Co-UDlabs
Building Collaborative Urban Drainage laboratories

3 Transnational Access calls
Results and testimonials

The Co-UDlabs project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008626.

UDC-BLOCK-Zafra

Methodology to determine the potential heavy metal loads washed-off by stormwater runoff from road-deposited sediments

Testimonial
David Santiago Hernández Medina
Environmental Engineering student

User group institution
Universidad Distrital Francisco José de Caldas (Colombia)
District Environment Secretary of Bogotá (Colombia)

Facility provider
Universidade da Coruña

> The UDC handed and instructed me in the use and analysis of instruments related to **concentration of heavy metals**, **particles analysis and in-depth flow discharges**. With that knowledge, I was able to investigate deeply **sediment and flow processes**. Finally, but not least important, I had a great team here in UDC, who helped me clear all the doubts that rose on the road and helped me moving forward with the research project.

> **My experience at the Co-Udlabs research facility was enriching**. For starters, I was able to work and learn all kinds of **sediment-flow** related concepts. Furthermore, with all the research accomplished, I was able to analyze and understand the mechanisms related to road deposited sediments and its intrinsic correlation with the leaching of heavy metals. At last, the programme, team and all the related procedures helped me fulfilling all the goals we had pointed out in the initial project plan. Hopefully, at future, this will help add/discard new theories related to leaching of RDS and heavy metals.

Co-UDlabs

- **Number of access days granted**: 60 days
- User group from **academia** and **policy makers** from Bogotá (Colombia).
- **Scientific support** on experimental design and measurement techniques (depths, flows, velocities and water quality).
- **Technical support** on samples analysis.
- Dataset and research article planned.

UDC-STREET-Bellos

Urban Flooding: Houses as reservoir (UF-HOUR)

Testimonial

Spyros Pritsis
PhD Candidate, Norwegian University of Science and Technology (NTNU)

User group institution

Democritus University of Thrace (Greece), National technical University of Athens (Greece), Norwegian University of Science and Technology (Norway), Universidad de Granada (Spain)

Facility provider

Universidade da Coruña

> "Participating in the Co-UDlabs TA gave me the opportunity to work as part of a research team outside my home institution, something that I hadn't had the chance of doing yet, being new in research. This broadened my understanding of my research topic and perspective on my field."

> "I worked at the research facility (CITEEC lab) for 2 months. During this time I had the help of professors, researchers and technicians there. I would describe my experience as fantastic. From a strictly scientific perspective, I learned a lot **about experimental hydraulics** through our collaboration, knowledge that I will use for my PhD. This stay also functioned as a crash course in a **plethora of auxiliary skills**, from adapting to a new group and communicating with the people to navigating a different university's administrative system. It should be noted that the catalyst for this positive professional experience was the friendly and supportive environment created by everyone I met at UDC."

Co-UDlabs

- **Number of access days granted**: 40 days
- Researchers from 3 universities (Greece, Norway and Spain).
- **New tailored platform** with buildings built for the experiments.
- **Scientific support** on measurement techniques (depth and pressure sensors and PIV).
- **Technical support** on assembly and calibration.
- **Dataset** and research article planned.
- Numerical modelling will be performed.

INSA-OTHU-Fuchs

In-situ SUDS modelling: simulating infiltration processes in SUDS under and extreme events

Testimonial
Katharina Fuchs
Project and research engineer, Institute for technical and scientific hydrology (itwh GmbH)

User group institution
ItwH GmbH (Germany), TU Berlin (Germany), Leibniz University Hanover (Germany), INSA Lyon (France)

Facility provider
INSA Lyon

> Participating in the Co-UDlabs TA program gave me the opportunity to conduct experiments that would not have been possible without participation. For the experiments, **a swale was equipped with soil moisture sensors and irrigated with different artificial precipitation events**. The soil moisture sensors were provided, prepared and installed by the INSA Lyon based on the project suggestions. Through the measured values obtained, it is **now possible to map the infiltration processes better and to improve existing approaches**.
> The data and findings obtained are an important basis for my further work.

> The experience at/with OTHU-SUDS has been consistently positive. The team on site consisted of research assistants, technicians and even a professor. Everyone was very helpful before, during, and after conducting the experiments, but also throughout the whole duration of the first TA program. I was even **provided with additional data from the GROOF and the weather station**. When problems arose, either because of the data, during the experiments or during the evaluation of the data the entire team was there to find solutions and to help.

- **Number of access days granted**: 3 days to install required devices and sensors.
- **Soil moisture map** will support the validation of home-made infiltration models. Collected data will also be analysed to evaluate the recovery time of the swale after the simulated extreme event.
- **An abstract** was submitted for NOVATECH and a **Master thesis** is in progress. Additional publications are expected.
- The construction of an artificial sprinkler system had been done to irrigate in situ monitored swale.

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IKT-LTF-Verhulst

Investigation of the rehabilitated waste water pressure pipes in response to pressure surges in operation IKT´s Large Test Facility (LTF)

Testimonial

Danny Verhulst
Chairman working group and Asset Management at VLARIO
Asset Manager Network at Aquafin NV

User group institution

VLARIO (Belgium), Aquafin (Belgium), KU Leuven (Belgium), Wessex Water, United Utilities, Seven Trent Water (UK)

Facility provider

IKT – Institute for Underground Infrastructure (Germany)

> “The expected outcome is very important for an upcoming problem in many countries: renovating rising mains (pressure lines) of pumping installations, without renewal. Standard rehabilitation techniques for gravitational sewers can not be used for pressure pipes, which are subject to water hammer. Within this research program, we are aiming to select, test and calculate rehabilitation liners that can withstand the pressure variations and thus may be used for rehabilitation in pressure pipes.”

> “The Large Testing Facility of IKT is very suitable for the experiments that have to be made. Not only the dimensions of the LTF but also the support from capable technicians for constructing the whole setup (testrigs, the measuring system, datalogging, ...) and analysis from IKT engineers, are very helpful in this complex matter.”

Co-UDlabs

- **Number of access days granted**: 40 days
- **Hydraulic experiments** are to show how pressure pipe. rehabilitated using Close-fit-liners behave under pressure surge loads. The current calculation approaches are to be examined.
- **Open dataset,** research articles and conference presentations are planned.

EAWAG-HALL-Langeveld

Characterization of thermal properties in sediment samples from urban drainage systems with temperature probes

Testimonial

Manuel Regueiro-Picallo
Postdoctoral Research, Universidade da Coruña
Water and Environmental Engineering Group

User group institution

TU Delft (The Netherlands), Water Board De Dommel (The Netherlands), Universidade da Coruña (Spain), Lulea Technical University (Sweden), Stockholm Vatten AB (Sweden)

Facility provider

Eawag

> "The Co-UDlabs TA Programme has been a unique opportunity to work with professionals and academics from the urban drainage sector of recognised international reputation. I discovered a new research environment during the execution of the TA project. Consequently, I could develop new research skills. The TA Programme also helped me to partially fund the experimental work of my postdoctoral research, which I have recently started. The experimental work involves costs of materials and hour of technicians that would otherwise have to be covered with funds from the host research centres. Having the support of the TA project greatly facilitated this process."

> "The use of the HALL facility was a success, as I was able to test a prototype for measuring sediment accumulation in sewer pipes by using temperature sensors. The HALL facility was versatile to design and perform the experimental campaign. I consider that the dataset obtained is of a very high scientific and technical excellence because I could test an innovative solution for sediment monitoring. I have worked with real organic samples during the experimental campaign, which were collected in the urban drainage system of Zurich."

- **Number of access days granted**: 40 days
- **Sediments** from Zurich utility (ERZ): 2 gully pots, sewer, CSO tank. Thermal characterization through active heating and sensing. Very good agreement with experiments and theory.
- **Dataset (open) and research articles** in preparation. Application to gully pots refined (energy, remote access, IoT).

Co-UDlabs

USFD-BURIED-Li

Hydraulic Analyses of the Toronto Exfiltration System (TES). Investigation of a novel stormwater drainage system to utilize exfiltration into the soil to reduce flood risk in congested urban areas.

Testimonial

James Li
Professor, Toronto Metropolitan University
Department of Civil Engineering

User group institution

Toronto Metropolitan University (Canada), University of Sheffield (UK), University of Siegen (Germany), University of Hong Kong (Hong Kong China)

Facility provider

University of Sheffield

> The the most relevant benefits and outcomes of participating in the Co-UDlabs TA Programme were to have access to the state-of-the-art research facility and technical support from the facility providers, resulting in research findings that are scientifically meaningful and defensible. I also received research support from the research faculty member and graduate students, resulting in research collaborations and exchanges. The multi-university researchers and students interactions will result in potential long-term research relationships.

> The Buried Cell research facility at the ICAIR, University of Sheffield, has provided a unique facility supporting my research objectives in sustainable urban drainage systems (SUDS). Not only the size of the facility but also the associated infrastructure, such as pump capacity and surrounding underground environment, have enabled me to test a full-scale hydraulic model of the SUDS. The necessary measurement sensors and recording devices are available for my research data collection. The most important research supports were the faculty member, the graduate students and the technicians.

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- **Number of access days granted:** 60 days
- Full scale system, two different types of soil condition, simultaneous hydraulic and groundwater measurement. Steady/unsteady/sediment tests.
- Dataset (open) and research articles planned. Numerical modelling performed by the user group.

USFD-ANNULAR-Morató

Annular Flume studies to test the effect on Antibiotic Resistant Genes and Use of CRISPR- Cas in *E. coli* from sediments affected by sewage pollution.

Testimonial

Dr Nury Gineth Infante González

Posdoctoral Researcher

Universitat Politècnica de Catalunya / Department of Chemical Engineering

User group institution

Universitat Politècnica de Catalunya-BarcelonaTech (Spain)

Facility provider

The University of Sheffield

> "It has been a great opportunity for the **creation and development of research**, it is highly enriching to strengthen knowledge and strategies that can contribute to the dissemination of solutions to emerging contaminants into the aquatic environment and climate change generating a **high impact at a technological and innovative level.**"

> "Training, development, and application with annular flume has been very gratifying, it has been more than I expected, the scope of the proposed objectives has been achieved according to the time, I have learned several topics independent of my field and with results that motivate me to continue researching."

Co-UDlabs

- **Number of access days granted**: 60 days
- **Annular flume** filled with local river water and gravel
- Biofilm dynamics and mobilisation/shear stress
- Antimicrobial resistance (AMR) characterisation (biofilm/water)
- Conference on AMR, data and open access publication planned

USFD-ANNULAR-Regueiro

Temperature time series analysis for predicting sedimentation in sewer systems

Testimonial
Manuel Regueiro Picallo

Postdoctoral researcher

University of A Coruña

User group institutions
University of A Coruña - Luleå Technical University - TU Delft - Water Board De Dommel - Stockholm Vatten AB

Facility provider
The University of Sheffield

> Participating in the Co-UDlabs Transnational Access programme allowed me to **extend my postdoctoral research work**. I am **currently developing a methodology to detect and estimate the depth of organic sediments in urban drainage systems** from temperature measurements, and having access to large installations provides technological development prior to validation in actual systems. Particularly, this project served to test the application of this methodology in sewer pipes under different flow conditions.

> It was my first time working in an annular flume, although I was already familiar with several studies that had been carried out in the ANNULAR flume at the University of Sheffield. I found the experience of working in the ANNULAR more complex than I had first expected. Estimating the flow velocities and setting up a heat exchanger were the main challenges of the project, which we were able to overcome. **As a result, I was able to simulate wastewater and sediment conditions in sewers** and, subsequently, **evaluate the influence of hydrodynamics on the heat transfer processes**.

- ***Number of access days granted**: 60 days*
- ***Communication of the results** in the 16th International Conference on Urban Drainage (ICUD) and **one research article** in preparation.*
- ***Open dataset** and **descriptive report** of the experimental campaign available on Zenodo.*

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IKT-LTF-Beenen

Assessment of Inspection tools for Rising Mains (AIR)

Testimonial

Alexander Towlson

PhD Candidate

University of Bristol
Ultrasonic & Non-Destructive Testing research group

Department of Mechanical Engineering

User group institutions

RIONED (The Netherlands), University of Bristol (UK), University of Sheffield (UK), XYLEM (Canada), ROSEN group (Switzerland), Wessex Water, Yorkshire Water, Seven Trend Water, United Utilities (UK) , STOWA, Waterboard company Limburg, Municipality of Arnhem (NL)

Facility provider

The University of Sheffield

> It has made clear the remaining issues with my inspection technique, which has informed my plan for the remaining years of the project. It has also been **useful** and **interesting** to see and use a high quality rig, allowing me to perform tests I could not otherwise do. Experiencing engineering and research settings in another country has also been a **valuable experience**.

> It has been a **very positive experience**, the people at IKT have been very welcoming and helpful. It has been very useful to test my device in a blind trial, to assess the performance of my device without the bias of prior knowledge of defect position. This has helped inform me of the issues surrounding defect characterisation, as well as the issue of contrast between surface roughness and small defects.

- ***Number of access days granted**: 40 days*
- *Several **groups of operators**, from the Netherlands, Belgium and the UK, **visited the lab** and took active part in identifying the main damage scenarios to be applied to the test set-up.*
- ***Report** in English and Dutch aimed at the community of network operators and network owners*
- ***Results communicated at several technical events** and to be published as **scientific articles**.*

Co-UDlabs

UDC-BENS-Peña

Evaluation of new flow and quality monitoring devices for sewers

Testimonial

Salvador Peña Haro

CTO

Photrack

Testimonial

Marie Burckbuchler

CEO and R&D engineer

Ubertone

User group institutions
Photrack, Ubertone, UPCT

Facility provider
Universidade da Coruña

> Photrack and Ubertone are companies working on **sensor development**. The Co-UDLabs TA and UDC gave us a unique opportunity to test, check feasibility, limitations and improve our instrumentation and data processing, which will allow us to bring into the market new and better instrumentation for the purpose of **sewer monitoring**. The project has also served us for **networking** with different sectors on instrumentation for **urban drainage**. Additionally, it was also an opportunity for a work-student in a company to get experience of research laboratory.

> The facility at BENS was ideal for our purposes; we were able to **install different instruments** with ease as well as **control the flow conditions**. We were able to **collect extensive data** which we continue analysing even after the project.
> We got **extensive support** from the **UDC team**, they were very helpful during all stages of the experimental work. Working with them was very pleasant and collaboration with them is still on-going.

- ***Number of access days granted**: 71 days*
- ***76 tests performed** (53 short tests with different boundaries and flow conditions, 16 long tests with sediment accumulation, 4 turbidity tests and 3 tests varying flow rate or boundary conditions)*
- ***Datasets** are being analysed and will be made open in 2024.*
- ***Abstracts** and **journal papers** are being prepared*

Co-UDlabs

EAWAG-01-HALL-Bares

Non-contact assessment of TSS and COD concentrations in wastewater with hyperspectral imaging

Testimonial
Dr. Vojtěch Bareš

Senior Scientist

Czech Technical University in Prague | ČVUT · Department of Hydraulics and Hydrology

User group institutions
CTU Prague (Czech Republic), TU Graz (Austria), Geo-Konzept GmbH (Germany), Photrack AG (Switzerland), Dr. Pecher AG (Germany)

Facility provider
EAWAG

> Participating in the Co-UDlabs TA Programme offered access to **cutting-edge research facilities**, a **user group with innovative stakeholders**, such as hyperspectral imaging specialists, and **technical support**, especially regarding wastewater analytics at Eawag. Without that support, we would have never been able to investigate non-contact wastewater monitoring technology. We are currently preparing the results for publication in a peer-reviewed journal. Interactions with researchers and SMEs in the international user group may lead to long-term research relationships.

> The Eawag experimental HALL facility is ideal for conducting necessary experiments. Its infrastructure with access to live wastewater and the assistance of **skilled technicians** in setting up the entire infrastructure, including test rigs and measurement systems, along with analysis from Eawag staff, greatly facilitate this complex process.

- ***Number of access days granted**: 73 days*
- ***Datasets** of wastewater reflectance and adsorption measurements, together with labelled ground-truth data are being analysed and will be made open in 2024.*
- ***Peer reviewed publication** will be made open in 2024.*
- ***External stakeholders** interested in the technology.*
- ***Follow-up R&D project** based on the results planned.*

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EAWAG-03-UWO-Dittmer

A Probabilistic Machine Learning-based Framework to Improve Urban Drainage Modeling Reliability (PROBURB)

Testimonial
Dr. Amin E. Bakhshipour

Senior Scientist

TU Kaiserslautern

User group institutions
TU Kaiserslautern (Germany), Shahid Chamran University of Ahvaz (Iran), Guangzhou University (China), Oceans Research Co. (Iran), Universität Innsbruck (Austria)

Facility provider
EAWAG

> Participating in the Co-UDlabs TA Programme offered access to **excellent research infrastructures and technical support,** especially regarding the Urban Water Observatory living lab and streaming data analytics at Eawag. With the data provided, we developed an advanced physics-based AI model for rainfall runoff simulation. This model can be readily transferred into practical application and forms the foundation of our current research as well as our new proposals. We are currently preparing the results for publication in a peer-reviewed journal. Interactions with researchers and SMEs in the international user group may lead to **long-term research relationships**.

> The Eawag experimental UWO dataset is ideal for conducting the required analysis. The openly available dataset, with the many sources of different signals and varying quality was a **unique possibility to very effectively organize our international user group.** Also, the assistance of **skilled technicians** in field visits, interpreting the data, including detailed knowledge on data transmission and instrument properties, helped a lot to carry out our research.

- ***Number of access days granted**: 10 days*
- ***UWO open dataset** available in the public domain (license-free)*
- *Advanced physics-based **AI model** for rainfall runoff simulation developed*
- ***Processed datasets** are being analysed and will be made open in 2024.*
- ***Abstracts** and **journal papers** are being prepared*

Co-UDlabs

USFD-AB Flume-Mignot

Pollutant Transport in Urban Floodwater

Testimonial
William Addison - Atkinson

PhD Student

The University of Exeter

User group institutions
INSA Lyon, University of Exeter

Facility provider
The University of Sheffield

> The Co-UDlabs TA program **facilitated access to cutting-edge laboratory facilities** tailored for studying **urban drainage** phenomena. These resources, including hydraulic flumes and monitoring equipment, enabled hands-on experimentation and real-time data collection, **enhancing my understanding of complex drainage dynamics**. Collaborative research projects within the program offered valuable insights and challenged conventional knowledge in the field. Engaging with researchers from diverse backgrounds broadened my perspectives and encouraged **innovative approaches** to tackling research questions.

> My experience at the Co-UDlabs research facility was incredibly enriching. **Access to advanced equipment** and **collaboration with experts** allowed me to conduct in-depth studies on **urban drainage dynamics**. This experience significantly contributed to **achieving my research objectives** by providing valuable insights, refining methodologies, and fostering interdisciplinary collaboration.

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- ***Number of access days granted***: *28 days*
- Comparative analysis of three different measurement techniques to describe the spreading of pollution from a surcharging drainage network in flood flows
- Effect of three different surface layouts considered
- **Datasets** are being analysed and will be made open in 2024.
- **Journal papers** are being prepared

About the Co-Udlabs project
Building Collaborative Urban Drainage laboratories

Co-UDlabs is a Horizon 2020 INFRAIA project aiming to integrate research and innovation activities in the field of **Urban Drainage Systems** (UDS) and address pressing public health, flood risks and environmental challenges.

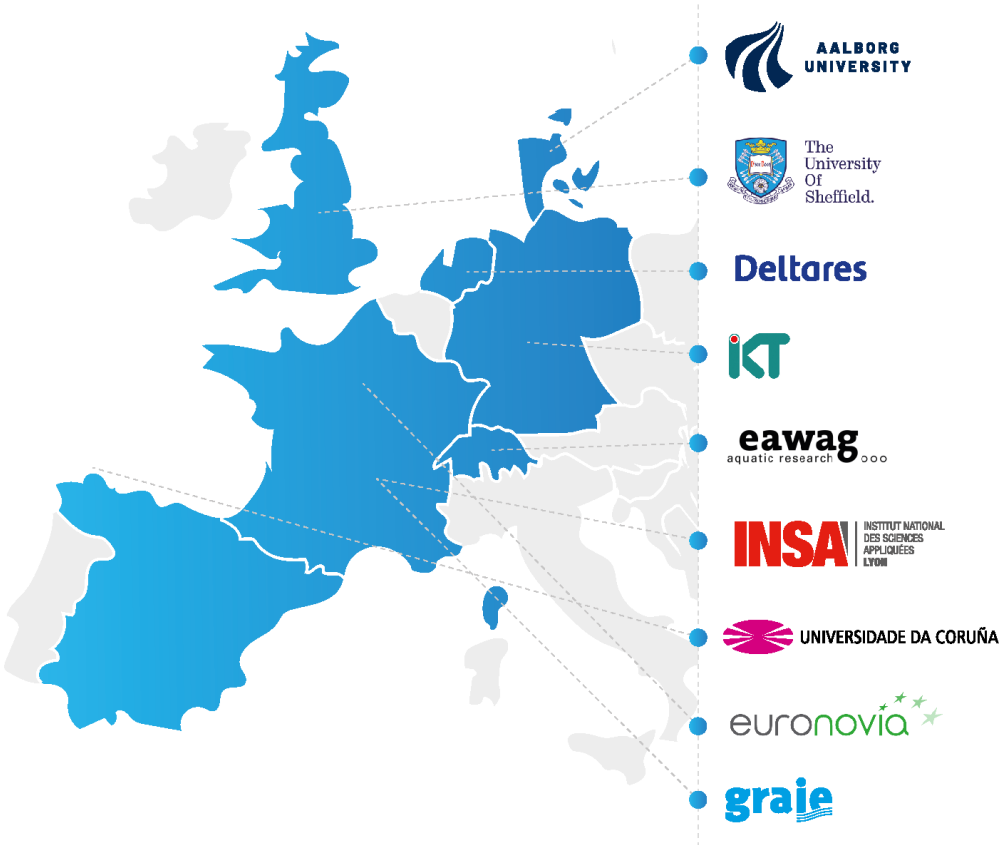
Consortium
9 partners
7 countries

Duration
4 years

Start/ end date
1 May 2021
30 April 2025

Budget
5M €

Our partners



Co-UDlabs

Co-UDlabs is a Horizon 2020 INFRAIA project aiming to integrate research and innovation activities in the field of **Urban Drainage Systems** (UDS) and address pressing public health, flood risks and environmental challenges.

Its partners have made **17 different installations** available for free access by research groups from all over the world.

We successfully closed our TA calls with over 30 funded projects!

For more information

Visit our website!

Contact us!
contact@co-udlabs.eu

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