Co-UDlabs

BUILDING COLLABORATIVE URBAN DRAINAGE RESEARCH LABS COMMUNITIES

D4.1. Data Management Plan

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Authors – Laura De Nale and Marion Hayaoui (Euronovia), Jose Anta (UDC), Simon Tait (USFD), Jörg Rieckermann (EAWAG)

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BACKGROUND: ABOUT THE CO-UDLABS PROJECT

Co-UDlabs is an EU-funded project aiming to integrates 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
CA	Consortium Agreement
DMP	Data Management Plan
DOI	Digital Object Identifier
EC	European Commission
FAIR	Findable, Accessible, Interoperable, Reusable
GA	Grant Agreement
GDPR	General Data Protection Regulation
JRA	Joint Research Activities
NA	Networking Activities
OA	Open Access
ORDP	Open Research Data Pilot
POPD	Protection of Personal Data
RI	Research Infrastructure
TA	Transnational Access
UDS	Urban Drainage Systems
WP	Work Package

EXECUTIVE SUMMARY

This deliverable is the Data Management Plan (DMP) of the Co-UDlabs project.

This document defines the general principles for data management within the project, the data sources and the persons responsible for the handling of research data during and after the end of the project (including data security, storage and archiving), which data will be made openly available and the definitive list of complete datasets (Annex 1).

This DMP describes how data will be managed during the project according to: i) the FAIR Data Management approach[1] that the EC has recommended to be used in Horizon 2020 actions, ii) the requirements of the article 29 of the Grant Agreement (specifically art. 29.3 - obligation to ensure open access to research data), iii) any national legislation regarding the protection of personal data (POPD, as described in Deliverable 11.1), iv) the protection of Intellectual Property Rights (IPR) and possible commercial confidentiality of Transnational Access users and partners and participants in the Joint Research and Networking Activities. In addition, the project participants will at all times meet their obligations on the access rights and non-disclosure of data as set out in the project Consortium Agreement. Nothing stated in this Data Management Plan removes any rights or obligations as set out in the Consortium Agreement.

The DMP outlines how the partners will collect data, will catalogue it and, when appropriate, how they will make it available on an open access basis during and after the project. The plan also describes the mechanisms the consortium will use to ensure that as much of the data collected during the project is made available as soon as is practicable.

The DMP is intended to be a living document in which information will be updated as the implementation of the project progresses and when significant changes occur. It's a central tool in the data quality system, carefully documenting the data lifecycle. This document provides a revised DMP based on the consortium internal discussions during the 1st General Assembly organized in A Coruna on June 29, 2022 and July 1, 2022, and 3rd General Assembly organized in Dübendorf-Zürich, on 22 – 24 January, 2024. It also includes an overview of the datasets available at the end of the second reporting period (M36). This document will be updated again at the end of the third reporting period (April 2025). Each version of the DMP will be reviewed by all partners at each General Assembly meeting.

[1] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

1. CO-UDLABS DATA MANAGEMENT: GENERAL PRINCIPLES

The Data Management Plan defines the general principles for data management within the project, the data sources, and the persons responsible for the handling of research data during and after the end of the project (including data security, storage and archiving), which data will be made openly available and the definitive list of complete datasets and DMP of the project. In the following, we will specify the Co-UDLabs approach to ensure that the data are i) findable, ii) openly accessible and iii) interoperable. In addition, we will describe how we are going to increase the re-use of the collected datasets.

1.1. GENERAL DATA POLICIES

The project participants will at all times meet their obligation on the access rights and non-disclosure of data as set out in the project Consortium Agreement. Nothing in the Data Management Plan removes any rights or obligations as set out in the Consortium Agreement.

The project will follow the H2020 Guidelines[2] as regards open access and data management and also adhered to the principles of the data management policies of the Co-UDlabs partners and national legislation regarding the Protection of Personal Data (Deliverable 11.1). The consortium will ensure that as much of the data collected during the project is made available as soon as is practicable. Yet, according to the principle "as open as possible, as closed as necessary", certain datasets can remain closed given appropriate justification.

1.2. DATA SOURCES

Co-UDlabs will generate data from three different types of activities: a) Networking Activities (NA), b) Transnational Access (TA) and c) Joint Research Activities (JRA). The characteristics of the data generated from these activities are different.

- **Networking Activities (NA)** are mainly aimed at project dissemination and engagement of UDS actors into the Co-UDlabs network of RI, data harmonization procedures within the different RI of Co-UDlabs, training activities and the management of TA proposals. data generated for and from these activities, such as mailing lists, lists of participants in events, or data related to transnational access project proposals, will be managed with special attention to the protection of personal data. Due to the sensitive nature of this kind of data, we ensure that access to datasets related to NA will be restricted to the consortium. These are listed in Annex 1.
- **Joint Research Activities (JRA)** experiments are conducted by Co-UDlabs partners either in the different experimental facilities offered by the project or in additional experimental sites, with an emphasis on joint experiments with multiple participants, often trying different tools and techniques as part of a coordinated experimental plan. The results of the experimental campaigns will be uploaded on Zenodo for open access.
- **Transnational Access (TA)** data will be generated by user groups external to the project consortium, that are selected in the framework of two calls for proposals (October 2021 and October 2023). The rules and guidelines applied for the management of data generated during thetransnational access will be in full agreement with those defined by the European Commission for this type of activity. Prior to starting

[2] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

the access period, user groups must produce a project specific data management plan (following the guidelines on fair data management with the support and approval of the facility providers) explaining how the data will be generated, managed and stored so that researchers outside the user team can make use of it, in support of the EU's open science strategy. Only once this initial DMP is approved by the ta facility provider, may the user group access the facility.

1.3. DATA MANAGEMENT RESPONSIBILITIES and PROCEDURES

In Co-UDLab we define responsible persons for the individual data sources and activities. This ensures that the necessary processes are in place in the various activities to comply with the FAIR principles.

In NA, as a general principle, the responsibility for storage and handling of the data rests with the lead partner of each task which involves data collection. All the project partners have identified a Data Protection Officer as stated in Deliverable 11.1. POPD Requirement No. 1. Deliverable 11.1 also contains a list of activities which specifically imply the collection, treatment, or management of personal data in compliance with the GDPR and identifies the respective WP, lead partners and relevant contact persons in charge of POPD authorizations. These NA activities include:

- The establishment of a database of relevant stakeholders, including staff employed by project partners, communication and dissemination recipients, and/or potential early users or adopters of project outputs (WP1 and WP4);
- The open competitive calls for applications and proposals for the transnational access to Co-UDlabs' research infrastructures and any related outreach events (e.g., webinars and hackathon events) as developed in WP5 and WP9;
- The registration forms for all training events (e.g., webinars, seminars, workshops) developed in WP3 and other events that are organised by the project (WP4);

Regarding the management of research data in the JRA and TA activities, the Co-UDlabs consortium has agreed on the following procedure for efficient data management[3]:

- Since the large number of research activities in Co-UDlabs make the management of the DMPs a complex issue, each JRA WP and each TA project in Co-UDlabs will require a specific DMP.
- The DMP template for the TA and JRA is available on Annex 2 and will be attached to the User Facility Agreement in Co-UDlabs. It is also possible using an online platform such as DMPOnline (https://dmponline.dcc.ac.uk/) to create, review, and share the different data management plans for its research activities, by means of a simplified template similar to the one described in Annex 2 (e.g. University of Sheffield template for Research Projects).This tool will assist the different transnational teams which operate remotely to work together.
- The responsible parties stated below will coordinate and ensure that the specific DMPs will be created before the start of the experiments for each JRA and TA activity (Table 1). The project co-ordinator will be the responsible party for checking that specific DMPs and datasets follow the project DMP and H2020 fair guidelines (Table 1).

[3] This procedure has been reviewed and updated during the General Assembly hold in Zürich in January 2024 as part of the evaluation of 1st Transnational Access call project implementation.

In JRA, as a general principle, the responsibility for storage and handling of the data rests with the WP leader. It is responsibility of WP leaders or another person delegated by him/her for that task, to co-ordinate data collection with participants of the JRA, to process and validate data. It is responsibility of WP leaders to ensure that one DMP for each JRA is created before the start of the experiments. A definitive version of the DMP will be finished one month after the end of each JRA.

Work Package Leaders or another person delegated by him/her for that task, are responsible for supervising adequacy and updates of the corresponding DMP and the supervision of the management of the data within each Work Package, including the curation of the data before uploading datasets to a public repository. Experimental datasets obtained will be made openly available on Zenodo after an appropriate quality check and approval from all the partners involved and a final validation by the project coordinator or another person delegated by him for that task. The project co-ordinator will also be the responsible for checking that specific DMPs and datasets follow the FAIR Guidelines.

In TA projects, as a general principle, the responsibility for storage and handling of the data rests with the user group originally collecting it whit the supervision of facility providers. It is the responsibility of Co-UDlabs facility providers to indicate to each user group how to ensure adequate data acquisition, processing and validation, according to Co-UDlabs principles and rules, and that sufficient resources will be made available from the project funds to complete these tasks. User groups should prepare and maintain a specific DMP for their TA project, and the corresponding facility provider will supervise the DMP development and curation of the generated datasets. A definitive version of the DMP will be finished one month after the end of each TA access period. All data need to be shared between user groups visiting a facility and the corresponding facility provider. The project co-ordinator or another person delegated by him for that task will be responsible for checking that specific DMPs follow the FAIR Guidelines.

The data from Co-UDlabs will be made openly accessible once it had been processed into a final format, organized, catalogued and checked so as to be free of error, subject to any constraints related to compliance with any national legal requirements (e.g., GPDR), the protection of IPR and commercial confidentiality.

Open adoption of standard methods and protocols for data acquisition, validation and data sharing will be developed within WP2, which will include internally- oriented activities to ensure interoperability considering such issues as data formats, and externally-oriented activities to foster smart governance and policy as well as public access to UDS operational data. After a first assessment of the existing sensors and data management systems in the facilities of Co-UDlabs research infrastructures (RIs), a unified metadata structure will be drafted for the main variables recorded in the RIs and will be included in future versions of the DMP.

An understandable data structure will be always used for any data collected. An adequate description of the context, measurement and processing methods will be made available for the data that will be made publicly available. Adequate documentation will be provided so that the open datasets will be searchable by third parties. Each open access dataset will include information on the project activity, experiment id, sensors used (if relevant), their calibration and validation, the file and parameter naming conventions and comments on any issues affecting data quality. If dataset refers to virtual testing, the metadata will include information on the model, the version of the algorithm and parameters and other inputs used. All data will be checked for accuracy prior to being made publicly available.

After generating and preparing a dataset, and the dataset being approved by the co-ordinator, user groups and partners are required to i) upload it to the Zenodo repository, which enables the dataset to be assigned a

unique DOI (Digital Object Identifier), ii) list it in Annex 1 of the Data Management Plan and then iii) state whether the data will be open access following the principles outlined above. If this is not possible, then the reason is given as to why the dataset is not to be open access. These decisions will be reviewed periodically at the subsequent General Assembly meetings. If any objection is raised as to the status of any dataset, this should be discussed at the General Assembly and then a final decision on the status of a dataset is taken by the General Assembly following the decision-making process described in the Consortium Agreement.

At M17, UDC drafted and shared with partners a "Guide to upload Co-UDlabs JRA and TA Datasets to Zenodo" (Annex 3) This document is a step-by-step guide to upload datasets generated in the scope of the Transnational Access program or the Joint Research Activities developed in Co-UDlabs project. In fact, the project hosts the open access data electronically through a Co-Udlabs Zenodo community (http://www.zenodo.org/coudlabs) and all upload datasets will be linked to this project community and to the Co-UDlabs page on OpenAIRE[3].

In addition to this official project data repository, partners and user groups generating the data may also store this data in a repository located at their institution securely and in line with institution's policies. At M17, UDC also produced a "Data storage report template" to be filled in and attached to the repository alongside the datasets by each JRA and TA team. This template is attached in Annex 4. Datasets produced within TA and JRA will be reported in the revisions of the DMP (Deliverable 4.1) and in Annex 1 of this Deliverable.

The following table summarises the procedure and responsibilities for data management within the different types of activity, as described above.

Table 1. Responsible persons for the different sources (top row) and data management procedures (left column)

		Networking Activities	Joint Research Activities	Transnational Access
1	Create and update DMP	Not Applicable	WP leader	User group leader
2	Generate and/or collect data	Lead partners involved in each WP. Datasets will be managed according to personal data collection and treatment procedures specified in Deliverable 11.1	Partners involved in each WP. One DMP is prepared per JRA WP to manage datasets.	User group leader. One DMP is prepared per TA project to manage datasets.
3	Organize and prepare datasets. Is it suitable for open access?			
4	Supervising creation, maintenance, and implementation of DMP	Not Applicable	WP leader	Facility provider
5	Curation/validation of dataset before being published	Not Applicable	WP leader	Facility provider
6	Check adequacy of DMP and datasets with GA and H2020 FAIR Guidelines	Not Applicable	Project coordinator	Project coordinator
7	Upload of datasets to Zenodo	Not Applicable	Partners who originally collect data.	User group leader

2. FAIR DATA PRINCIPLES

2.1. MAKING DATA FINDABLE, INCLUDING PROVISIONS FOR METADATA

The consortium agreed to deposit the data and publications generated by the project in the Zenodo repository, where a project community has been created (https://zenodo.org/communities/coudlabs/). The Zenodo repository complies with the principles of FAIR data, offering several useful features to make data findable.

Zenodo allows third parties to search, find, understand and download data with attribution. Datasets generated or collected during JRA or TA experiments will be identified with a consistent and uniform **naming convention**, to be defined by the consortium as soon as the first research datasets are ready. Concerning **metadata**, domain-specific data models, such as WaterML2.0, and metadata will be supplied to enable re-use. Discoverability of the datasets will be ensured by including a clear abstract / description and relevant keywords, that should include the project name acronym.

2.2. MAKING DATA OPENLY ACCESSIBLE

According to article 29.3 of the Grant agreement, Co-UDlabs partners must:

a) deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate — free of charge for any user — the following:

(i) the data, including associated metadata, needed to validate the results presented in scientific publications, as soon as possible;

(ii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan';

b) provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).

Our policy will be to make all research data resulting from the project openly available, unless there is a legitimate reason to restrict access. It is important to note that, according to the article 29.3 of the GA, the consortium does not have to ensure open access to all research data: exceptions are allowed according to the relevant policy of Horizon 2020.

2.3. MAKING DATA INTEROPERABLE

Data are interoperable when they can be exchanged between and re-used by researchers, institutions, organizations, countries, etc. To this aim, we will prescribe data models which enforce standard formats units and conventions. Also, we will prioritize open formats and open-source software, whenever possible.

Work Package 2 (WP2) is specifically dedicated to ensuring interoperability by definition of common standards, protocols and methods.

2.4. INCREASE DATA RE-USE

In the hands-on management of data, especially when dealing with comprehensive datasets compiled from numerous sources, the presence of a CC0 (Creative Commons Zero) license is exceedingly advantageous. This

license, effectively waiving copyright, allows for unrestricted use and reusability of data. CoUDlabs recommends the adoption of the CC0 license to maximize data re-use, which is conducive to fostering accessibility and encouraging unrestricted analysis, particularly when working with complex, multi-sourced datasets. Employing a CC BY (Creative Commons Attribution) license, or other restrictive licenses, can create practical hindrances, making CC0 a preferred choice for data use without the complications of attribution requirements.

Custom licences to restrict access should be avoided. Nevertheless, embargo periods between 6 and 24 months are possible to restrict access to the archived version of the data in the Co-UDLabs digital repository, given appropriate justification.

3. ALLOCATION OF RESOURCES

The research data collected, generated and/or processed by the project will be uploaded and preserved during and after the end of the project in the Zenodo repository. The repository allows uploading data free of charge with the size limited to up to 50 GB per record. Currently there are no costs for preserving data in this repository and, thus, no costs have been foreseen for data storage by the consortium. If any unforeseen costs related to the open access of research data occur, it is possible to be charged on the Program given its eligibility status for reimbursement, according to the articles 6 and 6.2 of GA.

Moreover, each partner has devoted sufficient human resources to respect the requirements set out by this deliverable D4.1 “Data Management Plan”. For more information on responsibilities, see section 1.2 of this document.

4. DATA SECURITY

All data will be stored securely to ensure its integrity and, if necessary, compliance with personal data protection regulations, IPR protection and commercial confidentiality. Devices that contain data will be password protected and securely stored when not in use. Datasets available online will be in a password protected environment, such as the project’s SharePoint.

The public repository Zenodo has been selected as a long-term secure storage of the Co-UDlabs project research outputs given its features fulfilling technical and legal data security requirements and long-term preservation. Other open access data generated such as training material or webinars will be not password protected and be made available also via the open access data repository Zenodo.

In addition to this official project data repository, partners generating the data may also store this data in a repository located at their institution securely and in line with the institution's policies. Data security and safety during creation, processing and analysis will be responsibility of the party who generates it, being facility providers responsible for providing secure data storage as part of any Transnational Access. Sensitive data, if any, will be stored and transferred encrypted.

5. LONG TERM STORAGE AND ARCHIVING

Open access data will be uploaded to the Zenodo data archive for long term storage and preservation. In addition, at the end of the project the coordinator will archive any project data (not containing personal data

or commercially confidential information) on the project SharePoint, that is a repository protected by a password, and will make this available to all the partners. The data shared through the repository will be preserved as described in the GA (Article 18: for at least five years after the project ends). Storage and archiving of peer-reviewed scientific publications relating to Co-UDLabs must comply with the Open access principles described in GA (Article 29.2.: Each beneficiary must ensure open access). The partner or user group producing any publication will be responsible for storing these publications in an enduring repository which is compatible with OpenAIRE (the consortium agreed on using Zenodo as repository after A Coruña General Assembly), as soon as possible after publication. Such publications will be listed and linked to Co-UDlabs page on OpenAire and also provide links for access on the project website.

6. LEGAL AND ETHICAL ASPECTS

All partners and Transnational Access user groups must follow internal data policies of each institution where data is generated and comply with national legal requirements with regards to the protection of personal data, which can be consulted in Deliverable 11.1 (Protection of Personal Data). This deliverable states that:

> *"In compliance with the requirements of the GDPR, all requests of personal data performed in the execution of the project's tasks and activities will have to be accompanied by a disclaimer clearly stating that anonymised inference based on collected data may be used for statistical purposes and/or periodic reporting on project progress and implementation" and that to safeguard the privacy of personal information submitted by individuals , Co-UDlabs will apply, whenever necessary, anonymisation and pseudonymisation techniques to the data that it collects or is provided with (that contains personal data). Aggregated anonymised personal data may be used in project reports, dissemination, and/or communication activities and products, especially whenever required by compliance criteria in the evaluation of project implementation and achievements"*.

The Co-UDlabs project partners and Transnational Access user groups must also comply with article 34 concerning ethical principles (including the highest standards of research integrity) and applicable international, EU, and national law (see Deliverable 11.2: Ethics Requirements). Due to the nature of the Urban Drainage Systems data, no fundamental ethical issues that can have an impact on data sharing is foreseen.

7. SUMMARY OF Co-UDlabs DATA MANAGEMENT PRINCIPLES

The following general principles will be followed to support project partners and Transnational Access user groups to create and manage the required data Management Plan (DMPs) within the Co-UDlabs project:

- Responsible persons are identified (Table 1) for the different data sources and data management procedures. This ensures that the required processes are installed in the Co-UDlabs project.
- Since the large number of research activities in Co-UDlabs make the management of the DMPs a complex issue, each Joint Research Activity and each Transnational Access project in Co-UDlabs will require a specific DMP following the template available at Annex 2.
- Pre-defined common identifiers to uniquely distinguish experiments and data management plans in Co-UDlabs will be available to all partners and user groups producing DMPs.

- DMPs and good practices will be shared between Work Packages Leaders, facility providers and TA user groups to ensure consistency and synergies along the full project.
- The project coordinator will create and maintain a database of DMPs and will check that specific DMPs and datasets follow the project DMP and H2020 FAIR Guidelines.
- After generating and preparing a dataset, and the dataset being approved by the coordinator, user groups and partners will be required to i) state whether the data will be open access. A valid justification will have to be provided in case the access to a given datasets needs to be kept closed. These decisions will be reviewed periodically at the subsequent General Assembly meetings. If any objection is raised as to the status of any dataset, this should be discussed at a General Assembly and then a final decision on the status of a dataset is taken by the General Assembly following the decision-making process described in the Consortium Agreement, ii) list each dataset in Annex 1 of the Data Management Plan, and iii) if the dataset is open, upload it to the Zenodo repository where a project community will be created, which enables the dataset to be assigned a unique DOI (Digital Object Identifier), iv) the datasets will be published using the Data Storage Report template available at Annex 4.

8. DATA GENERATED DURING RP1 AND RP2

By April 30, 2024 (M36), 30 datasets have been produced by the Co-UDlabs project in the framework of the NA (20), JRA (8) and TA (2) activities.

During RP1 and RP2, a set of coordinated Networking Activities (NA) have been organized by the project in order to engage users and to facilitate knowledge and data sharing. The participants lists generated by these NAs (see Annex 1) are considered as confidential datasets. These participants lists are managed with special attention in line with the Protection of Personal Data and the treatment procedures specified in Deliverable 11.1. Due to the sensitive nature of this kind of data, these datasets are restricted to the consortium. The database of Co-UDlabs stakeholders is also considered as a dataset produced by the project. This database, managed by GRAIE , includes personal data and is therefore restricted to the Consortium.

As defined in section 1.3., INSA LYON, USFD and UDC, as WP6, WP7 and WP8 leaders, ensured that one specific Data management Plan for each Joint Research Activity (JRA) was created before the start of the experiments. DMP were allocated at DMPonline tool (https://dmponline.dcc.ac.uk/). Initial and intermediate versions of the DMP are available upon request. A definitive version of the DMP will be finished one month after the end of each JRA. Datasets generated within JRA are reported in the Annex 1 of this document.

Regarding Co-UDlabs Transnational Access program, 13 projects from the 1st call have been finished and just a few projects of the 2nd and 3rd call have been started by April 30. At the end of RP2 (April 30, 2024), 2 open datasets have been reported.

ANNEX 1 – REGISTER OF PROJECT DATASETS AT M36

LIST OF DATASETS: NETWORKING ACTIVITIES

Date added to Data register	Description	Format	Origin (NA, JRA, TA)	Status of Data (Open / Restricted)	Justification of Status / Other comments	Responsible / Data controler (+ DOI zenodo)
01/07/2021	Database of Co-UDlabs **stakeholders** (continuously updated)	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	GRAIE EURONOVIA
13/10/2021	List of attendees to the Co-UDlabs **Webinar "Introduction to Co-UDlabs"**	.xls (Less than 1 MB)	NA/TA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	DELTARES UDC
04/11/2021	List of attendees to the Co-UDlabs **Workshop on "Urban Drainage Practice and Research Needs"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	IKT
25/11/2021	List of attendees to the Co-UDlabs Hackathon **on Transnational Access to RIs**	.xls (Less than 1 MB)	TA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	DELTARES
21/05/2022	List of attendees to the Co-UDlabs **25th EJSW - European Junior Scientists Workshop on "Monitoring urban drainage systems and rivers"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	INSA DELTARES
02/05/2022	**List of TA participants** in the 1st call and TA users	.xls (Less than 1 MB)	TA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC
30/06/2022	List of attendees to the Co-UDlabs **Live Workshop "Strengthening the links between scientists and practitioners to accelerate the transition towards smart and sustainable urban stormwater management – the CoUDLabs project"** at CGLE Carrefour des gestions locale de l'Eau	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	GRAIE
01/07/2022	List of attendees to the Co-UDlabs **1st Early-Stage Researchers Seminar**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC
23/08/2022	List of attendees to the Co-UDlabs p**re-conference workshop on "Urban Drainage Metrology Toolbox"** at Sewer Processes and Networks international conference (SPN)	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	INSA
15/09/2022	List of attendees to Co-UDlabs **Workshop on "Tapping The Value Of Urban Drainage Systems (UDS) Data"** at IWA's World Water Congress (WWC)	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC GRAIE
21/09/2022	List of attendees to the Co-UDlabs **Webinar on "Fourier transform infrared spectroscopy (FTIR) chemical mapping"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	AAU

17/11/2022	List of attended to the Co-UDlabs Workshop on "Capacity problems and flow rate determination in pressurized systems"	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GDPR). Data procedures in D11.1	DELTARES
16/05/2023	List of attendees to the Co-UDlabs **Webinar on "Acoustic monitoring of suspended solids in natural and engineered systems"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	EAWAG
12/06/2023	List of attendees to the Co-UDlabs **Webinar on "Routine Uncertainty Assessment"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	GRAIE
20/06/2023	List of attendees to the Co-UDlabs **Webinar on "2nd Call for Proposals"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC
03/07/2023	List of attendees to the Co-UDlabs **Workshop** at NOVATECH	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	GRAIE
06/09/2023	List of attendees to the Co-UDlabs **2nd Hackathon**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC
18/10/2023	List of attendees to the Co-UDlabs UDlabs p**re-conference workshop on "Urban Drainage Metrology Toolbox"** at Jornadas de Ingeniería del Agua	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	UDC
06/03/2024	List of attendees to the Co-UDlabs **Professional training course on Uncertainty Assessment in Urban Drainage**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	INSA GRAIE
15/03/2024	List of attendees to the Co-UDlabs **Webinar on "Optical observations in urban water systems and rivers"**	.xls (Less than 1 MB)	NA	Restricted	Includes personal data (GPDR). Data procedures in D11.1	DELTARES

LIST OF DATASETS: JOINT RESEARCH ACTIVITIES

Work Package	WP8
Dataset Name	CoUDlabs_WP8_T812_UDC_001. Identifying sediment deposits from temperature signals
DOI	https://zenodo.org/doi/10.5281/zenodo.7258998
Dataset description	This dataset contains the results of the experimental campaign and how data were collected on the research activity "Identifying sediment deposits from temperature signals" performed under Joint Research Activity "JRA 3- Improving Resilience and Sustainability in Urban Drainage solutions"
Type of data	Raw and processed temperature data (*.csv) Sediment properties (*.csv)
Data format	XLSX ☐ CSV ☐ DOC ☐ PDF ☒ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Anta, Jose; Regueiro-Picallo, Manuel; Naves, Acacia; Pernas, Raúl
IPR Owner	UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	WP8
Dataset Name	CoUDlabs_WP8_T831_AaU_001 Application of Large-Scale Particle Image Velocimetry (LSPIV) technique in Aalborg retention pond
DOI	https://zenodo.org/doi/10.5281/zenodo.7258998
Dataset description	This dataset includes the data obtained during the installation of a camera system to determine the surface velocities in a retention pond monitored by Aalborg University (AAU). The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.3.1. (Hydrodynamic design for stormwater detention ponds optimized for cost-efficient maintenance)
Type of data	Raw and processed images of surface runoff and (*.jpeg) Surface velocity maps resulted. (*.txt)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☒ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☒ MB ☐ Number of files: <50 ☐ 50-100 ☐ >100 ☒

Authors	Naves, Juan; Nielsen, Jesper; Anta, Jose
IPR Owner	UDC, AaU
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	**WP8**
Dataset Name	**CoUDlabs_WP8_T812_IKT_001 Permeable pavement clogging assessment using sediments with different properties**
DOI	**https://zenodo.org/doi/10.5281/zenodo.10370889**
Dataset description	This dataset includes raw and processed data from a series of laboratory tests that were conducted to develop and assess new and existing methods for analysing pavement performance and to gain insights into how these systems operate during their lifetime. This dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1.2. (Development of Scalable Measurement Protocols to Assess the Pollutant Retention and Release potentials of Urban Drainage Structures)
Type of data	Raw and processed flow and TSS time series: Q [L/s] (*.csv) TSS concentrations [mg/L] (*.csv) Sediment Particle size distribution [% volume] (*.csv) Sediment Density [kg/m3] (*.csv) Images of the experiments (*.jpeg)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☒ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☐ 50-100 ☐ >100 ☒
Authors	Goerke, Marcel; Bersuck, Frank; Torunski, Simon; Anta, Jose; Suárez, Joaquín; Naves, Juan
IPR Owner	IKT - UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	WP8
Dataset Name	CoUDlabs_WP8_T811_UDC_002 Application of imaging velocimetry techniques for urban drainage applications
DOI	https://zenodo.org/doi/10.5281/zenodo.10371730
Dataset description	This dataset includes the data obtained during the installation of a camera system and development of a LSPIV methodology to determine the velocities of runoff generated in the BLOCK rainfall simulator located at the Universidade da Coruña. The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1: Development of consensus on measurement of hydraulic and water quality performance of urban drainage technologies
Type of data	Raw and processed images of surface runoff and (*.jpeg) Surface velocity maps resulted. (*.txt)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☒ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☒ MB ☐ Number of files: <50 ☐ 50-100 ☐ >100 ☒
Authors	Naves, Juan; Carreres, Daniel; Anta, Jose
IPR Owner	UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	WP8
Dataset Name	CoUDlabs_WP8_T811_UDC_001 Analysis and assessment of new techniques to build-up the topography/geometry of Urban Drainage infrastructure with high resolution
DOI	https://zenodo.org/doi/10.5281/zenodo.10371818
Dataset description	This dataset includes data from an analysis and assessment of three different devices and techniques to obtain accurate elevation maps with a high resolution: i) conventional camera with the Structure from Motion (SfM) photogrammetric technique, ii) Intel® RealSense™ LiDAR Camera L515 and iii) Depth camera Intel d435i at the rainfall simulators of the UDC. The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1: Development of consensus on measurement of hydraulic and water quality performance of urban drainage technologies
Type of data	Topographic survey data of several laboratory large-scale facilities made by different techniques (*.csv, *.ply, *.jpeg) Filtered, scaled, and referenced models (*.ply) Digital Terrain Models (*.tiff)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☒ OPJ ☐ TIFF ☒

	Other ☒
Volume	Size: Order GB ☒ MB ☐ Number of files: <50 ☐ 50-100 ☐ >100 ☒
Authors	Sañudo, Esteban; Naves, Juan; Regueiro-Picallo, Manuel; Puertas, Jerónimo; Luis, Cea; Anta, Jose
IPR Owner	UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	**WP8**
Dataset Name	**CoUDlabs_WP8_T812_EAWAG_001. Sediment depth measurements for surrogate modeling of sediment build-up in gully pots using temperature data**
DOI	**https://zenodo.org/doi/10.5281/zenodo.10227266**
Dataset description	This database was developed as part of the Master Thesis in Environmental Engineering at ETH Zurich (Switzerland): Fuchs, L. (2023). The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1: Development of consensus on measurement of hydraulic and water quality performance of urban drainage technologies
Type of data	Experimental equipment: field setup (*.csv) Processed temperature data: field measurements (*.csv) Temperature sensors calibration (*.csv) Sediment properties (*.csv) Data storage report (*.pdf)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Fuchs, Lenard; Regueiro-Picallo, Manuel; Rieckermann, Jörg; Ebi, Christian; Bloem, Simon
IPR Owner	Eawag, UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: Creative Commons Attribution Non Commercial 4.0 International (CC BY-NC 4.0)

Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	**WP8**
Dataset Name	**CoUDlabs_WP8_T812_Deltares_001. Measuring sediment deposits in gully pots from temperature signals**
DOI	**https://zenodo.org/doi/10.5281/zenodo.10226224**
Dataset description	The experiments were designed to further develop an innovative methodology for measuring sediment bed deposits in UDS based on temperature data analysis. The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1: Development of consensus on measurement of hydraulic and water quality performance of urban drainage technologies
Type of data	Experimental equipment: field and laboratory setups (*.csv) Processed temperature data: field and laboratory measurements (*.csv) Temperature sensors calibration (*.csv) Flow data: laboratory measurements (*.csv) Sediment properties (*.csv) Data storage report (*.pdf)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Regueiro-Picallo, Manuel; Moreno-Rodenas, Antonio; Clemens-Meyer, Francois
IPR Owner	UDC, Deltares
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: Creative Commons Attribution Non Commercial 4.0 International (CC BY-NC 4.0)
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	**WP8**
Dataset Name	**CoUDlabs_WP8_T811_UOS_001. Investigating geometrical effects on hydraulic energy losses during sewer to surface flow interactions during urban floods**
DOI	**https://zenodo.org/doi/10.5281/zenodo.10683905**
Dataset description	This dataset describes hydraulic flow conditions within a scaled experimental manhole (A/B flume and USFD) during surcharging/flooding conditions. This includes pressure, continuation and surcharging flow from the manhole under a range of experimental boundary conditions, including the effect of various different manhole lids/grates. The dataset is a result from the Joint Research Activity 3 (WP8, Improving Resilience

	and Sustainability in Urban Drainage solutions), Task 8.1: Development of consensus on measurement of hydraulic and water quality performance of urban drainage technologies
Type of data	Time series and summary flow and pressure data (*.,xls) Grate geometry data (*.xls)
Data format	XLSX ☒ CSV ☒ DOC ☒ PDF ☐ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Brazier, Kaeli; Shucksmith, James; Nichols, Andy
IPR Owner	USFD
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: CC Attribution 4.0 International
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

LIST OF DATASETS: TRANSNATIONAL ACCESS

Work Package	WP9
Dataset Name	Combining active and passive temperature signals for estimating sediment depths
DOI	https://zenodo.org/doi/10.5281/zenodo.7258998
Dataset description	This dataset contains the results of the experimental campaign and how data were collected on the the Co-UDlabs Transnational Access project: *Characterization of thermal properties in sediment samples from urban drainage systems with temperature probes*, by Langeveld et al.
Type of data	Experimental equipment: laboratory setup (*.csv) Processed temperature data: laboratory measurements (*.csv) Temperature sensors calibration (*.csv) Sediment properties (*.csv) Data storage report (*.pdf)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Regueiro-Picallo, Manuel; Rieckermann, Jörg; Ebi, Christian; Bloem, Simon; Langeveld, Jeroen
IPR Owner	UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: Creative Commons Attribution Non Commercial 4.0 International (CC BY-NC 4.0)
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

Work Package	WP9
Dataset Name	CoUDlabs_TA_USFD_02_ANNULAR_Regueiro. Time series analysis of sewer temperatures in an annular flume to estimate sediment accumulation
DOI	https://zenodo.org/doi/10.5281/zenodo.10821837
Dataset description	This dataset contains the results of the experimental campaign and how data were collected on the Co-UDlabs Transnational Access project: *Temperature time series analysis for predicting sedimentation in sewer systems*, by Regueiro-Picallo et al.
Type of data	Experimental equipment: laboratory setup (*.csv) Raw and Processed temperature data: laboratory measurements (*.csv) Temperature sensors calibration (*.csv) Rotational velocity calibration (*.csv) Sediment properties (*.csv)

	Data storage report (*.pdf)
Data format	XLSX ☐ CSV ☒ DOC ☐ PDF ☒ PPT ☐ JPEG ☐ OPJ ☐ TIFF ☐ Other ☐
Volume	Size: Order GB ☐ MB ☒ Number of files: <50 ☒ 50-100 ☐ >100 ☐
Authors	Regueiro-Picallo, Manuel; Schellart, Alma; Jensen, Henriette; Tait, Simon; Fung, Wai Wan Vivian
IPR Owner	UDC
Accessibility	Open Access ☒ Embargoed access ☐ Restricted access ☐ Closed access ☐
Re-usability	Open Access in Zenodo: Creative Commons Attribution Non Commercial 4.0 International (CC BY-NC 4.0)
Data security	In addition to Zenodo, the data will be stored in the UDC cloud for the duration of the project.

ANNEX 2 – DATA MANAGEMENT PLAN TEMPLATE

Data Management Plan for TA projects

PROJECT TITLE

PPROJECT ID

Principal Investigator: Name (User Group Leader)
Data Manager: Name (Main visiting researcher or data manager)
Contributor: Other members of the user group.

Start date: dd-mm-yyyy
End date: dd-mm-yyyy

Abstract

The abstract should be a single paragraph that contains the purpose of the research methodology, and the main expected results.

DEFINING YOUR DATA

- **What digital data (and physical data if applicable) will you collect or create during the project?**
- **☐Analysis results (text/images) ☐CCTV/Video ☐Sensor data ☐Samples (water) ☐Other (specify)**
- **How will the data be collected or created, and how will you assure the quality of your data collection and processing?**
- **Approximately how much digital data will be generated (in GB, MB, etc), and what formats will they be in (e.g. .doc, .txt, .jpeg)?**
- **☐<1 GB ☐1GB to 10GB ☐100GB to 1000GB ☐More than 1000GB**
- **Are you using pre-existing datasets? Give details if possible, including conditions of use.**
- **What types and formats of data will the project generate or re-use?**
- **☐XLSX ☐CSV ☐NetCDF ☐dbase ☐JSON ☐DOC ☐PDF ☐PPT ☐JPEG ☐TIFF ☐OPJ ☐Other (specify)**
- **To whom might your data be useful ('data utility'), outside your project?**

Describe the methodology for data collection (E.g. physical experiments)
Enumerate de different types or data categories that you will be using (E.g. Analysis Results: .csv, .jpg)
Estimate the total amount of data. (E.g. 1 TB)

LOOKING AFTER YOUR DATA DURING YOUR RESEARCH

- **Where will you store digital data during the project to ensure it is secure and backed up regularly?**
- ☐Local servers ☐External Hard Drive ☐Cloud storage ☐Open-access repositories ☐Other **(specify)How will you name and organize your data files?**
- **If you collect or create physical data, where will you store these securely?**
- **Will you use extra security precautions for any of your digital or physical data? (E.g. for sensitive and/or personal data)**
- **What metadata/documentation will you create for your data? (E.g. a README file including methodology and file structure; descriptive metadata to enable discovery in a data repository)**

A copy of the raw and processed data will be stored at least at the private shared folder provided by the Universidade da Coruña within the Co-UDlabs Sharepoint environment. Only researchers and technical staff involved in the project have access to the shared folder.

Data files organization:
XXXX
XXXX

A readme.txt file will be created to ensure the localization of the data by researchers involved. A Data Storage Report describing the methodology used and the data obtained will be created at the end of the project following the Co-UDlabs template.

STORING DATA AFTER YOUR RESEARCH

- **Which data supporting your research conclusions will be stored on a long-term basis after the end of the project?**
- **Where will the data be stored after the project (e.g. SharePoint folder, or a subject-specific repository) and for how long?**
- **Will your chosen long-term data storage incur any financial costs?**

All raw and processed data generated in the framework of the project will be stored in a private shared folder within the Co-UDlabs environment. Facility provider and User Group will also store a copy of the data to be stored in a physical device. Everything will be also published and stored in Zenodo as soon as possible after the end of Transnational Access within a maximum period of two years. Zenodo is free of charge, so no extra resources are required.

SHARING DATA AFTER YOUR RESEARCH

- **How will you make data available outside of the research group after the project? (E.g. openly available through a repository, or on request through your department)**
- **☐Open-access repository ☐Institutional repository limited access ☐Provision on demand ☐Other**
- **Will you make all of your data available, or are there reasons you can't do this? (E.g. personal data, commercial or legal restrictions, very large datasets)**
- **If you can't share all of your data, how might you make as much of it available as possible? (E.g. anonymisation, participant consent, sharing analysed data only)**
- **How will you make your data as widely accessible as possible? (E.g. include a data availability statement in publications; ensure published data has a DOI)**
- **☐Keywords ☐DOI ☐Metadata standards ☐Other**
- **Will documentation or reference about any software be needed to access or read the data be included? Will it be possible to include the relevant software (e.g. in open source code)?**
- **Will there be any delay before making data available? If so, give the reasons for this.**

All raw and processed data generated in the framework of the project will be published and stored in Zenodo as soon as possible after the end of Transnational Access within a maximum period of two years. This will make data accessible for all researchers with no restrictions.

All revelant datasets generated through Co-UDlabs have to be published in open access with some exceptions you can consult with your facility provider or UDC team. The facility provider must provide a data storage template for Co-UDlabs users groups.

PUTTING YOUR PLAN INTO PRACTICE

- **Who will be responsible for data management in the project? (There may be more than one person)**
- **Do you require any extra resources to put your data management plan into practice? Will this incur any financial costs?**

Responsibles for data management are: (1) researcher name (main visiting researcher, Institution) and (2) researcher name (Group Leader, Institution).

ANNEX 3 – GUIDE TO UPLOAD DATASETS TO ZENODO

Co-UDlabs

BUILDING COLLABORATIVE URBAN DRAINAGE RESEARCH LABS COMMUNITIES

Guide to upload JRA and TA datasets to Zenodo

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 101008626

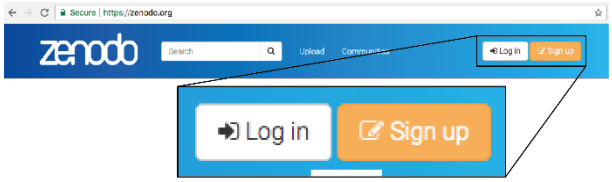
How to upload JRA and TA datasets to Zenodo

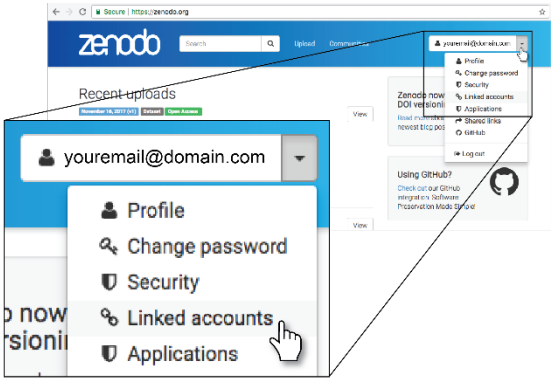
Zenodo is a general-purpose open repository developed under the European OpenAIRE program and operated by CERN. This document is a step-by-step guide to upload datasets generated in the scope of the Transnational Access program or the Joint Research Activities developed in Co-UDlabs project. The document is an adaptation of https://instruct-eric.eu/help/other/zenodo-upload-guidelines.

Sign in and new upload

1. Go to zenodo.org. Login to the site or create a new account.

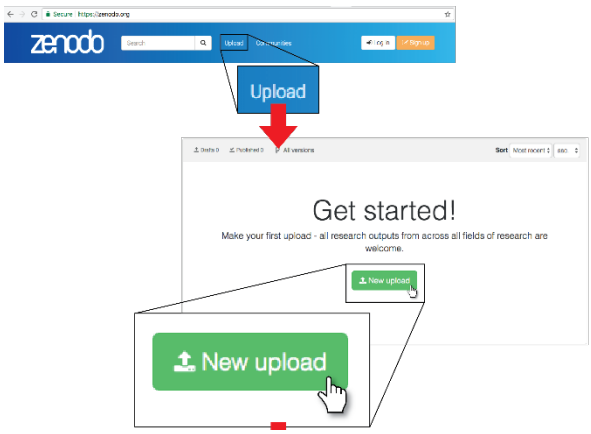
We recommend linking your (new/existing) Zenodo account with an ORCID ID. To link an ORCID ID to an existing account first login as usual, then select "Linked accounts" from the dropdown menu beside your email address on the homepage.

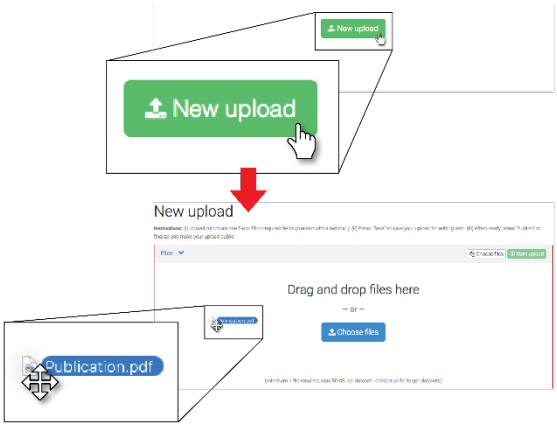




2. Click "Upload" to upload a new publication to Zenodo.
3. Click "New upload".
4. To save an incomplete Zenodo publication at any time click "Save" at the top or bottom of the page. This will not publish your publication unless you click "Publish".

Important note: Once the record is published you will no longer be able to change the files in this upload. This is because a Digital Object Identifier (DOI) will be registered immediately after publishing. You will still be able to update the record's metadata later. **If you only want to create a test upload, please do so on Zenodo Sandbox.**



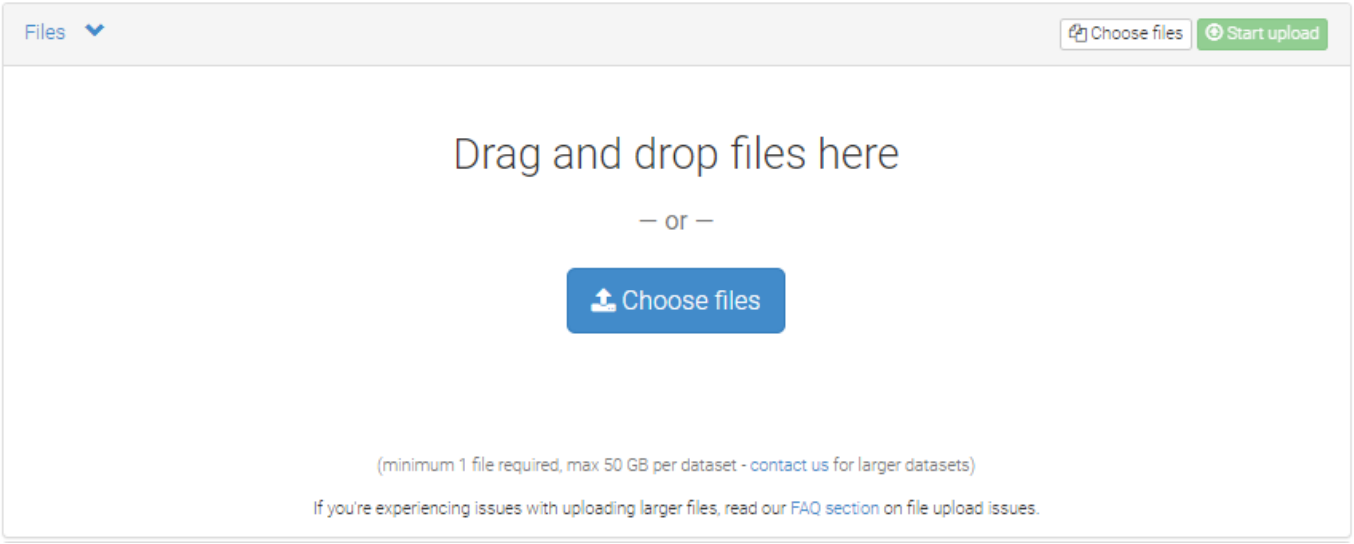


Files

5. Attach the files for your publication by dragging and dropping, or by clicking *choose files* to browse your local files for uploads. There is a maximum of 50 GB per dataset, if more is necessary contact Zenodo explaining the nature of the dataset and the space needed or split the dataset.

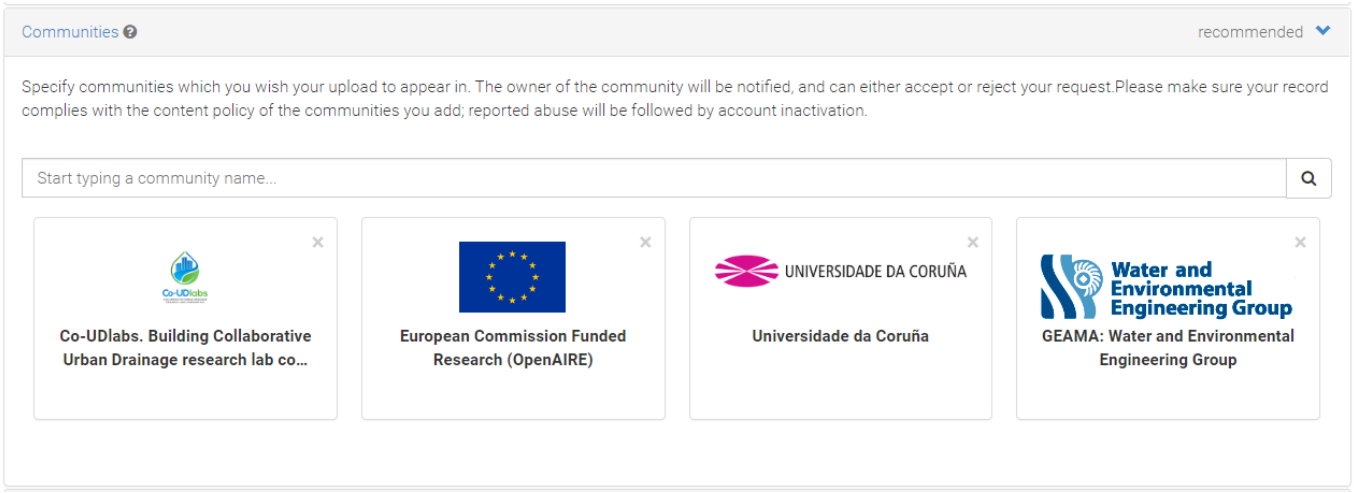
   Data Storage Report should be included within the dataset in order to make data more interoperable and reusable. Please, follow Co-UDlabs Data Storage Report Example. The data structure, files naming and metadata must be clear to ensure the use of the data by outsiders.

   Files must be uploaded to zenodo by clicking 'Start upload' button (up-right corner in green) before final publication.



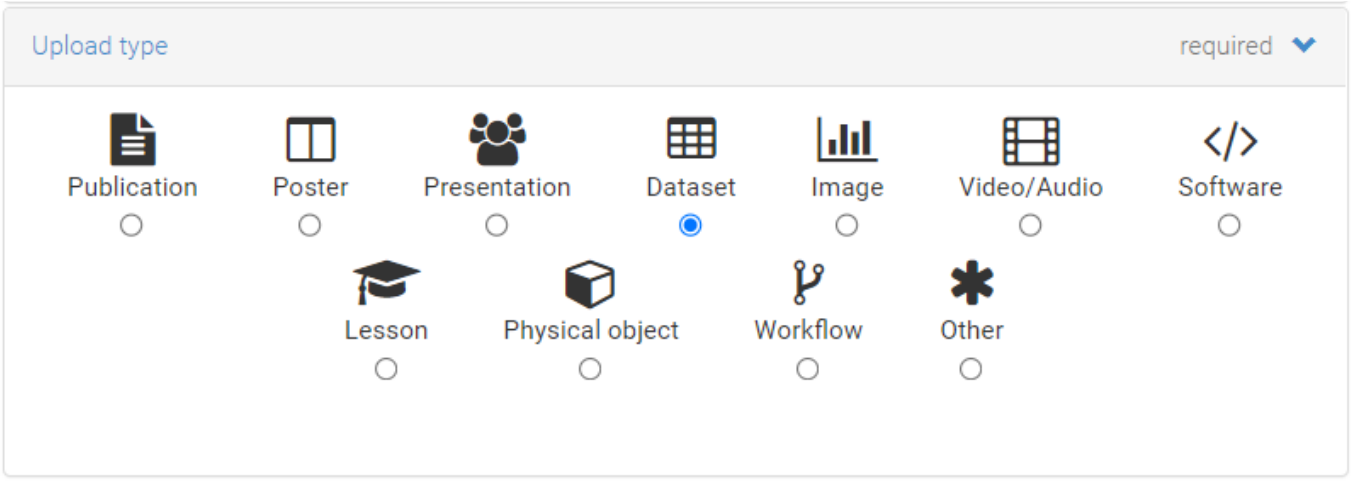
Communities

6. **Include at least Co-UDlabs and EC funded research (OpenAire) communities**. Feel free to also include communities of authors' institutions. The work will be verified by a 'curator' for the listed communities. A curator is someone who confirms the publication as linked to their community. After the approval of the curator, the work will be tagged with that community.



Upload type

7. Select 'Dataset'.



Basic information

8. Create a new DOI for your Dataset leaving empty Digital Object Identifier. Datasets uploaded within the scope of the Co-UDlabs project are assumed to be original without a prior DOI. If for some reason the work already has a DOI, please indicate it in this section.

   The DOI will be assigned once the work has been definitely submitted. if DOI is needed in advance, use the reserve DOI button.

9. Default date is the day of uploading. If the work has already been published elsewhere, enter the original publication date in the text box provided (this is more for publications and communications already published elsewhere)

10. Enter the title of the publication in the text box provided. The tittle should follow the next naming convention:

    Transnational Access (TA) datasets: 'Co-UDlabs_TA_TAcode DatasetTittle'

    Example:

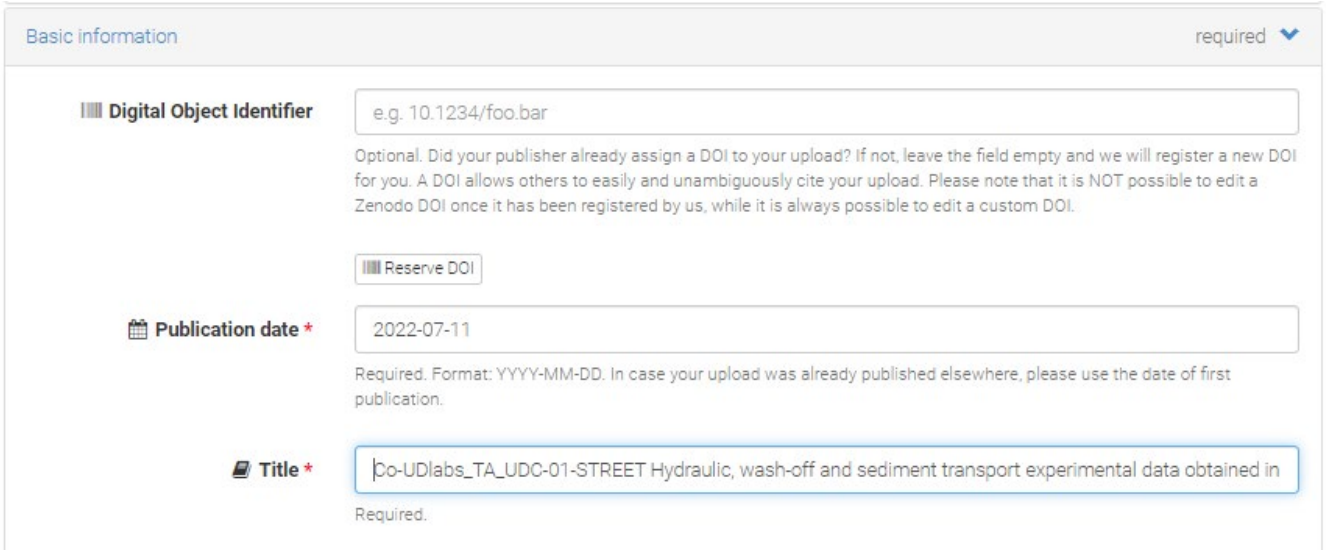
    Co-UDlabs_TA_UDC-01-STREET Hydraulic, wash-off and sediment transport experimental data obtained in an urban drainage physical model

    Joint Research Activities (JRA) datasets: 'Co-UDlabs_WPX_TXYZ_institution_DatasetNumber Dataset tittle'

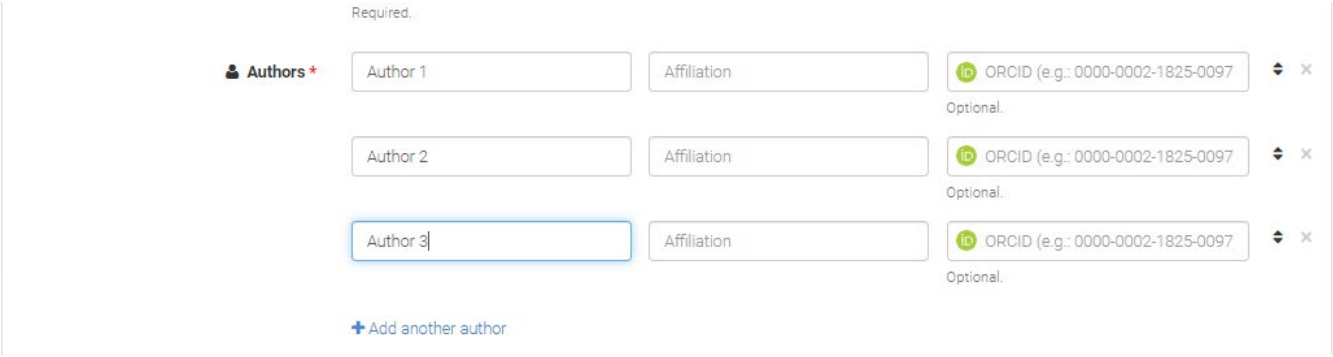
    (Dataset number should be coordinated according the specific DMP for each of the JRA)

    Example:

    Co-UDlabs_WP8_T812_UDC_001 Identifying sediment deposits from temperature signals



11. Enter each of the authors of the dataset in the text boxes provided. The affiliation and ORCID ID should be entered for each author where possible.



12. Provide a description of the dataset in the "Description" text box. This description can be modified after publication to link derived publications or include further details if authors find it interesting. Description should include at least the following points:

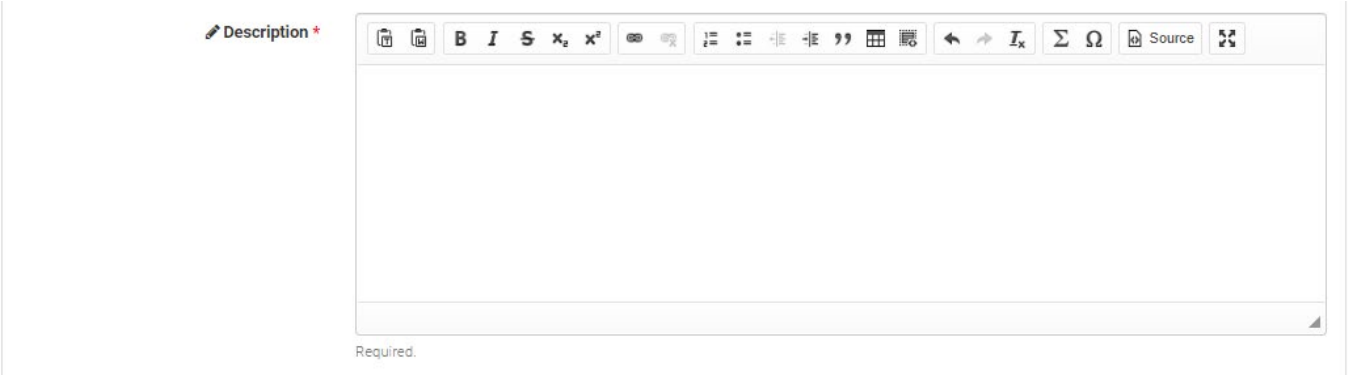
    - It must include that the data published in the dataset have been obtained within the scope of the Transnational Access (TA) programme or the Joint Research Activities (JRA) of the Co-UDlabs project (Building Collaborative Urban Drainage research labs communities).

      Please, in case of TA specify the title of the project and the number of the call in which the project was granted. For JRA indicate the corresponding Join Research Activity and number of Task stating briefly their main objectives.

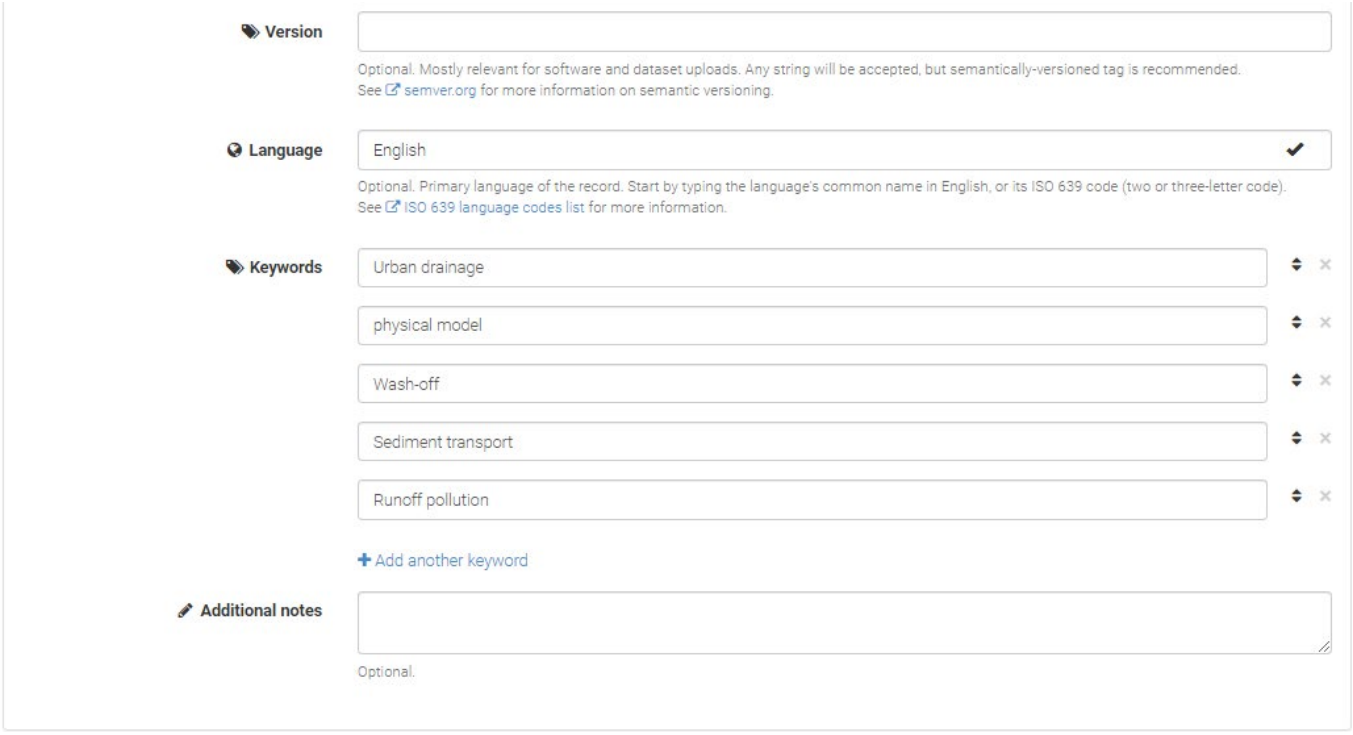
    - Brief abstract of the content of the dataset.

    - Users must acknowledge in their publications that their work was financially supported by the European Union's Horizon 2020 Research and Innovation Programme as follows: *"The authors acknowledge financial support from the European Union under the Horizon 2020 program within a contract for Integrating Activities for Starting Communities (Ref. 101008626)".*

    - A list of derived publication may be also included in the future (Zenodo allows modifying it after the publication of the dataset).

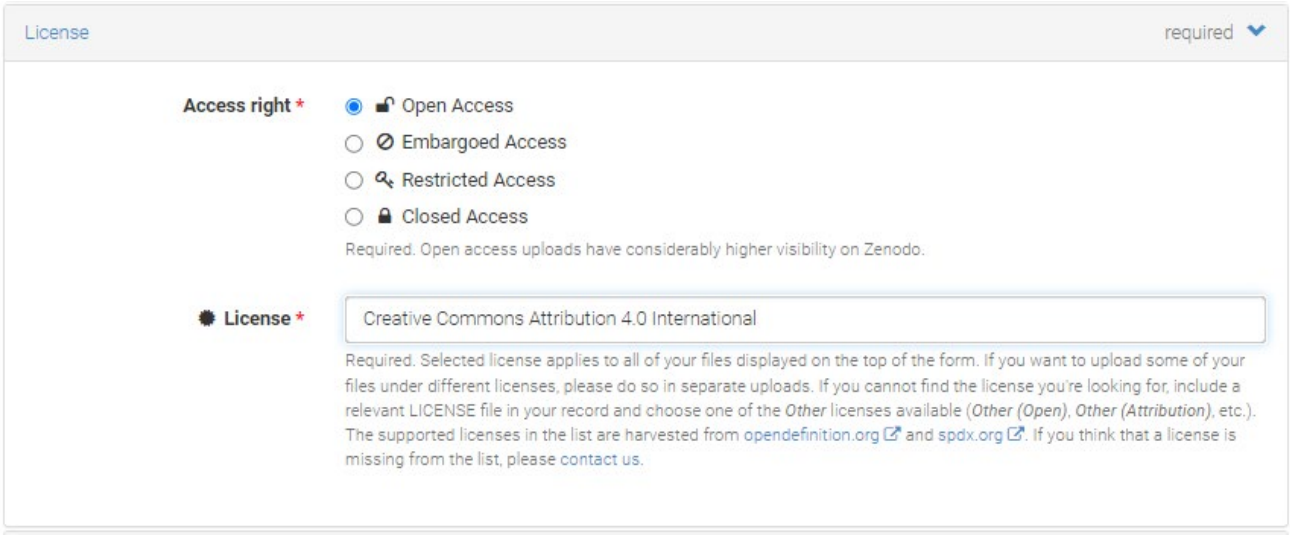


13. Leave 'Version' empty by default, Zenodo will manage the versions of the datasets in case of updating or modifying the dataset in the future. Only use in particular cases and softwares.
14. Language of the dataset. Co-UDlabs datasets should be preferably in English.
15. Include Keywords of the dataset. Meaningful keywords to describe your document are extremely important for search of users. You can also put this and additional information in the field "description".



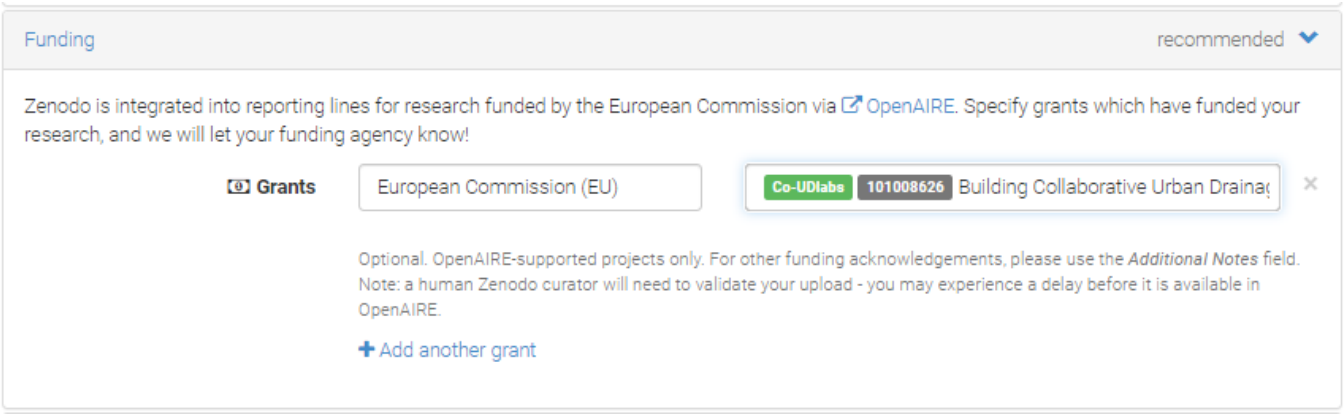
License

16. In this section you can choose what access will be given to your publication. The publication of datasets within TA or JRA during the project should be open access. Only TA datasets involving SMEs may have some well justified restrictions.



Funding

17. European Commission project/grant information must be included to associate your work with Co-UDlabs via OpenAIRE. Select **European Commission (EU)** from the list if it is not already selected. Enter the **grant number for the Co-UDlabs project** in the neighbouring text box (**101008626**). Further funding can be additionally added by clicking 'Add another grant'

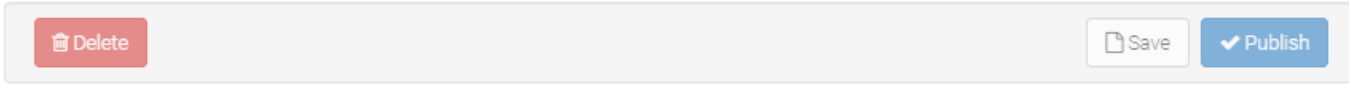


Publish or save for later

18. Once the files have been uploaded and all the information covered, the dataset is ready to be uploaded by clicking on the 'Publish' button at the top of the page. It is also possible to save the draft dataset for later publication by clicking on the Save button.

    Once the record is published you will no longer be able to change the files in this upload. This is because a Digital Object Identifier (DOI) will be registered immediately after publishing. You will still be able to update the record's metadata later.

    If you only want to create a test upload, please do so on Zenodo Sandbox.



ANNEX 4 – DATA STORAGE REPORT TEMPLATE

Co-UDlabs

BUILDING COLLABORATIVE URBAN DRAINAGE RESEARCH LABS COMMUNITIES

Data storage report template: COUDLABS_UDC_WP8_T8.1.2_001 “Identifying sediment deposits from temperature signals”

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N°101008626

DATASET DETAILS

Project title	Building Collaborative Urban Drainage research labs communities
Call identifier	H2020-INFRAIA-2020-1
Grant Agreement No	101008626

Activity	Joint Research Activities
Dataset ID	COUDLABS_UDC_WP8_T8.1.2_001
Dataset title	Identifying sediment deposits from temperature signals
Data sources	Data from laboratory experimental campaign where the variations of water and sediment bed deposits temperature is measured when water temperature is varied. (time series format). Dataset includes also sediment characteristic
Content	Raw and processed temperature time series: T [ºC], Sensor signal [ohms] Sediment characteristics: Moisture content (%), Organic matter (%), Density (kg/m3) (wet, bulk, dry-bulk and solid density), Porosity (-), Mean grain size (mm).
Formats	csv
Volume	1.5 Mb

AUTHORS

Jose Anta	UDC	jose.anta@udc.es	0000-0003-2002-0618
Manuel Regueiro	UDC	manuel.regueiro1@udc.es	0000-0002-4933-8550
Acacia Naves	UDC	acacia.naves@udc.es	0000-0003-1897-0884
Raúl Pernas	UDC	rpernascabo@gmail.com	-

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Abstract

This document describes the dataset 'Identifying sediment deposits from temperature signals' which is a result from the Joint Research Activity 3 (WP8, Improving Resilience and Sustainability in Urban Drainage solutions), Task 8.1.2. (Pollutant retention and release potentials of UD structures) within Co-UDlabs project, funded under the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008626.

These experiments introduce a new approach which uses high-resolution temperature data to identify sediment bed deposits by analysing time series. Water (wastewater or drainage water in UDS) and sediments show different thermal properties and heat transfer dynamics. Thus, the aim of this work is to estimate or at least evidenced the presence of sediments by analyzing the differences between the temperature timeseries measured in the water phase and at the bottom of bed deposits in a controlled environment. Data from the experimental campaign presented here will help to understand heat transfer processes between water and saturated sediment mixtures and, therefore, develop new methodologies to estimate accumulation in UDS.

9. Experimental setup

The experimental setup consisted in four adiabatic boxes of 15×15×15 cm^3 (inner dimensions) made of Expanded Polystyrene (EPS) to avoid significant heat transfer at the contours. Sediment thicknesses of 2, 4, 6 and 8 cm have been respectively poured at the bottom of each box together with 2 cm layer of water covering them. Two temperature sensors were installed in each box for measuring the water and sediment-bed temperatures. In addition, coil systems, which were made of 5 mm (diameter) plastic tubes, were deployed within each box to introduce temperature gradients in the water layer by pumping water from a temperature-controlled system. This system consisted in a water bath with heating and cooling devices attached, and four pond pumps (200 L/h) to supply temperature oscillation to each box. Finally, two additional temperature sensors were set for measuring the room and water bath temperatures, respectively. Figure 1 summarizes the experimental setup performed in the Hydraulics Laboratory of Civil Engineering School at Universidade da Coruña.

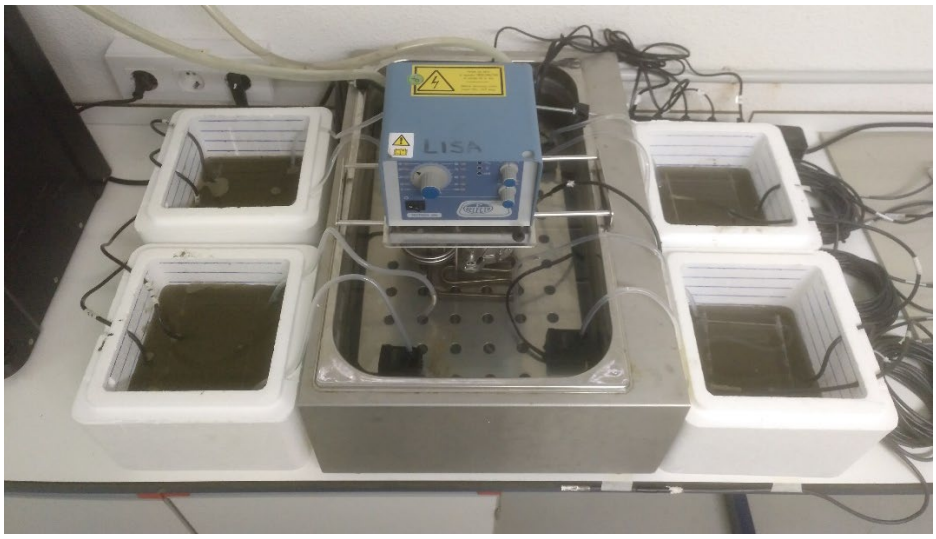


Figure 1. Photo of the experimental setup.

10.Experimental procedure

Two experimental procedures were carried out in this project.

- Pulse experiments (Figure 2a): these tests consist in short period increases of the water layer temperature within the boxes. The water was warmed up to 2ºC in 20 minutes, simulating heat dynamics due to sharp temperature gradients, such as stormwater inflows.
- Cycle experiments (Figure 2b): conversely previous procedure, these tests forced a prolonged heat-cooling cycle in the water layer. Cycles consisted of a 2-hour heating and a subsequent cooling. Water temperature oscillations were set in the range of 2°C, simulating daily temperature oscillations in wastewater or drainage water (Montserrat et al., 2013).

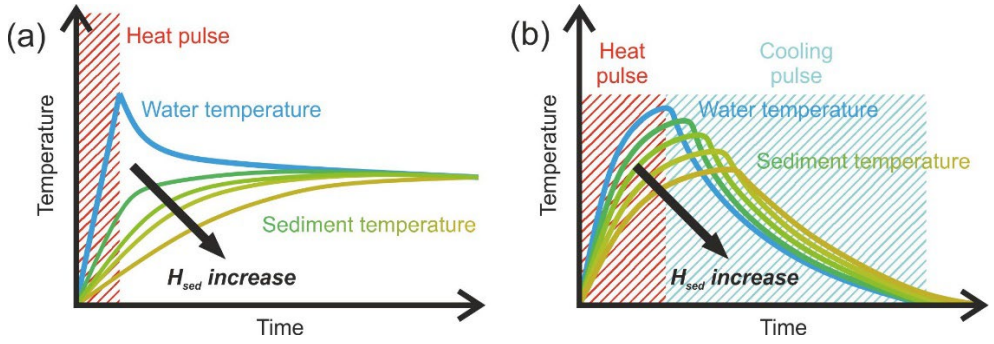


Figure 2. Scheme of experimental procedures: pulse (a) and cycle (b).

Each experimental procedure was applied to each box. Therefore, 8 tests were performed. Table 1 shows the experiments carried out and their configuration:

Table 1. Temperature test configurations.

Experiment	ID	Experimental procedure	Sediment thickness (cm)
PulseB1_2cm	P1	Pulse test	2
CycleB1_2cm	C1	Cycle test	2
PulseB2_4cm	P2	Pulse test	4
CycleB2_4cm	C2	Cycle test	4
PulseB3_6cm	P3	Pulse test	6
CycleB3_6cm	C3	Cycle test	6
PulseB4_8cm	P4	Pulse test	8
CycleB4_8cm	C4	Cycle test	8

Sediment thickness reference was measured from the temperature sensor placed at the bottom of the box up to the water-sediment interface. On the other hand, relative time systems were used for collecting the data from temperature sensors. Time resolution was set in 5 seconds. In addition, each pair of sensors were connected to a different data acquisition system, which were controlled by Arduino Nano boards with a RTC. Measurements were synchronized by turning on the power of the electronic boards and initializing the heat

pulse pumping at the same time. Mechanical and thermal properties of the sewer sediments were assumed to be constant, regardless of height, time or box. The same calibration parameters of the temperature sensors were applied during the entire campaign.

10.1. Temperature measurements

Temperature measurements were recorded with 4-wire PT100 sensors (TF44, WIKA Instruments) using an Adafruit PT100 RTD Temperature Sensor Amplifier - MAX31865 connected to Arduino Nano boards. The Arduino boards were mounted in a shield with integrated SD card and RTC DS3231 boards. In total, 5 Arduino nano boards were used:

- PT0 board was installed with two PT100 to measure air room (PT0a) and water bath (PT0b) temperatures.
- PT1 to PT4 boards were installed with two PT100 each to measure Box 1 to Box 4 water (PTXw) and sediment (PTXs) temperatures.

The following Table 2 summarizes the information about the temperature sensors, also included in file *Measuring_info.csv*.

Table 2. Temperature PT100-TF44 sensor information

ID	Location	Plan view position	Zcoord (m)	Resolution (s)	Acquisition units (*)	Result units
PT0a	Room	-	-	5	ohms	deg.C
PT0b	Water bath	-	-	5	ohms	deg.C
PT1w	Box 1	center	0.03	5	ohms	deg.C
PT1s	Box 1	center	0.00	5	ohms	deg.C
PT2w	Box 2	center	0.05	5	ohms	deg.C
PT2s	Box 2	center	0.00	5	ohms	deg.C
PT3w	Box 3	center	0.07	5	ohms	deg.C
PT3s	Box 3	center	0.00	5	ohms	deg.C
PT4w	Box 4	center	0.09	5	ohms	deg.C
PT4s	Box 4	center	0.00	5	ohms	deg.C

(*) PT100 sensors report ohms in hexadecimal format

PT100 sensors measure the temperature through the resistance of a Platinum strip. As a reference, they present a resistance of 100 ohms at a temperature of 0ºC. In this project, we first analyzed the resistance measurements by each sensor (ohms in hexadecimal format), to later obtain the temperature values by applying the Callendar-van Dusen (CvD) formula.

10.1.1. Data collection

Raw temperature measurements were saved as text files by the Arduino microcontrollers in microSD cards. Subsequently, raw measurements were corrected by introducing calibration coefficients, which were previously obtained from controlled-uniform temperature measurements, and transformed in degrees Celsius (deg.C or ºC). Data were saved in both raw and calibration-corrected formats. Next section summarizes how to introduce the calibrating coefficients and obtain the resulting units in degrees Celsius.

10.1.2. Post-processing

PT100 sensors were calibrated before the experimental campaign by setting constant temperatures in the water bath, within the temperature range expected to be used in the experiments (20-35ºC). For this purpose, all sensors were introduced in the water control system and temperatures were measured for 4-5 minutes with a time resolution of 5 seconds (*Sensors_calibration*). Resistance Temperature Detector (RTD) measurements were compared and adjusted with the data collected from one of the PT100 sensors (PT4s), which was taken as a reference. Therefore, a linear regression was applied to perform the transformation from raw to corrected RTD measurements. The linear regression equations are obtained by setting the following equation:

$$RTD_{\mathrm{cc}} = m \cdot RTD_{\mathrm{raw}} + n$$

where RTD_{raw} represent raw RTD measurements (ohms, in hexadecimal format), and m and n are the linear regression coefficients of the PT100 calibration. m-coefficients showed values close to 1, as expected, while n-coefficients showed slight oscillations in the offset setting.

After correcting RTD measurements, the Callendar-van Dusen (CvD) formula was applied to transform the RTD values (in ohms) to temperature units (in degrees Celsius):

$$RTD = R_0 \cdot (1 + A \cdot T + B \cdot T^2), \text{ if } T > 0$$

where T is the temperature (ºC), R_0 is the resistance at 0ºC and its value is equal to 100 ohms, and $A = 3.9083 \times 10^{-3}$ and $A = -5.775 \times 10^{-7}$are the coefficients of the CvD formula. This formula accurately approximates the relationship between resistance and temperature, with a maximum error of 0.0022ºC within a temperature range of 0 to 200 ºC (King and Fukushima, 2004). To transform the RTD from a hexadecimal to a ohms-based decimal format it is necessary to apply the following equation:

$$RTD = \frac{RTD_{\mathrm{cc}}}{32768} \cdot R_{\mathrm{ref}}$$

where RTD_{cc} is the calibration-corrected RTD measurements, 32768 refers to 8000 in hexadecimal (base 16) format, and $R_{\mathrm{ref}} = 430$ is the value of the reference resistance of the resistor (ohms) PT100 RTD Temperature Sensor Amplifier - MAX31865 given by the manufacturer.

10.2. Sediment properties analysis

To carry out the analysis of sewer sediment properties, several sub-samples were taken and analyzed according to standardized methods. For this purpose, laboratory equipment such as test tubes, capsules, pycnometers, high-precision weighing scales, drying ovens, etc. were used. Additionally, specific devices were also used for performing grain size distribution analysis. On the one hand, wet sieving method was applied by using sieves ranged from 0.063 to 2 mm. On the other hand, laser diffraction analysis was also performed with a Beckman Coulter LS 13 320 (Aqueous Liquid Module). This study was focused on characterizing mechanical properties of sediments. The properties analyzed are listed below (see also *Sediment_prop.csv*):

- Moisture content (%).
- Organic matter (%).
- Density (kg/m^3): wet, bulk, dry-bulk and solid density.

- Porosity (-).
- Mean grain size (mm).

10.2.1. Data collection

Subsamples from sewer sediment were analyzed by following several standard methods, which are listed in the following Table 3.

Table 3. Standard methods for sample analysis.

Parameter (sediment property)	Standard method reference
Moisture content	2540G, APHA (1998)
Organic Matter	2540G, APHA (1998)
Wet density / Specific gravity	2710F, APHA (1998)
Solid density	UNE EN 1097-7:2009
Grain size distribution	ISO 13320:2009 and ISO 2591-1:1988

10.2.2. Post-processing

The following parameters were obtained from the combination of parameters obtained by applying standard methods (Table 2).

- Dry bulk density (kg/m^3): $\rho_{dry-bulk} = \rho_{bulk}/(1 + w/100)$, where ρ_{bulk} is the bulk density (kg/m^3) and w is the moisture content (%).
- Porosity (-): $\varphi = 1 - \frac{\rho_{bulk}}{\rho_{solid}}$, where ρ_{solid} is the solid density (kg/m^3).

In addition, the overall characterization of the sewer sediment was obtained by averaging the values obtained from the subsample analysis.

11.Data and result files organization

Main data collection was based on data from temperature sensors and sediment properties. Temperature data were stored in csv files, which are organized in folders according to test procedure and sediment thickness conditions (Table 4). Thus, folder names combine the type of test (Pulse or Cycle), the number of the box (B1, B2, B3 and B4), and the sediment thickness (in cm.) or the reference to room and water bath temperatures (B0). Data from each experiment considered in Table 1 are stored in separate folders, which include the following files:

- "*C1_Temperatures_RawSignal(RTD).csv*": Raw temperature time series measured by the PT100 sensors located at the sediment-bed and in the water layer.
- "*C1_Temperatures_Processed(degC).csv*": processed temperature time series after applying the calibration coefficients and CvD formula to transform temperature from resistance to degree Celsius values.

Please, note that C1 is the reference to the experiment.

Table 4. Folders and file organization.

	CycleB0_room&wbath_Temp	Folder
	Room_Temperature_Processed(degC).csv	.csv file
	Room_Temperature_RawSignal(RTD).csv	.csv file
	CylcleB1_2cm	Folder
	CylcleB2_4cm	Folder
	CylcleB3_6cm	Folder
	CylcleB4_8cm	Folder
	PulseB0_room&wbath_Temp	Folder
	PulseB1_2cm	Folder
	PulseB2_4cm	Folder
	PulseB3_6cm	Folder
	PulseB4_8cm	Folder
	Sediment_properties	Folder
	Standard_methods	Folder
	APHA_methods.csv	.csv file
	…	.csv files
	Sediment_prop.csv	.csv file
	Sensors_calibration	Folder
	Step1_Temperatures_RawSignal(RTD).csv	.csv file
	…	.csv files
	Measuring_info.csv	.csv file

Figure 3 plots water and sediment-bed processed temperatures for the eight experiments performed:

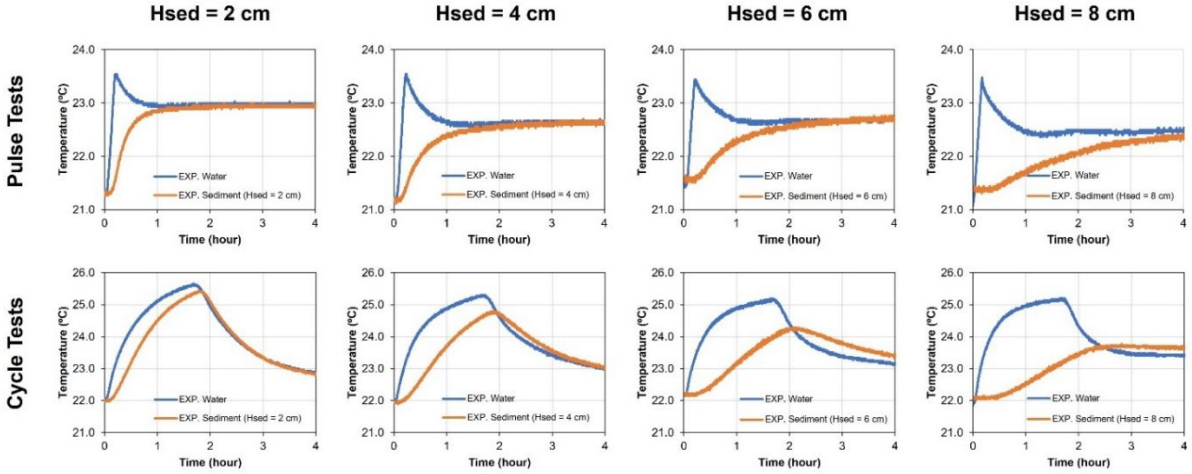
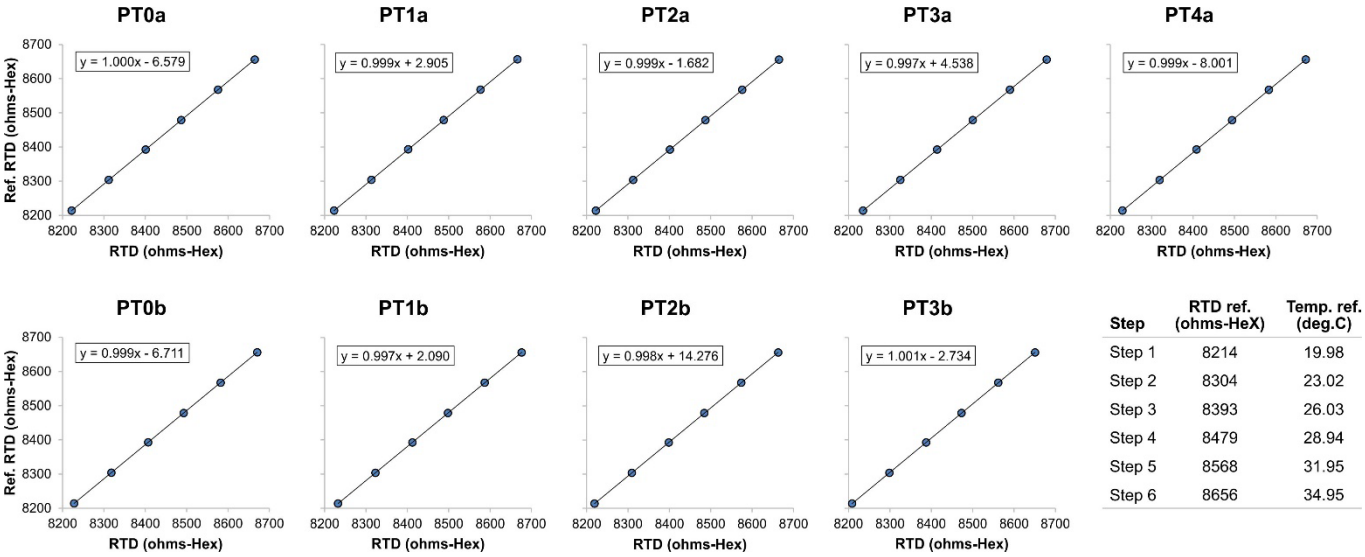


Figure 3. Temperature time series in water and sediment-bed for pulse and cycles tests, and sediment thicknesses ranged from 2 to 8 cm.

Furthermore, sensor calibration and sediment properties were respectively stored in separate folders. Regarding sensor calibration, the folder contains raw temperature time series from 6 steps in the range of (20-35ºC).



Step	RTD ref. (ohms-HeX)	Temp. ref. (deg.C)
Step 1	8214	19.98
Step 2	8304	23.02
Step 3	8393	26.03
Step 4	8479	28.94
Step 5	8568	31.95
Step 6	8656	34.95

Figure 4. Regression lines obtained from the calibration steps of the PT100 sensors. PT4b sensor measurements were chosen as reference values.

In addition, sediment properties are summarized in the file: *Sediment_prop.csv*. Raw sediment analysis data are also provided in the folder: *\Standard_methods*.

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