



Co-UDlabs

Building Collaborative Urban Drainage
research Labs communities

D3.2. 2nd Report on training and education activities

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Background: about the Co-UDlabs Project

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

Bringing together 17 unique research facilities, Co-UDlabs offers training and free access to a wide range of high-level scientific instruments, smart monitoring technologies and digital water analysis tools for advancing knowledge and innovation in Urban drainage systems.

Co-UDlabs aims to create a urban drainage large-scale facilities network to provide opportunities for monitoring water quality, UDS performance and smart and open data approaches.

The main objective of the project is to provide a transnational multidisciplinary collaborative research infrastructure that will allow stakeholders, academic researchers, and innovators in the urban drainage water sector to come together, share ideas, co-produce project concepts and then benefit from access to top-class research infrastructures to develop, improve and demonstrate those concepts, thereby building a collaborative European Urban Drainage innovation community.

The initiative will facilitate the uptake of innovation in traditional buried pipe systems and newer green-blue infrastructure, with a focus on increasing the understanding of asset deterioration and improving system resilience.

List of acronyms

Acronym / Abbreviation	Meaning / Full text
AaU	University of Aalborg
CA	Consortium Agreement
CITEEC	Center for Technological Innovation in Construction and Civil Engineering
DEL	Deltares
ECTS	European Credit Transfer and Accumulation System
ESR	Early-Stage Researcher
FTIR	Fourier transform infrared spectroscopy
GA	Grant Agreement
IKT	Institute for Underground Infrastructure
INSA	National Institute of Applied Sciences
JRA	Joint Research Activity
LIDAR	Airborne light detection and ranging
RI	Research Infrastructure
SfM	Structure from motion
TA	Transnational Access
UD/UDS	Urban Drainage / Urban Drainage System
UDC	University of A Coruña
USFD	University of Sheffield
WP	Work Package

Executive summary

This document is a deliverable of the Co-UDlabs project, funded under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 101008626.

The aim of this document is to report on the different types of training and education activities organized by the project partners under WP3 until M34 of the project, as well as the plan for the next months. Through the organization of these events, WP3’s objectives are to:

- Enhance the transfer of knowledge and develop new skills among the project partners and between the research community and the practitioner’s community;
- Foster the use of the Co-UDlabs Research Infrastructures via tailored actions targeting their future users;
- Create a pool of high-qualified professionals via adequate training activities targeted to general Urban Drainage community, with a special attention to increase the participation of the industry and the early-stage researchers’ community.

1. The Co-UDlabs training programme

In support of its research activities and the establishment of a pan-European Network for Urban Drainage Innovation, Co-UDlabs is organising a series of training activities and initiatives throughout its implementation, as part of WP3. The project's training strategy is based on three main pillars:

- UD early-stage and junior researchers' activities and training events (Task 3.1)
- UD industry professionals and practitioners training activities (Task 3.2)
- Public webinars on specific and emerging monitoring techniques in UD (Task 3.3)

These events will take place in a hybrid, online or physical format.

Whenever possible, these trainings will be recorded and will be made available online on the Co-UDlabs **YouTube channel** (<https://www.youtube.com/channel/UC29ggHMkX1w9QReChDcXniQ>) that has been created in April 2022. The Co-UDlabs YouTube channel gathers the content of the webinars and other training actions related with specific monitoring techniques such as optical imaging, microplastics monitoring, drainage assets assessment, uncertainty analysis. It is curated by the project consortium and is regularly being updated with videos from the project, allowing the community to access the project content during and after the project completion.

1.1. UD early-stage and junior researchers' activities and training events

Two types of activities are planned within this pillar:

1. Two **internal Co-UDlabs early-stage researcher seminars** targeting PhDs and early-stage researchers from partner institutions of Co-UDlabs, aiming to enhance interaction between academics, sharing ideas and promote common experimental protocols. These seminars have a duration of 2 days and are targeting 20 participants.
2. Two **open workshops and a PhD course** targeting the UD European junior research community.

Until M34, we have organised the following training events for UD junior and early-stage researchers:

- **One open workshop:** The **25th EJSW – European Junior Scientists Workshop on “Monitoring Urban Drainage Systems and Rivers”** was held on 15-21 May 2022, in St-Maurice-en-Valgaudemar, France. This workshop was jointly organised by the Sewer Systems and Processes Working Group of the IWA/IAHR Joint Committee on Urban Drainage and the Co-UDlabs project. It gathered 20 junior-scientist participants from institutions based in 11 countries and even more diverse nationalities. The 25th EJSW included:
 - 20 oral presentations by the junior scientists (20 min presentation + 10 min for questions/answers).
 - 5 short courses (45 min) by senior organisers on i) low-cost monitoring, ii) uncertainty assessment, iii) data validation, iv) application of cameras in discharge monitoring, and v) 3D-printing applied to urban drainage and river monitoring.
 - 1 workshop (1.5 h) on ethics in science and research.
 - 4 afternoon hands-on sessions: In total 8 sessions were organized and each participant attended one of them: (i) DIY low-cost water level monitoring, ii) sediment transport monitoring, iii) tracing experiment for discharge measurement, iv) data validation, v) sensor calibration, vi) uncertainty

assessment, vii) Large-Scale Particle Image Velocimetry (LSPIV) in river flows, and viii) turbidity -TSS (or COD) correlation.

The EJSW benefited from wonderful weather for outdoor hands-on sessions and was a great opportunity for sharing knowledge and experience, networking and creating links between participants, reinforced by recreational activities. The flyer of the event is available in Annex 1. More information is available on the project website (<https://co-udlabs.eu/2022/05/26/25th-ejsw-2022/>).



Figure 1. EJSW 2022 in St Maurice en Valgaudemar (photo: F. Clemens-Meyer)

- An **internal Co-UDlabs early-stage researcher seminar** took place on June 27-28, 2022, at the UDC's School of Civil Engineering in A Coruña (Spain). The seminar aimed to enhance interactions between PhD students and junior researchers of the project, sharing ideas while identifying and promoting common experimental protocols and approaches. Organised by UDC, the seminar was an excellent opportunity for everybody to learn about the project's main research lines and agendas and receive feedback, recommendations, and additional insight. The event included cutting-edge work and presentations on sediment accumulation, wastewater turbidity monitoring, infrastructural planning for heavy-rain laboratories, as well as innovative approaches to flooding health risks, performance assessment in UDS, LIDAR and SfM-based techniques for surveying and experimental planning. A total number of 9 oral presentation were performed in the seminar which accounts with the participation of 33 attendees. The agenda of the event is available in Annex 2. More information is available on the project website (<https://co-udlabs.eu/2022/07/04/co-udlabs-celebrated-its-first-general-assembly-and-early-stage-researchers-seminar/>).



Figure 2. 1st Co-UDlabs internal early-stage researcher seminar (photos: Andrea Ciambra)

The next training events for early-stage and junior researchers are planned to take place in 2024, as follows:

- **One open workshop:** The **26th EJSW – European Junior Scientists Workshop on “Monitoring UDS and Rivers”** will be held on May 26 – June 1, 2024, in St-Maurice-en-Valgaudemar, France. This workshop is organized by INSA Lyon and Deltares (Co-UDlabs partners), in collaboration with the Sewer Systems & Processes Working Group of the IWA – IAHR Joint Committee on Urban Drainage. It will focus on
 - On-line monitoring of water quality and quantity in waste- and stormwater collection systems, and rivers
 - Links between data validation and model calibration
 - Emerging monitoring concepts and data communication techniques
 - Ethics in researching, publishing, presenting and sharing data.

The call for abstracts and the brochure of the event are available on Co-UDlabs website (<https://co-udlabs.eu/2023/08/29/26th-european-junior-scientists-workshop-ejsw-call-for-abstracts/>), as well as all information relates to the workshop on the event website (<https://ejsw-2024.sciencesconf.org/>)

- The **2nd internal Co-UDlabs early-stage researcher seminar** is planned to be held at USFD in **the autumn of 2024**. This will be a 2-days hybrid seminar.
- **A PhD course on Sewer Processes will be organized by AaU in Aalborg (Denmark) on October 7-11, 2024.** It will be worth 5 credits in the ECTS system and will be open to PhD students from institutions from all over Europe. The course will focus on sewer process and sewer process modelling in relation to sulfide and methane formation and associated problems in terms of odor sewer corrosion and greenhouse emissions. The objective of the course is to give the students insight and knowledge on the most recent advances of sewer process modeling and applications to real-world use. The course will address the following topics:
 - State-of-the-art of the sewer process modeling
 - Aerobic and anaerobic organic matter transformation
 - Air-water mass transfer of sewer gases
 - Sewer odor and corrosion
 - Mitigation methods

1.2. UD industry professionals and practitioners training activities

This pillar concerns the organisation of training activities aimed specifically at urban drainage industry stakeholders, regulators, professionals, and other practitioners.

- The first of these events was organized by IKT on November 3-4, 2021. The free online **Workshop on Urban Drainage Practice and Research Needs** aimed to identify valuable good practices and research for the optimisation of UD assets’ performance and improve their resilience to climate change and sustainability. More specifically, the workshop was also designed to introduce Co-UDlabs’ three Joint Research Activities and to illustrate their themes with various examples of issues and good practices from urban drainage network owners and researchers. It was, in other words, a very valuable and outstanding opportunity for researchers, utility management, regulators, businesses, and other relevant stakeholders in UD systems to meet, discuss, and share potential pathbreaking ideas for the sustainable future of this field. The workshop

was also a great venue to introduce Co-UDlabs' first Trans-National Access (TA) call to the attendees. The workshop was attended by 59 participants on Day1 and 51 participants on Day2. The agenda of the workshop is available in Annex 3. All presentations are available for download on the project website (<https://co-udlabs.eu/2021/11/09/ikt-workshop/>).

- **Industrial workshop on flow rate determination of pumping stations and hydraulic structures** (DEL - November 17, 2022). This one-day course was on “Capacity problems and flow rate determination in pressurized systems”. With 58 participants, the webinar targeted practitioners who are either designing, building, or managing wastewater pressure mains. The following subjects were addressed in the course: 1) Basics of (multiphase) hydraulics in pressurized systems 2) How to determine the performance of a pressurized system and to detect capacity problems 3) Different sources of capacity problems and how to identify them 4) The effect of air/gas pockets on capacity, energy consumption and what remedies are available 5) Methods to detect the presence of air/gas pockets 6) Several relevant case studies. The workshop is fully available on the Co-UDlabs website and Youtube channel (<https://co-udlabs.eu/2022/11/30/lets-take-a-look-back-at-the-co-udlabs-industrial-workshop-capacity-problems-flow-rate-determination-in-pressurized-systems/>). The agenda is available in Annex 4.



Figure 3 Industrial workshop organized by DEL

The next training activities aimed for UD industry professionals are planned to take place with the following schedule:

- **Industrial and water professional workshop on Uncertainty assessment in UD monitoring data** (INSA and GRAIE – 6-7 March 2024). With a duration of 2 days, the course targets practitioners, operators, water utilities and stakeholders engaged in monitoring activities. The workshop aims to introduce the importance of uncertainty assessment in urban drainage, present the UDMT webapp, and provide examples of application. A session will be fully dedicated to examples and case studies brought by the participants. At the end of the course, participants will know the methods applied in the UDMT and how to use it for their own needs. The training course will be limited to 15 participants. The programme and registration is available on the Co-UDlabs website (<https://co-udlabs.eu/evenements/workshop-on-uncertainty-assessment-in-urban-drainage/>).
- **Applied course on UD metrology** (UDC –July - September 2024). This course targets UD practitioners and water utilities interested in monitoring the main hydraulic and water quality parameters of sewers and drainage networks. The course will be held at CITEEC laboratories, allowing the participants to join STREET and BLOCK TA infrastructures, as well as Campus-SUDS research infrastructure of UDC on pilot Sustainable

Urban Drainage techniques (<https://campus-suds.udc.es/h>). Limited to 12 participants, the course will take place over 4 days:

- Day 1 – Measurement of hydraulic variables. Rainfall, flow rates, water depths and velocities will be measured using different technologies (direct measurement, ultrasound, pressure, acoustic velocimetry, etc.).
 - Day 2 – Measurement of pollution parameters. Automatic grab samplers and on-line probes will be used to measure the most relevant variables and methods of analysis.
 - Day 3 – Data collection and management. In this session different technologies to convert signals to data will be presented. Additionally, the course will present how parametrize hydraulic and pollution parameters linked to dry and wet weather flows.
 - Day 4 – Demo Day – Simulation of a field campaign in the infrastructure of CITEEC. A field work will be simulated in the BLOCK model and SUDS pilot techniques. Measurements of all relevant parameters will be made, online and by grab samples. The analyzed events will be parameterized assuming that the control sections are part of a specific urban area.
- **Practice workshop on themes relevant for the improvement of the monitoring and inspection of drainage systems**, which will have an impact on better and more efficient UDS management (IKT – **early 2025**). The aim of this one-day workshop, which will be limited to 20 participants, is to exchange ideas and to define research need regarding the application of practical solutions for the improvement of the monitoring and inspection of drainage systems, which will have an impact on better and more efficient UDS management procedures. This practice workshop will offer a platform for the exchange of knowledge and experience between industry and public sewer network operators, promoting mutual understanding between scientists, industry and network operators.

1.3. Public webinars on specific and emerging monitoring techniques

Each research institution of the project is planning to organise a webinar for specific and emerging monitoring techniques in UD. The planning of the next webinars, that has been defined and validated by project partners during the first six months of the project, is available in the table below:

Table 1: List of Co-UDlabs webinars

Webinar title	Date planned	Partner in charge [+ co-organisers]
1 - FTIR Chemical mapping	September 21, 2022	AaU
2 - Acoustic turbidity measurements	May 16, 2023	EAWAG, UDC
3 - Routine uncertainty assessment (UA) in urban drainage data	June 12, 2023	INSA, DEL, GRAIE
4 - Optical and computer vision techniques for flow and processes	March 15, 2024	DEL, UDC
5 - Underground infrastructure monitoring techniques	2024	IKT, USFD, DEL
6 - Routine data validation (DV) in urban drainage	May 2024	INSA, GRAIE

More information will be made available on the project website (<https://co-udlabs.eu/>) closer to the date of these events. The recordings of these webinars will be uploaded on the YouTube channel of the project

(<https://www.youtube.com/channel/UC29ggHMkX1w9QReChDcXniQ>) and disseminated on the project social media channels for maximum visibility.

The first webinar, focused on **Fourier transform infrared spectroscopy (FTIR) chemical mapping**, was organized by Aalborg University on September 21, 2022. This free webinar was intended to provide basic knowledge on a widely used analytical technique that combines the chemical information from Fourier Transform Infrared Spectroscopy with the resolving power of microscopy. After introducing basic concepts about Infrared Spectroscopy and how an FTIR spectrometer works, infrared microscopy was briefly explained, including different modes of collecting spectra at the microscopic scale. Finally, μ FTIR-chemical mapping technology was introduced, focusing on theoretical and practical details related to this technique. To conclude, the webinar provided a short overview of the main applications of μ FTIR-chemical mapping ranging from biomedical science to material science and microplastic analysis on environmental samples, focusing on urban water microplastic monitoring. This public webinar was attended by 18 participants. The agenda of the webinar is available in Annex 5. The webinar has been recorded and the video has been made available on the project You Tube channel: [Co-UDlabs Webinar: Fourier Transform Infrared Micro-Spectroscopy \(FTIR\) \[Part 2/2\] \(youtube.com\)](https://www.youtube.com/watch?v=...).

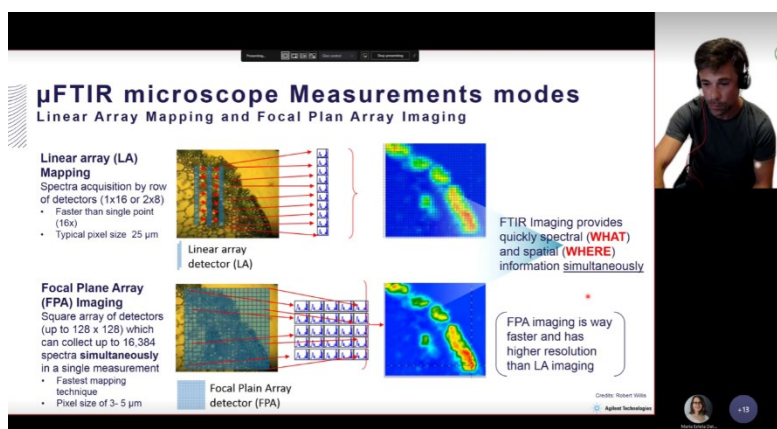


Figure 4. Webinar on FTIR chemical mapping (September 21, 2022)

The second webinar on **the principles and applications of acoustic backscattering to monitor suspended solids in natural and engineered systems** was organized by EAWAG on May 16, 2023, from 13:00 -16:30 CEST. As acoustic monitoring in water systems is very contemporary topic, the event was endorsed by the International Water Association and the Association of Hydraulic Research. The event brought together particle experts, sensor manufacturers, and individuals with practical experience in monitoring campaigns and projects. More than 100 participants registered for the event, with around 50 attendants permanent. The webinar was divided into two main blocks of presentations, followed by group discussions and. The presentations cover various aspects, including particle characterization, problem setting, theory, scattering, and scientific instruments. The afternoon session focuses on applications in urban and wastewater systems. The flyer including the agenda of the webinar is available in Annex 6. The webinar has been recorded and the video has been made available on the project You Tube channel: [CoUDlabs Webinar: Acoustic monitoring of suspended solids in natural and engineered systems \(youtube.com\)](https://www.youtube.com/watch?v=...). A summary and the slides of the event are also available in the Co-UDlabs Zenodo community: <https://zenodo.org/doi/10.5281/zenodo.7969766>

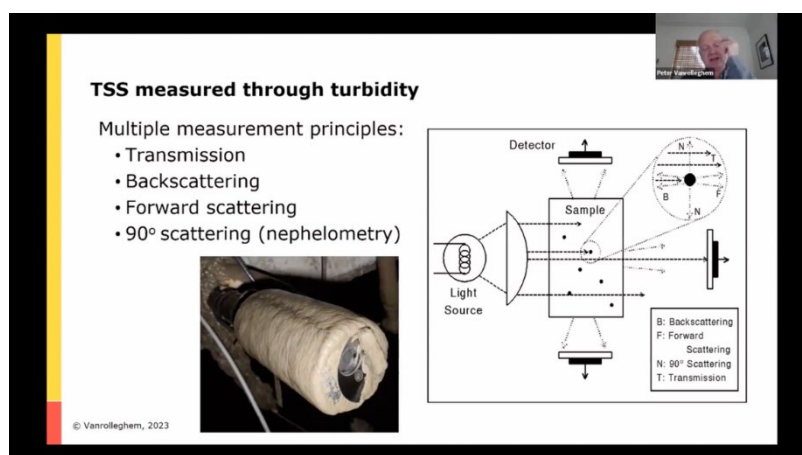


Figure 5 Webinar on the principles and applications of acoustic backscattering to monitor suspended solids in natural and engineered systems (May 16, 2023)

The third webinar on **Routine Uncertainty Assessment**, was organized on **June 12, 2023** (14:00 – 16:30 CEST) by INSA and Deltares to introduce the importance of uncertainty assessment in urban drainage and the necessity to develop its systematic application, present the methods applied in the UDMT as well as the webapp, and provide examples of application. The speakers were: Jean-Luc Bertrand-Krajewski, Mathieu Lepot (INSA Lyon) & François Clemens (Deltares, TU Delft). With 35 participants in attendance, the webinar was recorded and the video made available on the Co-UDlabs YouTube channel: [Co-UDlabs webinar on the Urban Drainage Metrology Toolbox \(UDMT\) \(youtube.com\)](https://www.youtube.com/watch?v=...).

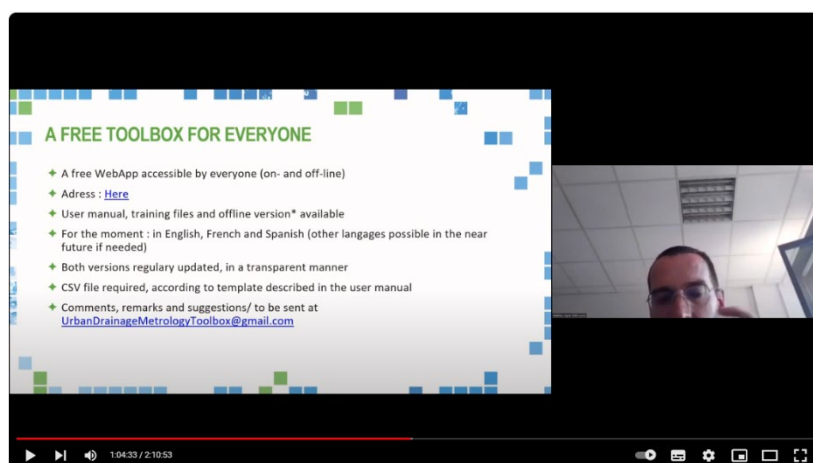


Figure 6 Webinar on Routine Uncertainty Assessment (June 12, 2023)

1.4. Implementation process and lessons learned

The training activities organized in the framework of WP3 are progressing as planned, with some minor deviations:

- Due to the low number of registrants, the PhD course on Sewer Processes planned to be organized in 2023 by AaU in Aalborg (Denmark) has been rescheduled to take place in the autumn of 2024. This year, we are starting the promotion of this course in due time, before the summer, and all partners are planning to widely promote it through their networks.

- The Industrial and water professional workshop on Uncertainty assessment in UD monitoring data planned to be organised by INSA and GRAIE in 2023 will take place this year, on 6-7 March 2024. This change was decided because a webinar on the same topic (Routine Uncertainty Assessment in urban drainage data) was organised by INSA in 2023 and it was deemed more appropriate to organise these two events at different times.
- The planning of the Co-UDlabs webinars set during the first 6 months of the project evolved and some of the webinars planned in 2023 are taking place during 2024. This does not have any negative impact on other activities.

2. Conclusions

At M34, Co-UDlabs has organized 7 successful events including:

- **1 online workshop** on Urban Drainage Practice and Research Needs on November 3-4, 2021
- **1 online industrial workshop** on Capacity problems and flow rate determination in pressurized systems on November 17, 2022
- **A 1st early-stage research seminars** targeted to PhDs and early-stage researchers from partners of Co-UDlabs
- **1 European Junior Scientist Workshop (EJSW)** on UD monitoring on May 15-21, 2022
- **3 public webinars** on FTIR chemical mapping (September 21, 2022), on Acoustic monitoring of suspended solids in natural and engineered systems (May 16, 2023) and on Routine Uncertainty Assessment (UA) in urban drainage data (June 12, 2023)

9 events are planned to be organized between M35 and M48, including 3 UD early-stage researcher activities & trainings events, 3 UD industry professional & practitioners training activities and 3 Webinars.

Annex 1. Flyer of the 25th EJSW – European Junior Scientists Workshop (15-21 May 2022)

EJSW ON 'MONITORING URBAN DRAINAGE SYSTEMS AND RIVERS'


When: 15th May – 21st May 2022
Where: Saint Maurice en Valgaudemar, France

ABSTRACT SUBMISSION

Apply: Extended abstracts should be sent not later than **9th January 2022** to the following e-mail address:
ejsw-2022@sciencesconf.org

Applications require a 1-page motivation letter, an up to 4-pages extended abstract and personal details including name, age, affiliation, position and e-mail address. All submitted abstracts will be evaluated through a scientific review. The organising committee will select the final extended abstracts (max. 24 junior participants) for oral presentations and notify the acceptance by end of January 2022.


PROMOTERS



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LOCATION & VENUE

Saint Maurice en Valgaudemar is a small typical village in the French Alps, at the entrance of the Séveraisse valley, close to Ecrins National Park.

The workshop venue is the *Val des Sources Hotel* (<http://www.levaldessources.com/en/home/>), with a meeting room and access to both a small channel and a river (with a flood every evening during that season!) a few minutes away for the practical workshop sessions.

Surrounding landscape and nature offer possibilities for active recreation between workshop sessions. Free-time between working sessions would allow visiting the Séveraisse valley, hiking, cycling, rafting, etc.



Les Alpes Pittoresques
SAINT-MAURICE en VALGAUDEMAR (Haute-Alpes) 1878 (1000 m. altitude)

St Maurice en Valgaudemar, 1100 m altitude.
 (source: <https://www.geneanet.org>)

First Announcement & Call for Abstracts

**25th European
Junior Scientists Workshop**

**MONITORING
URBAN DRAINAGE SYSTEMS AND
RIVERS**

Hands-on seminar on sensor applications and monitoring techniques

**Saint Maurice en Valgaudemar, France
15th – 21st May 2022**



Organised by
SS&PWG
 Sewer Systems & Processes
 Working Group of the IWA – IAHR
 Joint Committee on Urban Drainage
 and the Co-UDlabs H2020 European Project



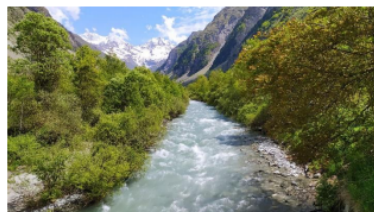
BACKGROUND AND OBJECTIVES

You are a motivated young scientist, a PhD student or a starting post-doc researcher? You want to present ideas and plans, discuss preliminary results of your own research in an inspiring, open, cooperative and non-competitive environment?

Then, the European Junior Scientists Workshops (EJSWs) provide a perfect opportunity to do so. The idea is not only to listen, neither only to talk and to dominate, but to learn from and help each other in solving scientific problems in a collaborative way.

The 25th EJSW focuses on:

- On-line monitoring of water quality and quantity in waste- and stormwater collection systems, and rivers.
- Links between data validation and model calibration.
- Emerging monitoring concepts and data communication techniques.
- Ethics in researching, publishing, presenting and sharing data.



The Séveraise river (source: <https://cleada.fr>).

In a plebiscite manner the 4th edition of this particular workshop offers juniors to i) **present and discuss**, and ii) **hands-on practice** of various measuring principles in a setting that gives more opportunity to learn and to share compared to regular conferences.

CALL FOR EXTENDED ABSTRACTS

Authors are invited to submit an extended abstract accompanied with a 1-page motivation letter not later than **9th January 2022**.

The extended abstract should include title, author(s), affiliation(s), full address (incl. tel. and e-mail) of the corresponding author and 3-5 keywords. The abstract should be between two and four A4-pages including a graphical abstract, illustrations, diagrams, tables and references. Objectives, hypotheses, applied approach, applicability, equipment and methods should be emphasised and (some) results should be presented.

Extended abstracts should be submitted via e-mail, preferably in MS Word format.

For the preparation of the abstracts, authors should use the instructions for authors recommended by Water Science and Technology (a template is available):

<http://wst.iwaponline.com/content/instructions-authors-wst>

Up to 23 participants will be selected based on submitted abstracts. Evaluation of abstracts will be carried out by the Organising Committee. Authors will be notified of acceptance for oral presentation not later than **31st January 2022**.

FEES

Participants are expected to make all travel arrangements to and from Lyon, France and pay for the trip. The workshop costs will be sponsored. A workshop fee of approx. € 600 (exact amount will be given on the website in January 2022) for all participants will be charged to cover costs for local transportation (Lyon Part Dieu railway station to Saint Maurice en Valgaudemar and return), accommodation and all meals.

PUBLICATION

Selected extended abstracts will be published as workshop proceedings on the workshop website with agreement of the authors.

PROGRAMME

The 25th EJSW will not only offer junior scientists an opportunity to present their research work and to be trained in chairing sessions as usual EJSWs, but will also put forward a unique set of practice sessions lead by the Organising Committee.



Participants during the EJSW 2019 edition in La Bérarde.

Morning sessions will be devoted to junior scientist's oral presentations and short lectures for afternoon sessions.

Afternoon sessions will include hands-on field workshops on the following topics:

- How to do proper sampling?
- How does a sensor work?
- Why and how to calibrate sensors?
- What induces measurement uncertainty?
- How to assess/interpret this uncertainty?
- How to analyse and validate raw data?
- How to operate a data communication network?
- How to design, to build and to maintain a monitoring station?

WEBSITES

Info and updates will be given at:

25th EJSW website:

<https://ejsw-2022.sciencesconf.org>

SS&PWG website: <http://www.sspwg.org>

Co-UDlabs website: <https://co-udlabs.eu>

Annex 2. Agenda of the 1st Early-Stage Researchers Seminar (June 27-28, 2022)

DAY 1	
Monday, June 27, 2022, 16:00–19:00 (CEST)	
16:00–18:00	Participants' welcome and registration <u>UDC School of Civil Engineering</u>
19:30	Icebreaking event: <i>A Pint of Co-UDlabs</i> 'Tapas' route in the city: checkpoint at ' <u>Obelisco</u> ' landmark site downtown
DAY 2	
Tuesday, June 28, 2022, 09:00–17:00 (CEST)	
08:30–09:00	Participants' welcome and registration Room 8–Ground floor, <u>UDC School of Civil Engineering</u>
09:00–09:20	Welcoming remarks and introduction to the Seminar
	Co-UDlabs researchers' portfolio–Early-stage and senior researchers (1) 20-minute presentation of work performed on urban drainage by Co-UDlabs partners [HYBRID EVENT: LINK]
09:20–11:00	<ul style="list-style-type: none"> Manuel Regueiro (UDC) SedTemp: Approach to sediment accumulation in urban drainage systems based on temperature measurements Marcel Goerke (IKT) Planning and conception of a heavy rain laboratory and its practical use Pierre Lechevallier (EAWAG) Non-contact monitoring of wastewater turbidity and organic pollution with hyperspectral camera
11:00–11:15	Coffee break
	Co-UDlabs researchers' portfolio–Early-stage and senior researchers (2) 20-minute presentation of work performed on urban drainage by Co-UDlabs partners [HYBRID EVENT: LINK]
11:15–13:30	<ul style="list-style-type: none"> Jose Anta (UDC) Permeable pavement clogging laboratory experiments using rainfall simulators Sophie Scutt (University of Sheffield) Evaluating the Public Health Risks of Urban Flooding Events Jörg Rieckermann (EAWAG) Performance assessment of RTC of urban drainage systems based on (uncertain) monitoring data
13:30–15:00	Lunch break at ETSICCP Cafeteria

Co-UDlabs researchers' portfolio–Early-stage and senior researchers (3)

20-minute presentation of work performed on urban drainage by Co-UDlabs partners [\[HYBRID EVENT: LINK\]](#)

- 15:00–16:40**
- François Clemens (DELTARES)
DELTARES research on Urban Drainage Systems
 - João Paulo Leitão (EAWAG)
Flooding and image-based analysis (water level estimation from images)
 - Esteban Sañudo Costoya (UDC)
Hydraulic experiments and topographic survey applying LiDAR and SfM techniques at BLOCK facility

16:40–17:00 **Wrap-up and closing remarks**

20:00 **Social dinner, Restaurante Artabria**
Project-wide dinner for all ESRS and GA participants

Annex 3. Agenda of the Co-UDlabs online practice workshop on urban drainage (November 3-4, 2021)

DAY 1	Wednesday 3rd November 2021, 09.00 – 12.30 (CET) / 08.00 – 11.30 (GMT/UTC)
09:00	Welcome by workshop moderator - Dr. Iain Naismith (Co-UDlabs - IKT, Germany)
The Co-UDlabs Project	
09:00 – 09:15	Why is the European Commission funding the Co-UDlabs Project? Objectives, Ambition, Work programme Dr. Iain Naismith (Co-UDlabs - IKT, Germany) Dr. Jose Anta Álvarez (Co-UDlabs - Universidade da Coruña, Spain)
09:15 – 09:30	Co-UDlabs and collaboration - Bringing Science, Industry and Network Operators together Dipl.-Ing. Thomas Brüggemann (Co-UDlabs - IKT, Germany) Prof. Dr.-Ing. Bert Bosseler (Co-UDlabs - IKT, Germany)
Setting the scene – Storm Bernd – July 2021	
09:30 – 09:45	Case Study - Heavy rainfall events in Europe in July 2021: consequences and challenges for sewer network operators (experiences of IKT in co-ordinating assistance for affected municipalities) Mirko Salomon (ComNetAbwasser - IKT, Germany)
Session I - Optimising existing urban drainage asset performance - use of monitoring and sensing to optimise network performance in response to heavy rainfall	
09:45 – 09:55	Overview of issues concerning monitoring and sensing for asset performance <ul style="list-style-type: none"> • by the leader of the Co-UDlabs Joint Research Activity 1 on Smart Sensing and Monitoring in Urban Drainage Dr. Jean-Luc Bertrand-krajewski - INSA Lyon (France)

09:55 – 10:30	Short presentations of examples of good practice in Europe <ul style="list-style-type: none"> • Smart Utilisation of Wastewater Storage capacity in sewers – Centaur Project (UK, France, Portugal) Dr. Alma Schellart (Co-UDlabs - University of Sheffield, UK) • Pollution released in Combined Sewer Overflows. Monitoring challenges in traditional infrastructures of Madrid (Spain). Antonio Lastra (Canal Isabel II, Spain) • Management of flow measurement data in sewers Dr. Franz Tscheikner-Gratl (Norwegian University of Science and Technology)
10:30 – 11:00	Panel discussion on research needs for ‘use of monitoring and sensing to optimise performance in response to heavy rainfall’. <ul style="list-style-type: none"> • Virtual White Board open
11:00 – 11:15	Coffee break
Session II - Evaluation of Assets and Deterioration	
11:15 – 11:25	Overview of the evaluation of assets and deterioration issues <ul style="list-style-type: none"> • by the leader of the Co-UDlabs Joint Research Activity 2 on Evaluation of assets deterioration in Urban Drainage systems Prof. Simon Tait, (Co-UDlabs, University of Sheffield, UK)
11:25 – 12:00	Short presentations of examples of good practice <ul style="list-style-type: none"> • Application of cameras for monitoring pumping stations (Netherlands) Prof. François Clemens (Co-UDlabs - Deltares, Netherlands) • AI-based Approaches for Short- and Long-term Sewer Asset Management in Berlin (Germany) Dipl.-Ing. Matthias Riechel (Kompetenzzentrum Wasser Berlin, Germany) • Numerical Studies about deterioration assets in Arnhem and Den Haag (Netherlands) Dr. Irene Schepers (IKT, Netherlands)
12:00 – 12:30	Panel discussion on research needs for ‘use of monitoring and sensing to optimise performance in response to heavy rainfall’. <ul style="list-style-type: none"> • Virtual White Board open
12:30 - End of day 1	

DAY 2	Thursday 4th November 2021, 09.00 – 12.00 (CET) / 08.00 – 11.00 (GMT/UTC)
09:00	Welcome by workshop moderator - Dr. Iain Naismith (Co-UDlabs - IKT, German)
Session III – Improving resilience and sustainability of urban drainage assets	
09:05 – 09:15	Overview of the issues concerning resilience and sustainability <ul style="list-style-type: none"> • by the leader of the Co-UDlabs Joint Research Activity 3 on Improving resilience and sustainability in urban drainage solutions Dr. Luís Cea Gómez - Universidade da Coruña (Spain)
09:15 – 10:15	Short Presentations of good practice in Europe <ul style="list-style-type: none"> • Dealing with London’s legacy of combined sewers (UK) Andrew Hagger (Thames Water Utilities, UK)

	<ul style="list-style-type: none"> • Development of modular technology for handling and treating rainwater as part of Aalborg Utility’s rainwater management (Denmark) Prof. Jesper Ellerbæk Nielsen (Aalborg University, Denmark) • Addressing climate change in the City of Almere (Netherlands) Maria Rus (City of Almere, Netherlands) • Co-Designing a “Livable Street”: Project ‘LesSON’ and the Future Initiative “Water in the City of Tomorrow” (Germany) Dr. Daniela Falter (Emschergenossenschaft, Germany) • Not all SuDS are created equal: Impact of different approaches on combined sewer overflows (Switzerland) Dr. Joao Paulo Leitao (Co-UDlabs - EAWAG, Switzerland)
10:15 – 11:45	<p>Panel discussion on research needs for “Improving resilience and sustainability of urban drainage assets”</p> <ul style="list-style-type: none"> • Virtual White Board open
10:45 – 11:00	Coffee break
Reminder of the outcomes from Day 1	
11:00 – 11:15	<ul style="list-style-type: none"> • Illustrated summary of the key points from the presentations and discussions from Day 1 – Sessions I and II Dr. Iain Naismith (Co-UDlabs – IKT, Germany)
The way forward	
11:15 – 11:55	<ul style="list-style-type: none"> • Panel discussion on the next steps for actioning the workshop’s findings through Co-UDlabs Co-UDlabs Joint Research Activity leaders
11:55 – 12:00	Concluding remarks
12:00 - End of day 2	

Annex 4. Agenda of the Deltares course on hydraulic capacity problems in pressurized systems.

1. This course targeted practitioners who are either designing, building or managing wastewater pressure mains. The course covered the the diagnosis (and prevention) of air pockets or other blockages in pressurized hydraulic lines and pumping systems, addressing the following topics:
 1. - Basics of (multiphase) hydraulics in pressurized systems
 1. - How to determine the performance of a pressurized system and to detect capacity problems
 1. - Different sources of capacity problems and how to identify them
 1. - The effect of air/gas pockets on capacity, energy consumption and what remedies are available
 1. - Methods to detect the presence of air/gas pockets
 1. - Several relevant case studies
1. Agenda

Thursday 17th November 2022, 10.00 – 14.00 (CET)	
10:00	Welcome by course moderator – Femke Verhaart (Deltares)
10:05-12:00	<p>Introduction to the course Femke Verhaart (Deltares)</p> <p>Basic hydraulics of pressurized systems Dr. Mike van Meerkerk (Deltares)</p> <p>Identifying capacity problems Michiel Tukker (Deltares)</p> <p>Air pockets Michiel Tukker (Deltares)</p> <p>Plenary discussion and questions</p>
12:00-13:00	Lunch break
13:00-14:00	<p>Examples from the engineering practice Case 1</p> <p>Case 2</p> <p>Femke Verhaart (Deltares)</p> <p>Plenary discussion and questions</p>
14:00	Concluding remarks and post course chat

1.

Annex 5. Agenda of the Webinar on Fourier transform infrared spectroscopy (FTIR) chemical mapping

Wednesday 21st September 2022, 14.00 – 15:30 (CEST)	
PART 1	
14:00 – 14:25	FTIR theory... a quick intro How an FTIR spectrometer work? A few definitions From Marco to μ FTIR μ FTIR microscopy μ FTIR Chemical Mapping... How does it work?
14:25	5 min break
PART 2	
14:30 – 15:00	FPA Chemical Imaging Main applications of μ FTIR Chemical mapping μ FTIR Imaging and urban drainage: analysis of microplastics in urban waters Wrap up
15:00 – 15:30	Q&A
15:30 - End of the webinar	

Annex 6. Flyer including the agenda of the Webinar on the principles and applications of acoustic backscattering to monitor suspended solids in natural and engineered systems



Acoustic monitoring of suspended solids in natural and engineered systems

Webinar, 16 May 2023, 13:00-16:30 CEST

Eawag
Das Wasserforschungsinstitut
des ETH-Bereichs



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

Acoustic monitoring of suspended solids in natural and engineered systems

Co-UDLabs Webinar, 16. May 2023

Goal

Water quality is becoming increasingly important in natural and sewer environments due to sediment-related issues like erosion, transport, and deposition. These problems affect engineered systems, and the environment by causing mechanical obstacles and pollutants attached to sediments.

Total suspended solids (TSS) is a crucial parameter to monitor pollutant levels, but few techniques offer real-time data. Traditional methods involve lab measurements or optical backscatter sensors that require significant calibration and maintenance. However, acoustic turbidity monitoring, based on acoustic backscattering, offers a modern approach to TSS monitoring.

In this webinar we will discuss the latest developments in TSS monitoring using acoustic backscattering methods, including fundamental principles, particle characteristics, instrument calibration, signal analysis, and inversion methods. Practical experiences from monitoring in rivers and wastewater systems will also be shared, as well as limitations of the technique and potential for further development.

Target audience

The webinar is aimed at engineers, planners, and operators of wastewater systems, representatives of municipalities and authorities, as well as manufacturers of monitoring equipment, who would like to gain further insight into modern technologies for environmental monitoring.

Date, Time, Place

Tuesday, 16. May 2023, 13:00 – 16:30 CEST
online

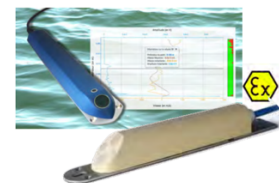
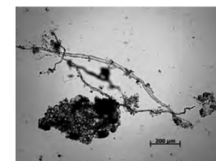
Contact and registration

www.Co-UDLabs.eu
info@co-udlabs.eu
Registration:
<https://forms.office.com/e/td6294dJmN>
Participation is free.



Program

- 13:00 Welcome and introduction**
Jörg Rieckermann, Eawag, CH
- 13:05 The importance of particles and continuous monitoring in urban drainage systems**
Peter Vanrolleghem, Université Laval, CA
- 13:20 Acoustic Scattering from particles - theory and scientific instruments**
Stephane Fischer, Ubertone S.A.S., F
- 13:35 Experimental evaluation of hydro-acoustic models and inversion methods in rivers**
Céline Berni, INRAE, F
- 13:50 Discussion**
- 14:25 Coffee break**
- 15:00 Monitoring suspended solids with acoustic turbidity in sewers**
Asmorom Kibrom, NIVUS GmbH, D
- 15:15 Lab-scale characterization of TSS using acoustic backscattering**
Manuel A. Regueiro Picallo, University of A Coruña, ES
- 15:30 Experiences with acoustic monitoring of fine TSS for stormwater treatment**
Daniela Böckmann, Dr. Pecher AG, D
- 15:45 Time Resolved Optical Turbidity**
Anne Pallarès, Université de Strasbourg, F
- 16:00 Discussion**
- 16:30 End**



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