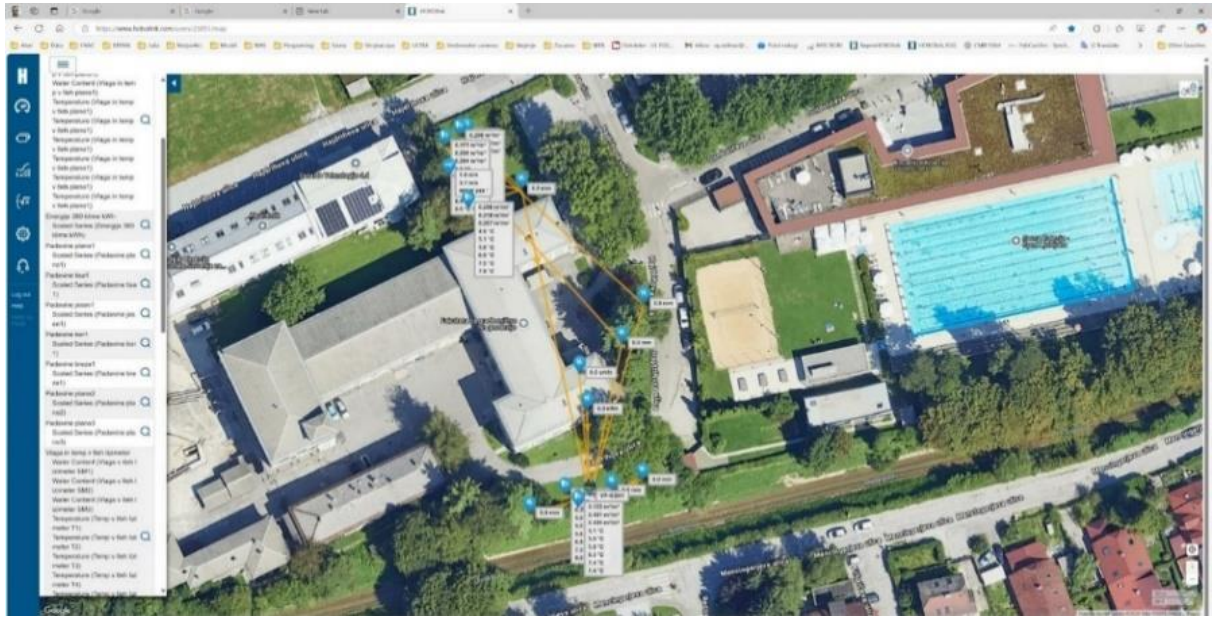

- Close to one of the building we run an experimental plot on urban hydrology (urban park). The main part of the plot are continuous rainfall partitioning studies on two isolated trees (deciduous – birch and evergreen – pine).
- Rainfall: disdrometers and rainfall gauges.
- Rainfall partitioning: interception (Leaf Area Index, collecting leaves), throughfall, stem flow.
- Evaporation & transpiration: tree diameter, sap flow.
- Infiltration: infiltration disks and other infiltrometers (intermittent measurements) and soil water sensors.
- Rain garden (a Nature-based Solution): under construction to collect stormwater from the building‘s roof.
- The outdoor environmental parameters that focus on the water cycle can be used in courses on Hydrology, Irrigation and Drainage, Surface Drainage and Sewage, Hydrometry, and Introduction to Environmental Engineering.
- We think this virtual demonstration center is a valuable contribution to students‘ experiences and skills.

Questions?

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Thank You for Your Attention !