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## How to monitor and regulate Combined Sewer Overflows?

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# How to monitor and regulate Combined Sewer Overflows (CSOs)?

## *Comment mesurer et réguler les surverses de réseaux unitaires ?*

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Co-UDlabs



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# Background

## Co-UDlabs project

- Encourages data-supported assessment of urban drainage systems.
- Examines data collection, curation and publication practices.

## Changing legislation Combined Sewer Overflow (CSO) monitoring:

- Europe: Urban Wastewater Treatment Directive (UWWTD), new monitoring and “open data” obligations related to CSOs proposed
- England & Wales: since 2021 CSO event duration data publicly accessible
- England (Environment Act 2021):
  - Report on discharges from storm overflows in near-real time
  - Continuously monitor water quality upstream and downstream of CSOs!

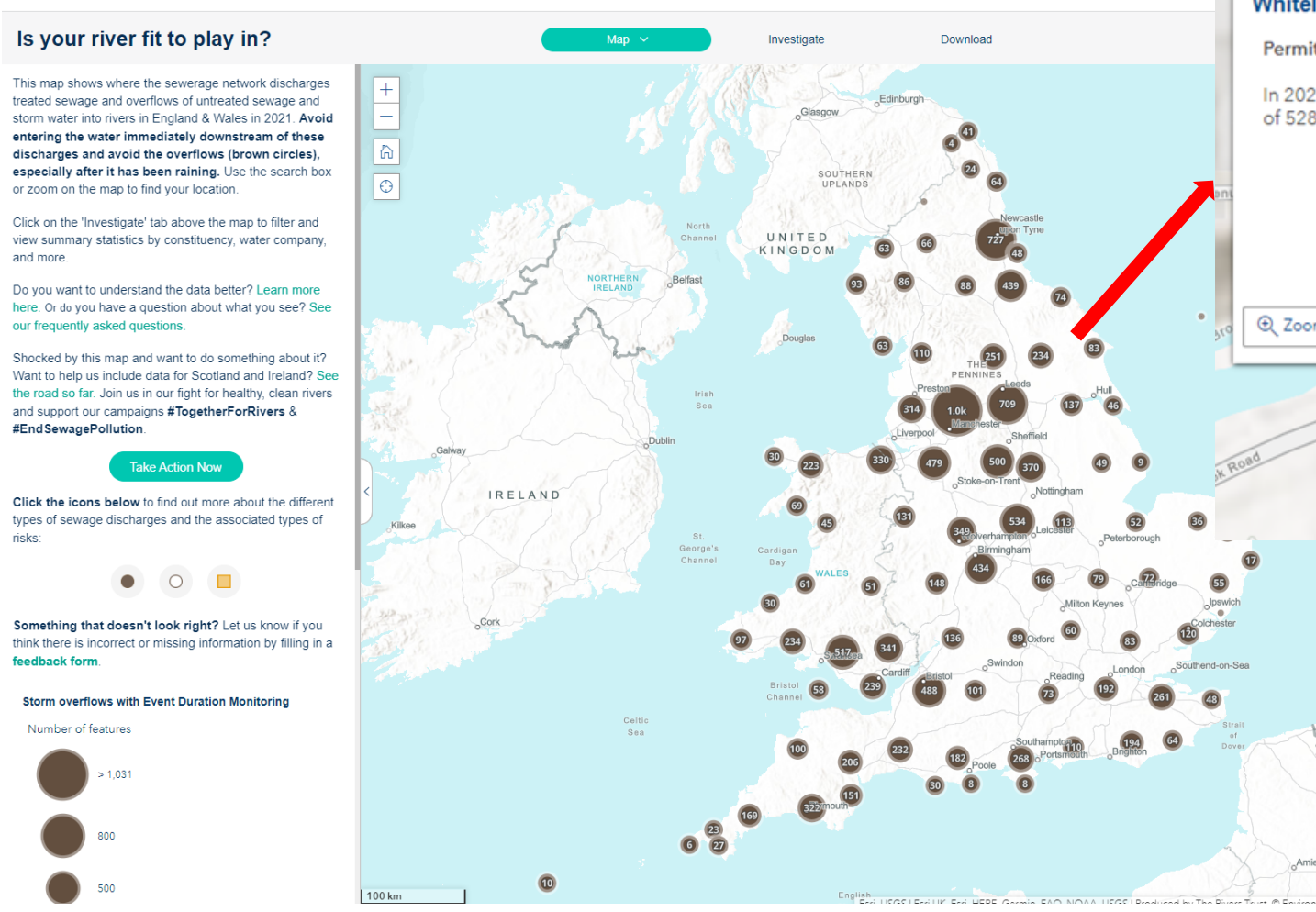
# England and Wales experiences of openly accessible CSO data



Photo by Dr J. Shucksmith

# Open CSO data: Used by NGOs

## e.g. Rivers Trust map, Surfers Against Sewage 'poo watch'



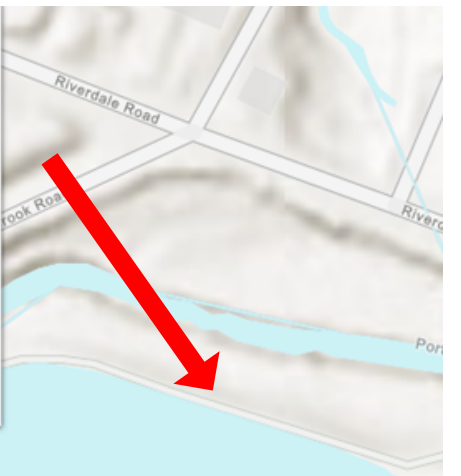
**Whiteley Woods Cso (Yorkshire Water)**

Permit number: WRA8517

In 2021, this sewer storm overflow spilled 49 times for a total of 528 hours, discharging into the Porter Brook.

**CSO in a popular public park, in 2021 spilled 49 times, 528 hours**

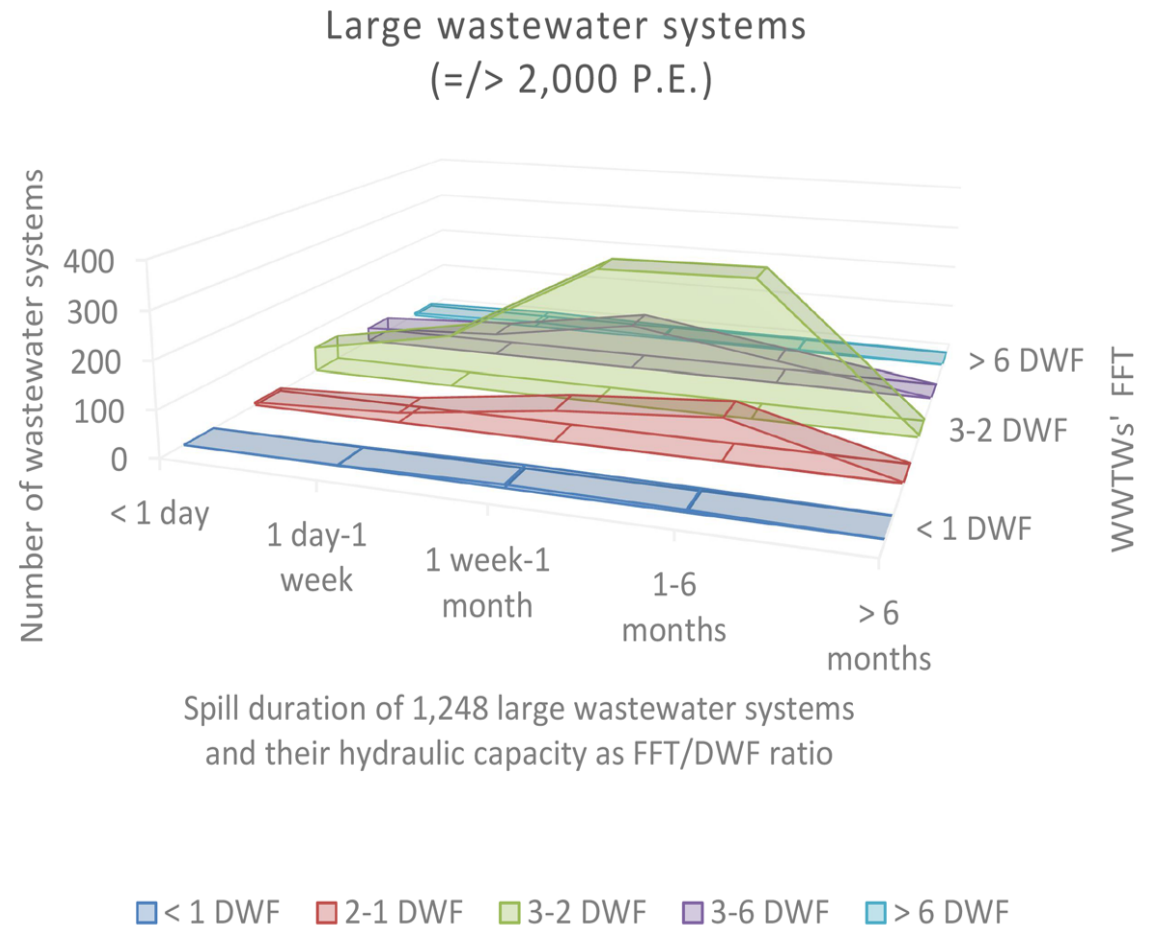
Zoom to



# Open CSO data used by researchers

Giakoumis and Vouvoulis (2023) paper:

- 82% of CSOs with max. spill duration per system are located at storm tanks and inlets of treatment works
- Chronic under-capacity of English Wastewater systems



# Open CSO data in the press



## Water firms discharged raw sewage into English waters 400,000 times last year

Data published for first time by Environment Agency shows 27% increase on previous year



Countries are legally obliged to treat sewage before it is released into waterways. Photograph by Travelarium/Alamy

<https://www.theguardian.com/environment/2021/mar/31/water-firms-discharged-raw-sewage-into-english-waters-400000-times-last-year>



## Water companies criticised for passing £10bn sewage bill on to customers

Clean water activists say industry's promise to reduce pollution should not be taken on trust



“England’s privatised water companies have paid out dividends of £2bn a year on average since they were given the utility debt free more than three decades ago. In 2022, water companies paid shareholders dividends of £1.4bn; up from £540m the previous year”

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## FEARGAL SHARKEY: The nerve of these water companies to apologise for THEIR failure and then make us pay for it!

# What else could we learn from extensive open data?

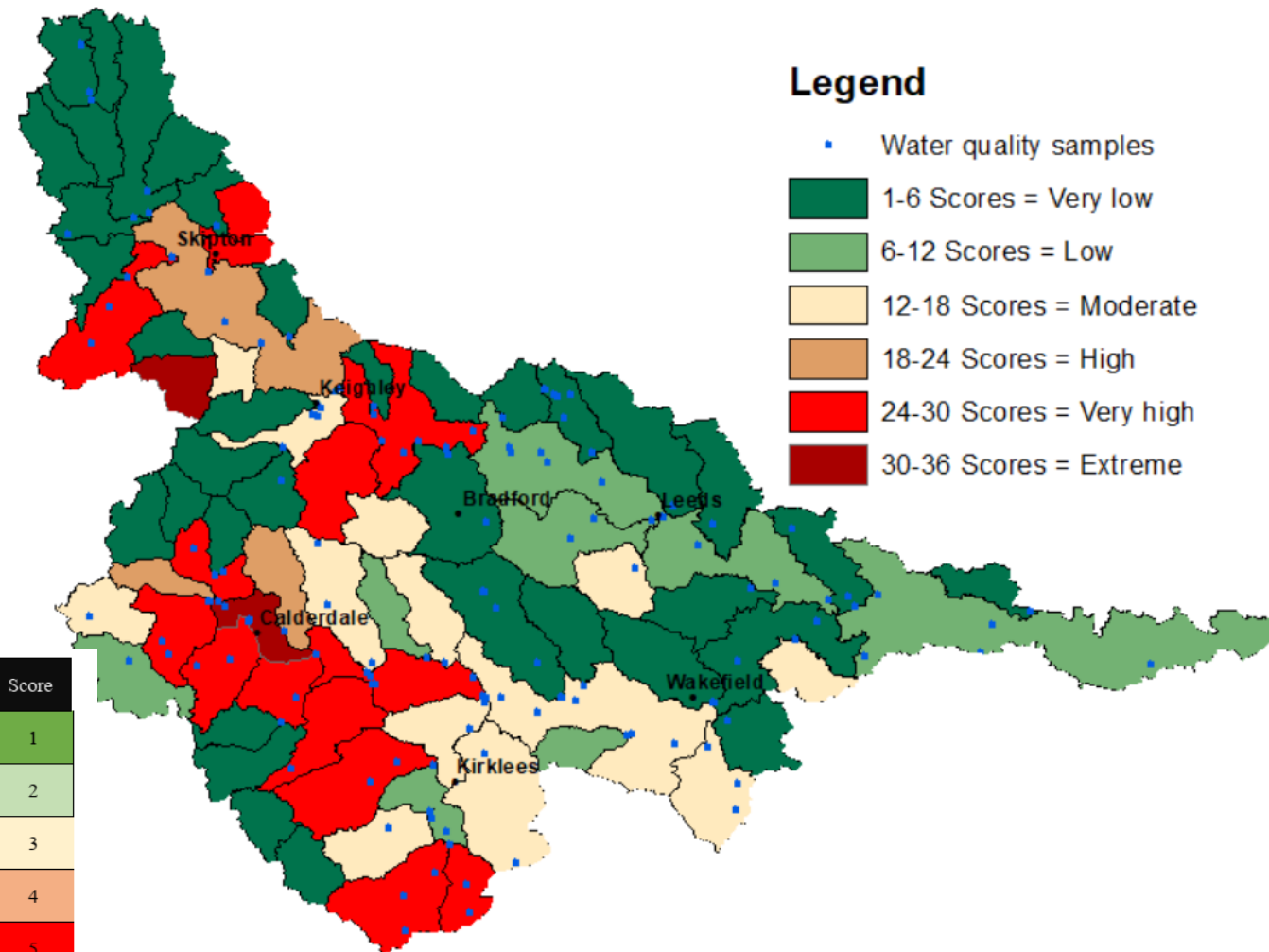
## Investigations Uni of Sheffield students

Masters dissertations Ibrahim Alyahya (2022), and Sophie Norman (2022)

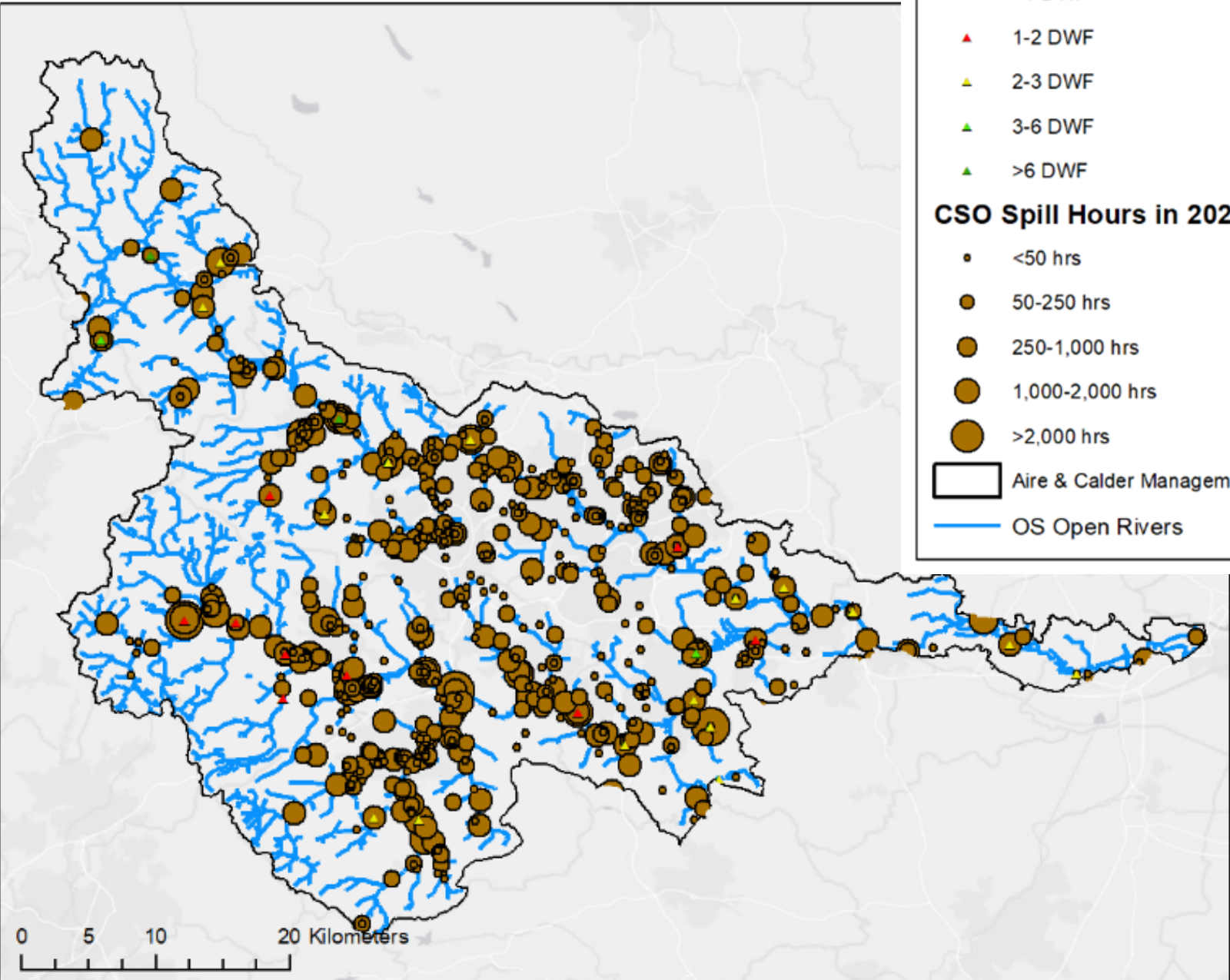
- Combine CSO-EDM data, census data, height isolines & river water body catchment (RWBC) boundaries to express CSO-EDM data in scores based on spills number & duration per 10,000 inhabitants.
- Data from 2020, Aire & Calder catchment.

CSO spill frequency	Score
0–10 CSO frequency spills per 10,000 people	1
10–40 CSO frequency spills per 10,000 people	2
40–100 CSO frequency spills per 10,000 people	3
100–200 CSO frequency spills per 10,000 people	4
200–400 CSO frequency spills per 10,000 people	5
>400 CSO frequency spills per 10,000 people	6

CSO spills duration	Score
0–100 Hours CSO spills duration per 10,000 people	1
100–200 Hours CSO spills duration per 10,000 people	2
200–400 Hours CSO spills duration per 10,000 people	3
400–800 Hours CSO spills duration per 10,000 people	4
800–1600 Hours CSO spills duration per 10,000 people	5
>1600 Hours CSO spills duration per 10,000 people	6







**Large Treatment Works Capacity**

- ▲ <1 DWF
- ▲ 1-2 DWF
- ▲ 2-3 DWF
- ▲ 3-6 DWF
- ▲ >6 DWF

**CSO Spill Hours in 2021**

- <50 hrs
- 50-250 hrs
- 250-1,000 hrs
- 1,000-2,000 hrs
- >2,000 hrs

Aire & Calder Management Catchment  
— OS Open Rivers



Combining findings from Giakoumis and Voulvoulis (2023) with CSO spill duration map & OS Open rivers map

By Archie Browne, University of Sheffield BEng student (2023)

# Discussion & Conclusions so far

- England & Wales open data highlights **quite how poorly** systems performing
- Country-wide data powerful in attracting public interest and scrutiny
- England: breakdown of trust in water utilities, scrutiny of privatisation
  
- Ongoing investigation CSO EDM data in CoUDlabs
- Need widespread evidence for higher level strategies/ideas/policy (see also Pistocchi et al. 2019 work)
- But, what spatial temporal scale data for optimal decisions/management?
- How best to regulate CSOs? Still an open question...!

# Acknowledgement



See also session D1, Philippa Mohan:  
Water quality regulatory assessment considering  
instrument measurement uncertainty

**Co-UDlabs**

COLLABORATIVE URBAN DRAINAGE  
RESEARCH LABS COMMUNITIES



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