How to regulate Combined Sewer Overflows transparently? Lessons learned from UK & EU

Alma Schellart, University of Sheffield

Co-UDlabs

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008626

University of Sheffield

Overview of presentation

- Introduction
- Investigation of Combined Sewer Overflow (CSO) regulation and its implementation in several European countries
- Geospatial analysis CSO data England and Wales
- Discussion and (some) conclusions and (more) questions

Introduction

- **Increasing scrutiny** of combined sewer overflows, changing legislation
- **Challenges**: urban creep, climate change, ageing assets,
- **Challenging Opportunities**: new sensing and data sharing developments, and **public interaction with open data**
- What do we know about **practical implementation of regulation**?
- Can **geospatial analysis of the CSO event-duration dataset from England & Wales** help identify areas with excessive CSOs elsewhere?
- **what type of CSO data would be most useful to collect and release to the public, and how it can help with transparency and implementation of regulation?**

Methodology

Europe, 10 areas studied: England & Wales, France, Switzerland, Flanders & Brussels, Denmark, Spain, Netherlands, Germany, Austria, Norway

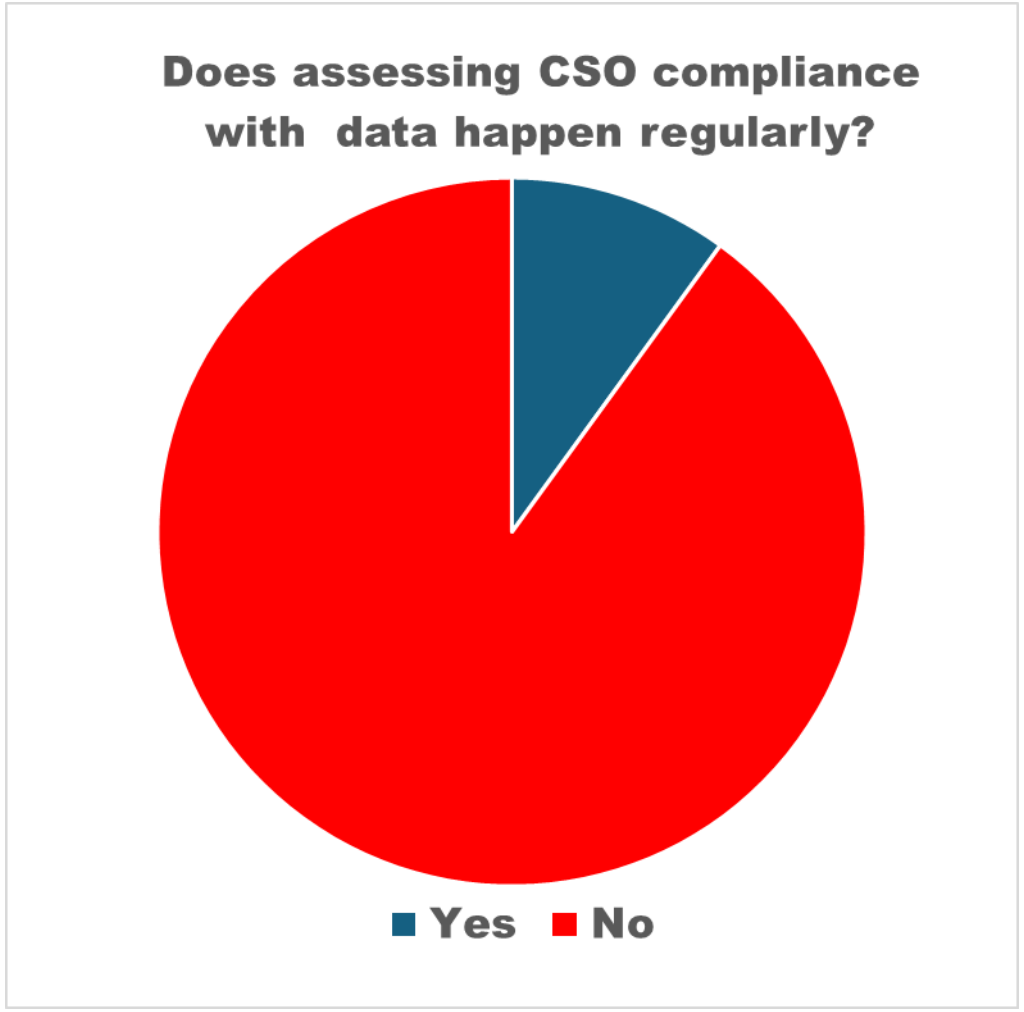
- Questions developed to compare implementation of regulation and compliance assessment in several European countries/regions.
- Local experts * asked to respond and comment

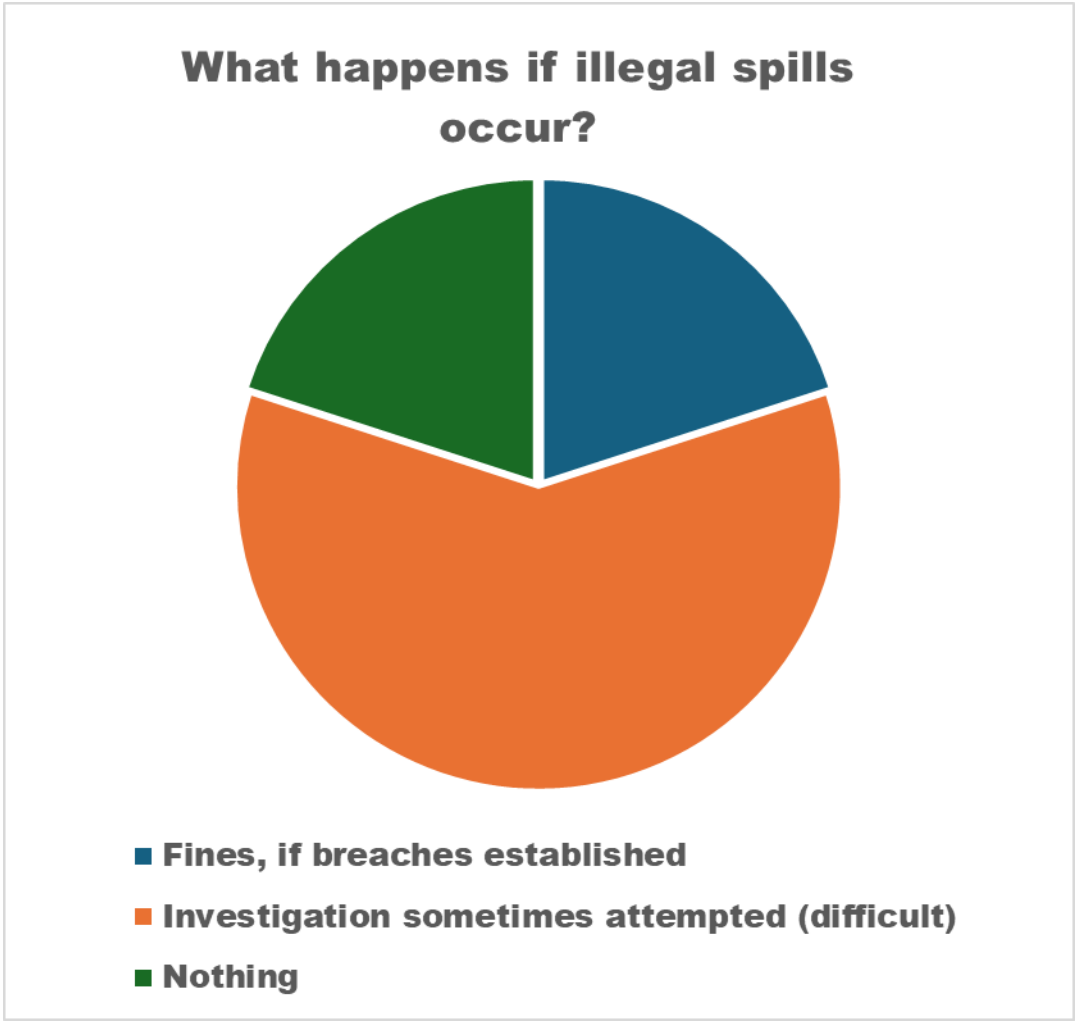
England & Wales:

Geospatial analysis of the annual CSO event-duration monitoring data. Analysis on local area district level, and on (smaller) sewer catchment level

*Acknowledgement: Jean-Luc Bertrand Krajewski, Joerg Rieckermann, Liz Sharp, Jose Anta, Frank Blumensaat, Francois Clemens, Ulrich Dittmer, Isabel Douterelo, Günter Gruber, Henriette Jensen, Marius Møller Rokstad, James Shucksmith, Simon Tait, Franz Tscheikner-Gratl, Boud Verbeiren, Luca Vezzaro

Comparison on assessing compliance





Discussion – on regulation type

Emission based or receiving water impact based?

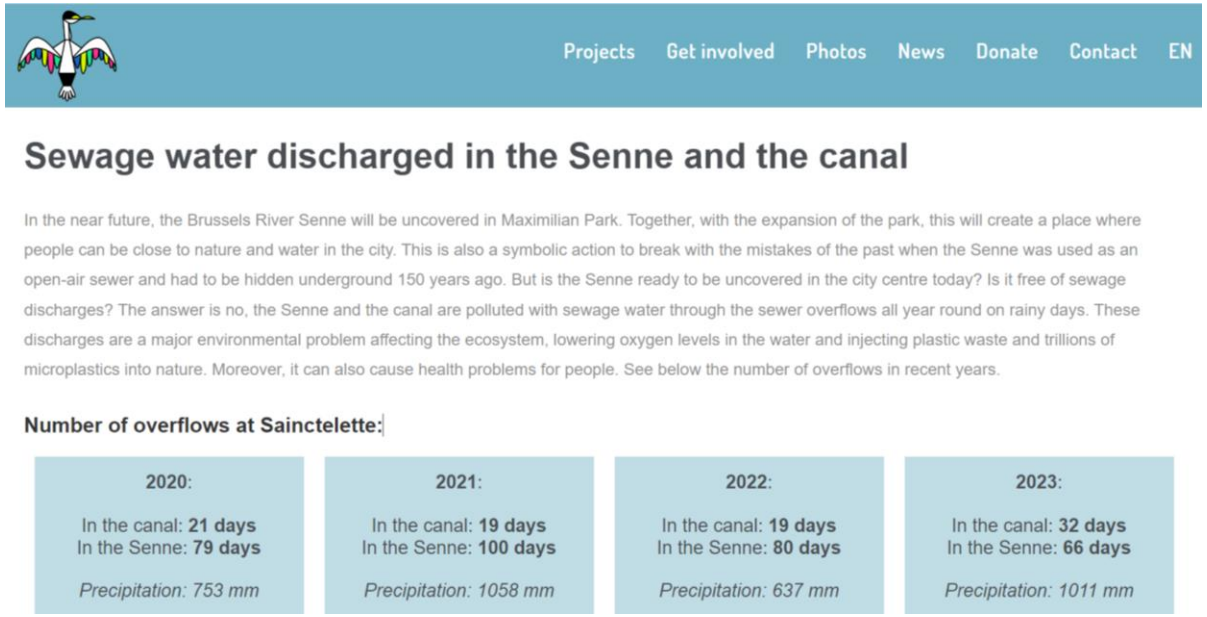
- **Emission based** (CSO frequency or volume) → what about river impact?
- **Receiving water impact based** regulation → more scientifically sound, however, very complex to implement in practice
- **Example:** In next planning period, Yorkshire (England), two catchments are required to have investigation for impact based regulation compliance. Est. cost £1,760,000 (data collection & simulations) for 28.8 km river length → approx. 1% of main river length in Yorkshire in a 5 year period (similar to last 5 year period…)

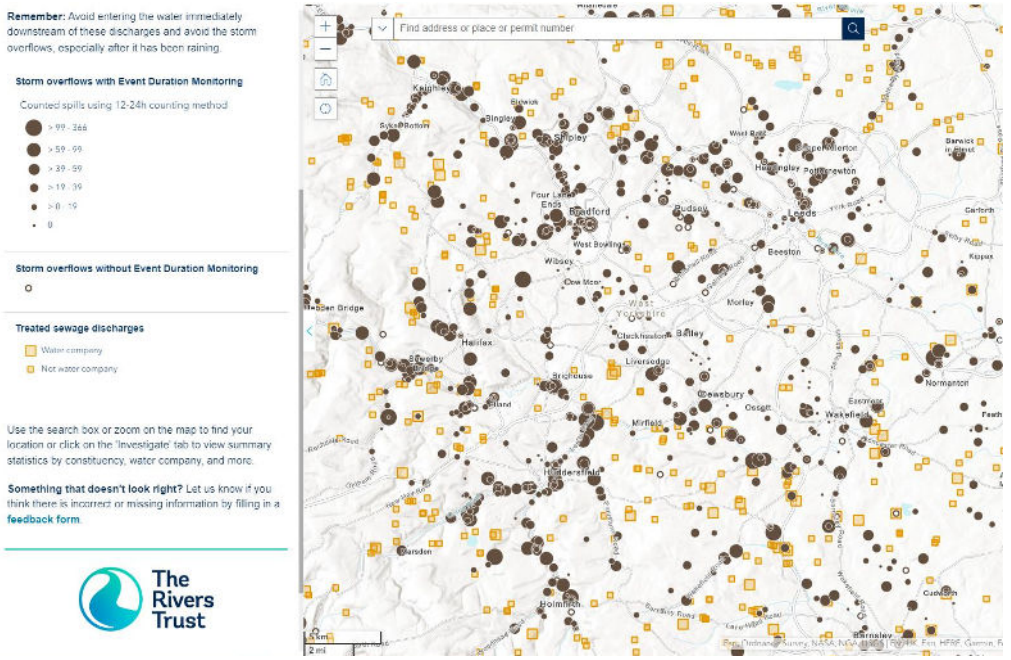
Discussion – regulation & open data?

- Regulation is never perfect, yet necessary….
- Emissions based is 'simpler' but doesn't tell full story of river impact
- Receiving water impact based is complicated, costly and allowing for more 'interpretations' related to compliance
- In the 10 countries/areas studied, the process of checking compliance with regulation is opaque.
- Source tracking is difficult ('polluter pays' concept is not necessarily helpful)

Can open data help with regulation and transparency?
…A comparison of two experiences..

Open CSO data, made more visible by NGOs
Example from Brussels and England





Belgium: Citizens group ‘City to Ocean’ is making use of open CSO spill in Brussels. Collaboration between Canal It Up and HYDRIA (sewer operator managing the Flowbru data).

https://www.citytoocean.org/en/sainctelette-sewage-overflow/

England: The Rivers Trust made clear maps showing Environment Agency’s open CSO event duration data

https://theriverstrust.org/key-issues/sewage-in-rivers

Brussels: ‘Be Part of the solution’

Canal It Up shows **positive messages to public**

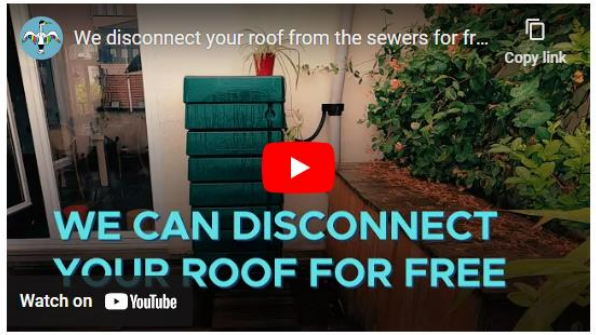
Number of overflow days **as well as rainfall** per year shown

Disconnect your roof: Be part of the solution

Do you live in Brussels with a terrace or a garden and want to install a rainwater harvesting tank or a rain garden to protect waterways?

Sign up now to be among the potential candidates for the free installation of a rainwater tank (with or without a swale)!

Registration form



In cities, rainwater is usually directed towards the sewers. During heavy rainfall, the sewers cannot manage the volumes of water, and thus this mixed water (rainwater and wastewater) flows into Brussels' waterways, such as the Senne and the Canal. This is the main cause of poor water quality in Brussels (read more about the issue of storm overflows in Brussels here).

It is high time to consider rainwater as a resource that can be used for various purposes in our daily lives. Installing a rainwater tank allows us to utilize this resource, and if we connect this tank to a garden, it also helps reduce the volume of rainwater going into the sewers, thus reducing sewer

https://www.citytoocean.org/en/disconnect-your-roof/

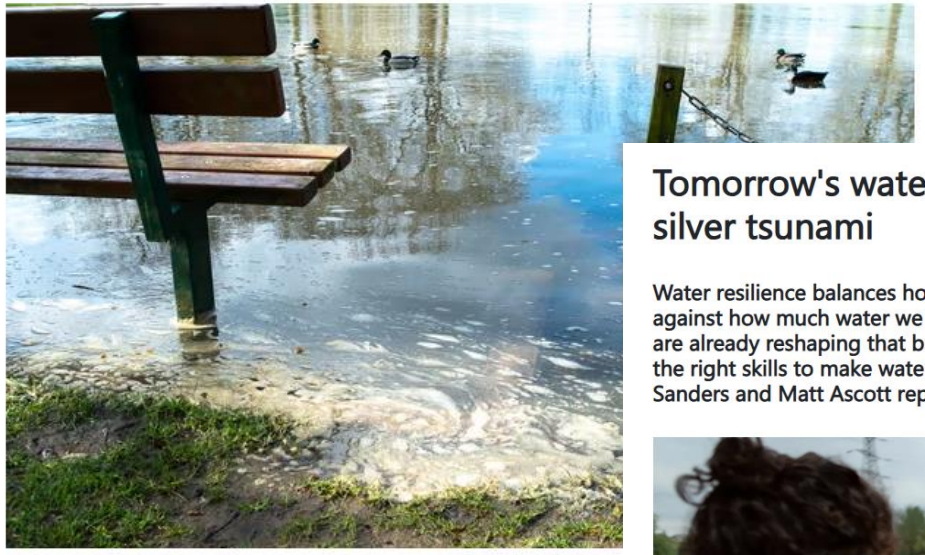
Number of overflows at Sainctelette:

2020:	2021:	2022:	2023:
In the canal: **21 days** In the Senne: **79 days**	In the canal: **19 days** In the Senne: **100 days**	In the canal: **19 days** In the Senne: **80 days**	In the canal: **32 days** In the Senne: **66 days**
Precipitation: 753 mm	*Precipitation: 1058 mm*	*Precipitation: 637 mm*	*Precipitation: 1011 mm*

England: increased public attention to CSOs and scrutiny, but also….unhelpful negativity

One in three UK water workers verbally abused amid sewage fury, GMB finds

Exclusive: public anger over river pollution affecting employee safety, union survey suggests



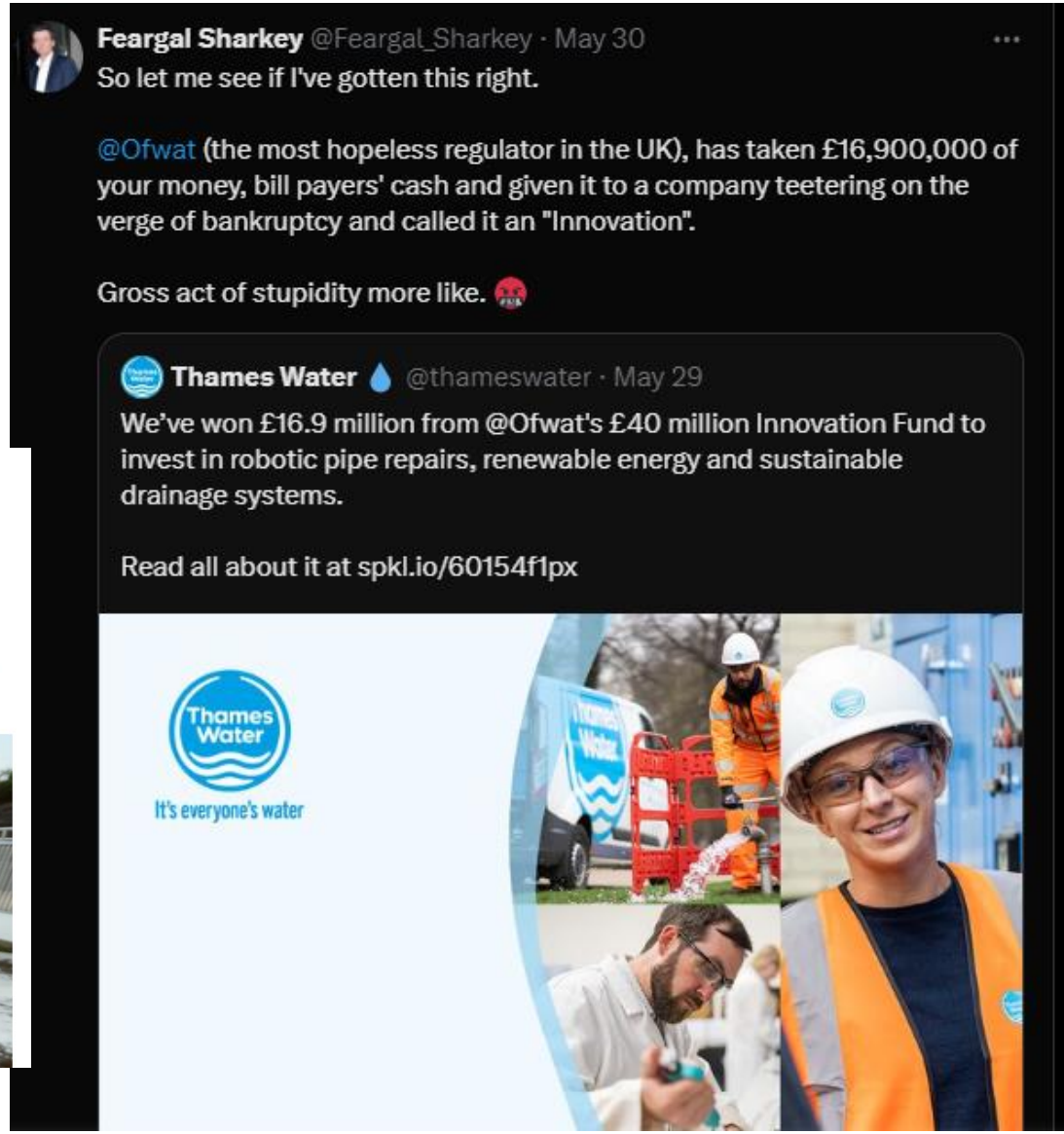
Sewage floats on the River Thames in Datchet, Berkshire. Photog McLean/REX/Shutterstock

https://www.theguardian.com/business/2024/apr/03/one-in-three-uk-water-workers-verbally-abused-amid-sewage-fury-gmb-finds

Tomorrow's water skills - how to tackle the silver tsunami

Water resilience balances how much water we have in the environment against how much water we use. Climate change and population growth are already reshaping that balance. But do we have the right people with the right skills to make water more resilient as these pressures grow? Joe Sanders and Matt Ascott report

https://www.ciwem.org/the-environment/tomorrows-water-skills-how-to-tackle-the-silver-tsunami



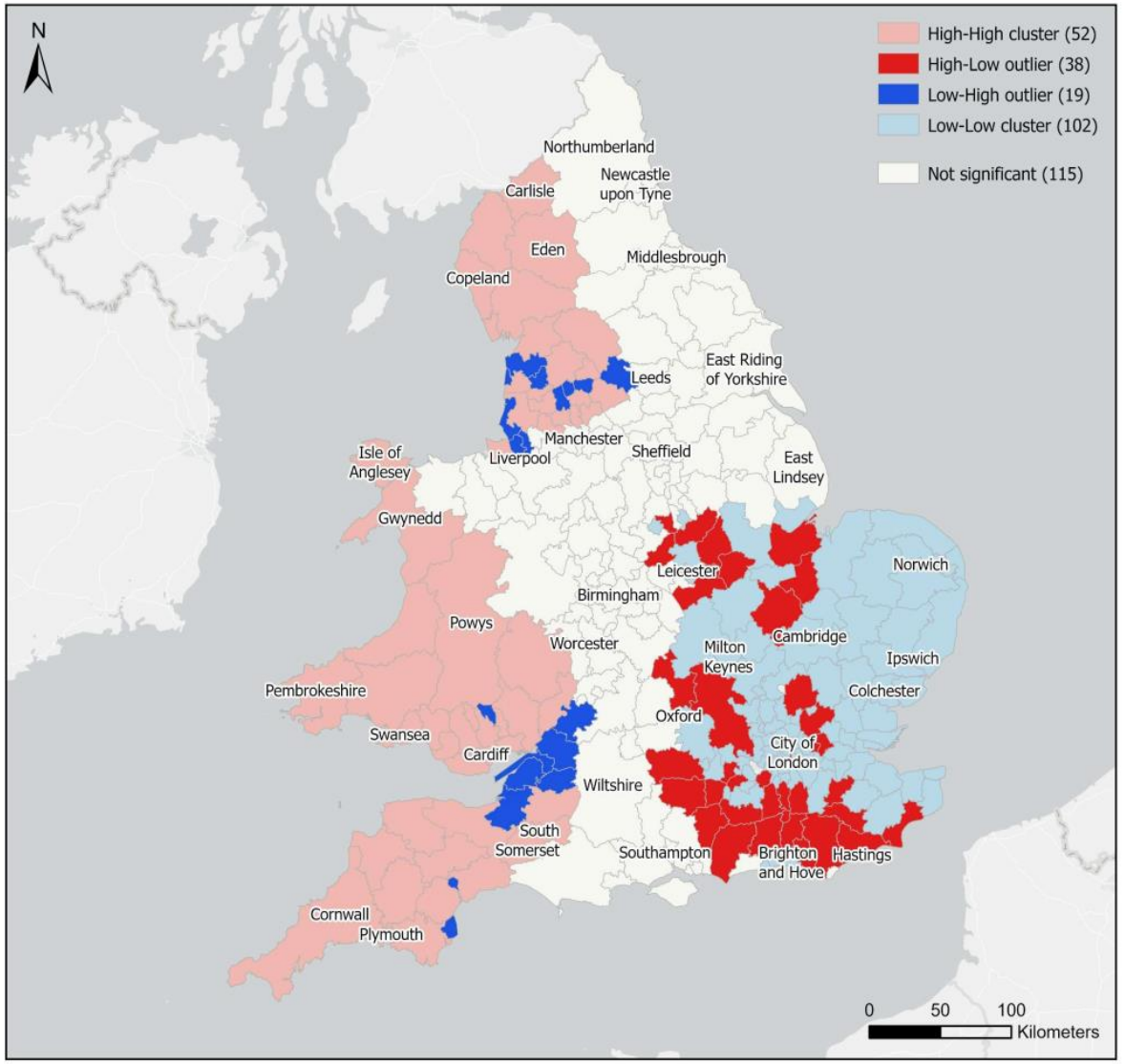
@Feargal_Sharkey 238,300 Followers
(Lead singer of the Undertones)

Geospatial analysis CSO spills – Local Area District level (2022)

LISA cluster analysis based on the average of the total duration of monitored CSO spill events in 2022

Higher spill durations in the West, lower spills in the South-East, but also many outliers

Analysis by Carlo de Vito, as part of TUDelft student placement to Deltares.
Supervised by Antonio Moreno Rodenas, Alma Schellart, James Shucksmith and Zoran Kapelan

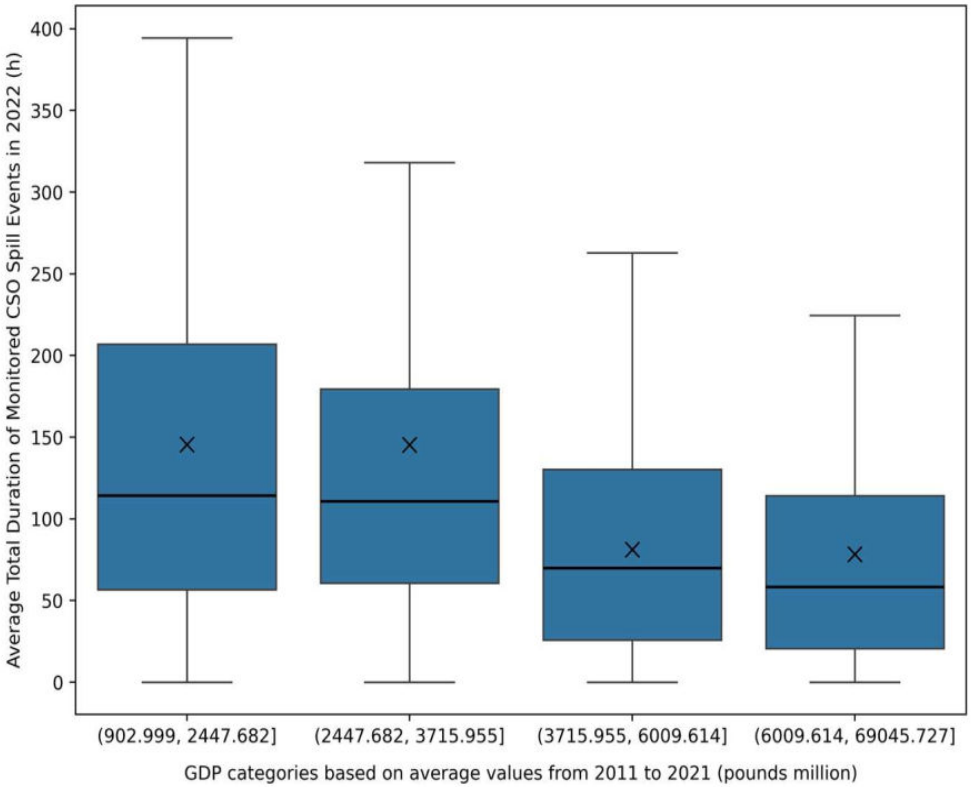


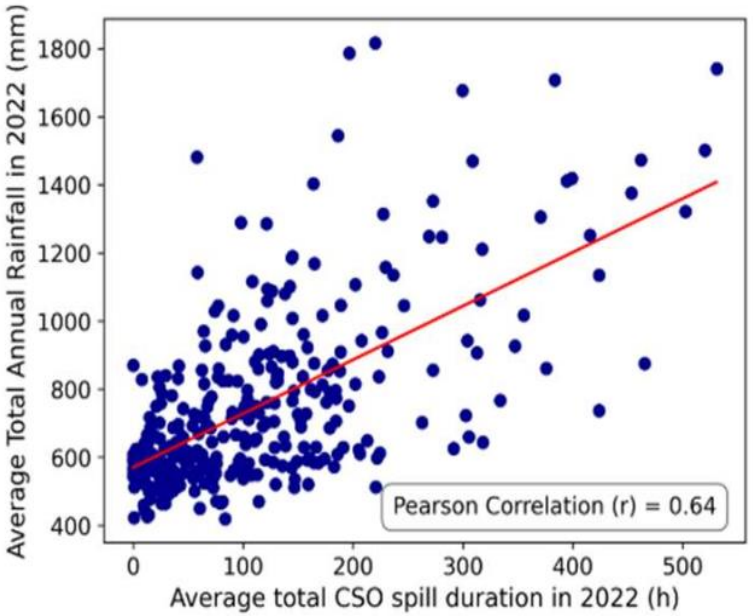
Geospatial analysis CSO spills – Local Area District level (2022)

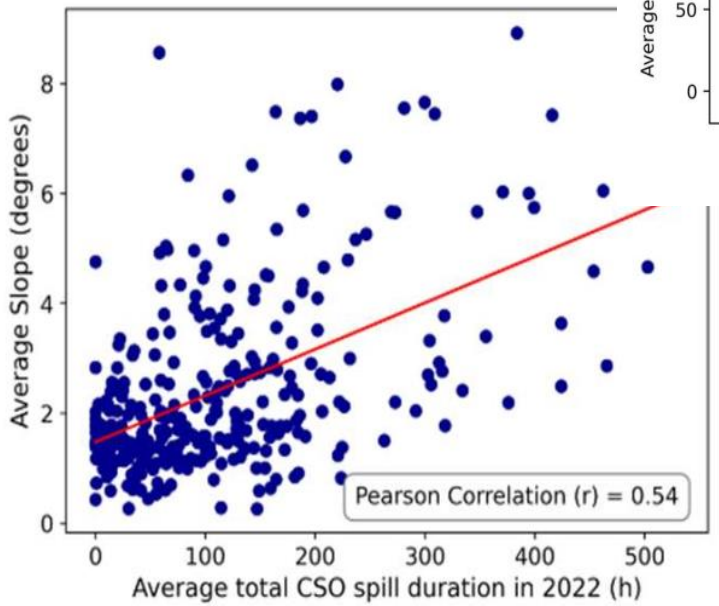
Weak correlations between Local Area District Average spill duration and:

- Average total annual rainfall (raingauges)
- Average slope
- GDP

But…Many outliers







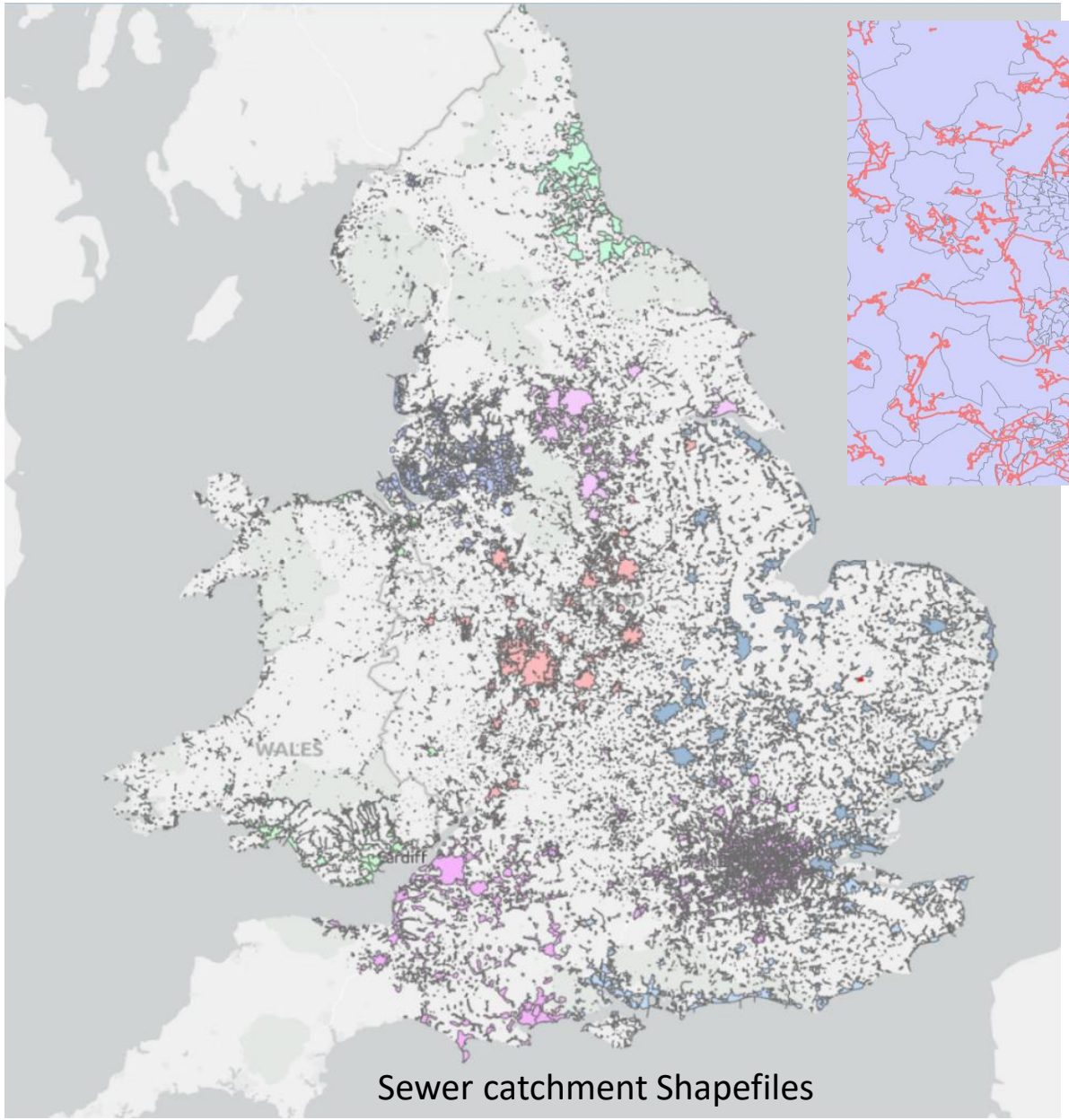
Geospatial analysis CSO spills – Sewer catchment level (2022)

Self-organising maps analysis of annual CSO spill count and duration, averaged per **sewer catchment**

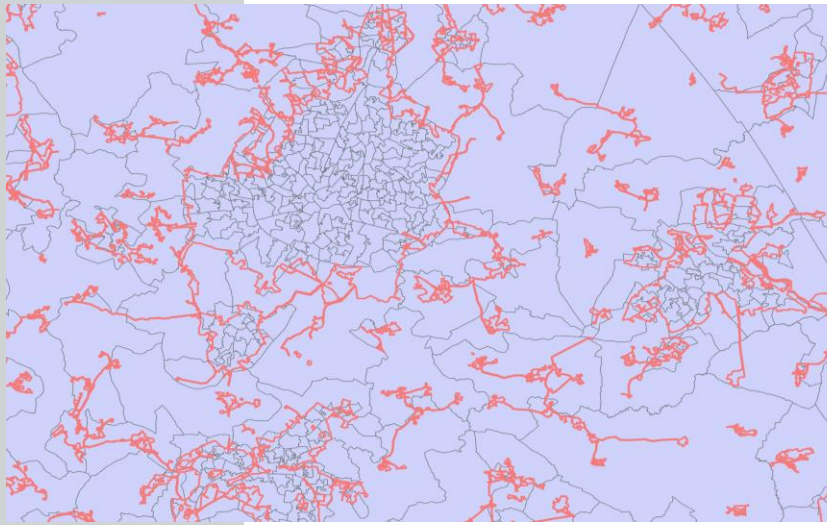
Population data and associated socio-economic data from 'Lower Super Output Area'(LSOA) census data (shapefiles containing approx. 1500 inhabitants)

Rainfall data from weather radar (1km^2 & 5 minute resolution)

By Yiqi Wu, University of Sheffield



Sewer catchment Shapefiles

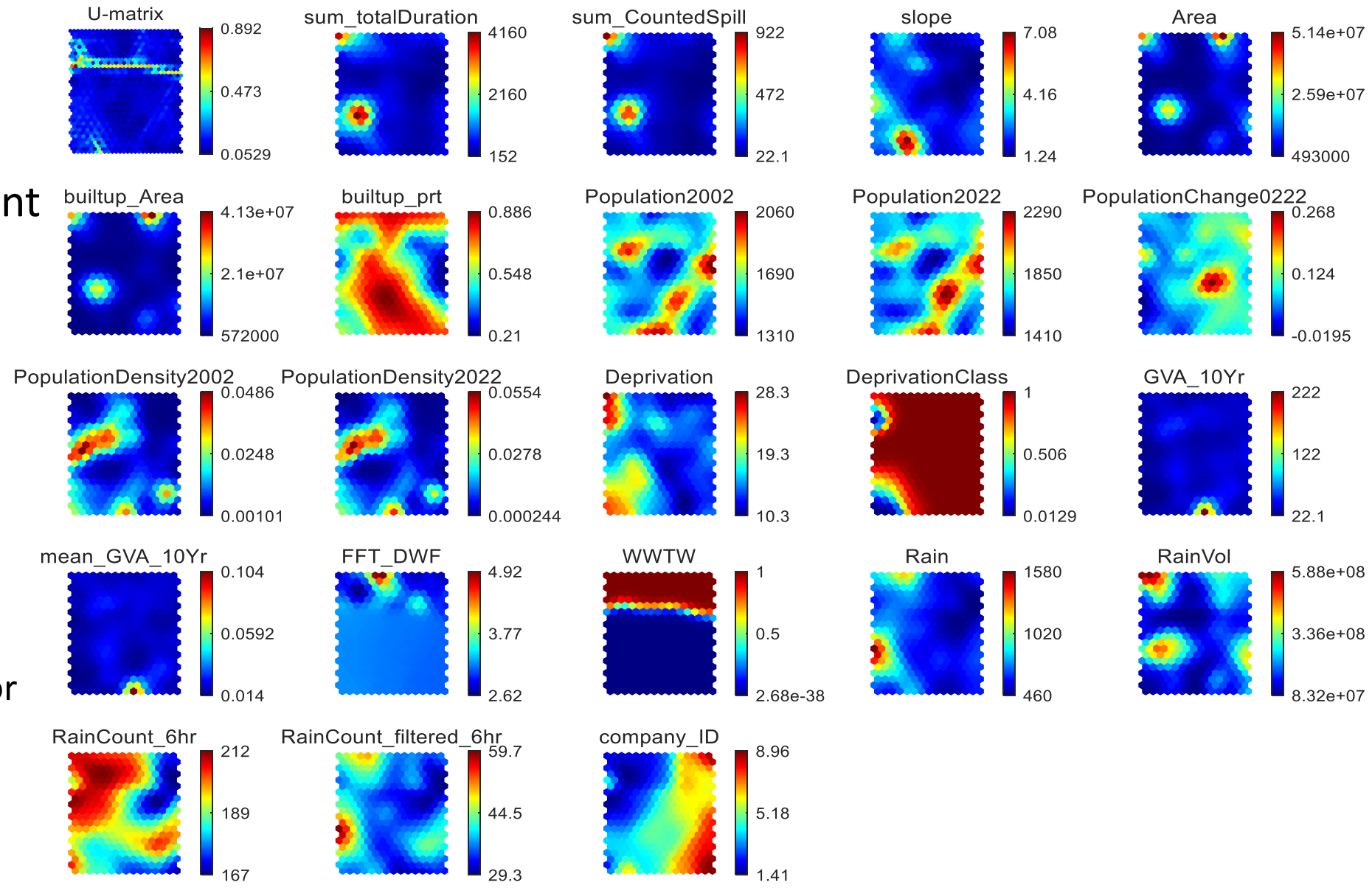


Example of overlapping wastewater catchments (red outlined polygons) and LSOAs (purple polygons).

Geospatial analysis CSO spills – Sewer catchment level (2022)

very weak to no correlations seen between CSO duration or spill count and potential explanatory parameters
Further analysis ongoing!

(only clear correlations seen between spill duration & spill count; or between explanatory parameters themselves, e.g. population 2002 & 2022)



Conclusions

- **CSO data often not collected in Europe**, data is not widely reported
- A plethora of local CSO regulations exists in Europe, however, **process of compliance assessment is opaque & doesn't happen regularly due to various difficulties**.
- In an ideal future, publicly open data may be a more transparent way to hold water utilities to account, **but it has to happen very carefully**.
- Where CSO data has been made open public, very **different experiences**
- **How data can best be made public is an open question**.
- **Importance of clear explanations, as well as positive messaging, also for attracting future workforce**

Conclusions

- England & Wales: **Relatively weak correlation between CSO spill duration and rainfall seen at larger scales**
- England & Wales: **No strong spatial correlations between CSO spill data from and hypothesised explanatory parameters at sewer catchment scale**.
- Likely many local factors influencing the occurrence of CSO spills
- In literature: also no simple correlations between observable variables and receiving water quality impacts, making the establishment of effective regulatory standards challenging.
- Discussions are urgently needed between local citizen groups and water utilities, to investigate expectations of urban drainage, and work out how and what data to be made open to the public.

Questions?

Details can be found in Deliverable 6.4 https://zenodo.org/records/14718051

Parts of the work were also presented at ICUD2024

Photo by Dr J. Shucksmith (taken during light rain in Sheffield)

Co-UDlabs

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008626