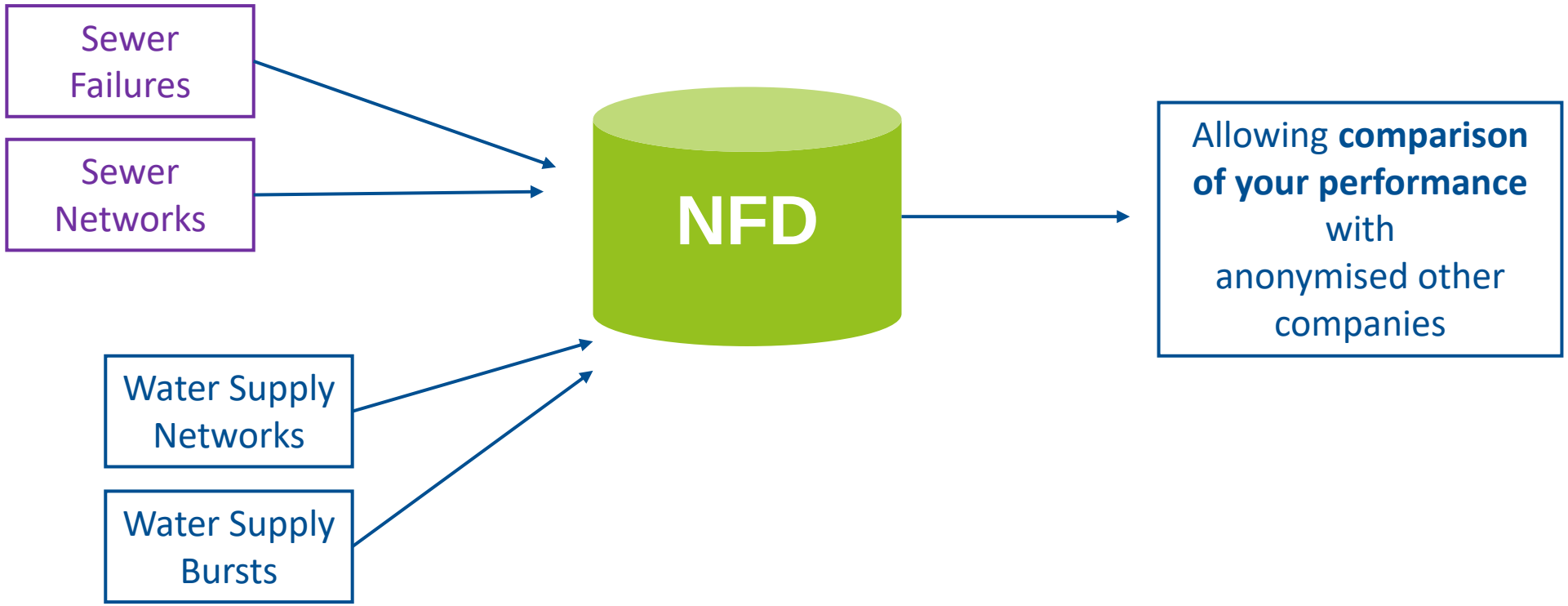
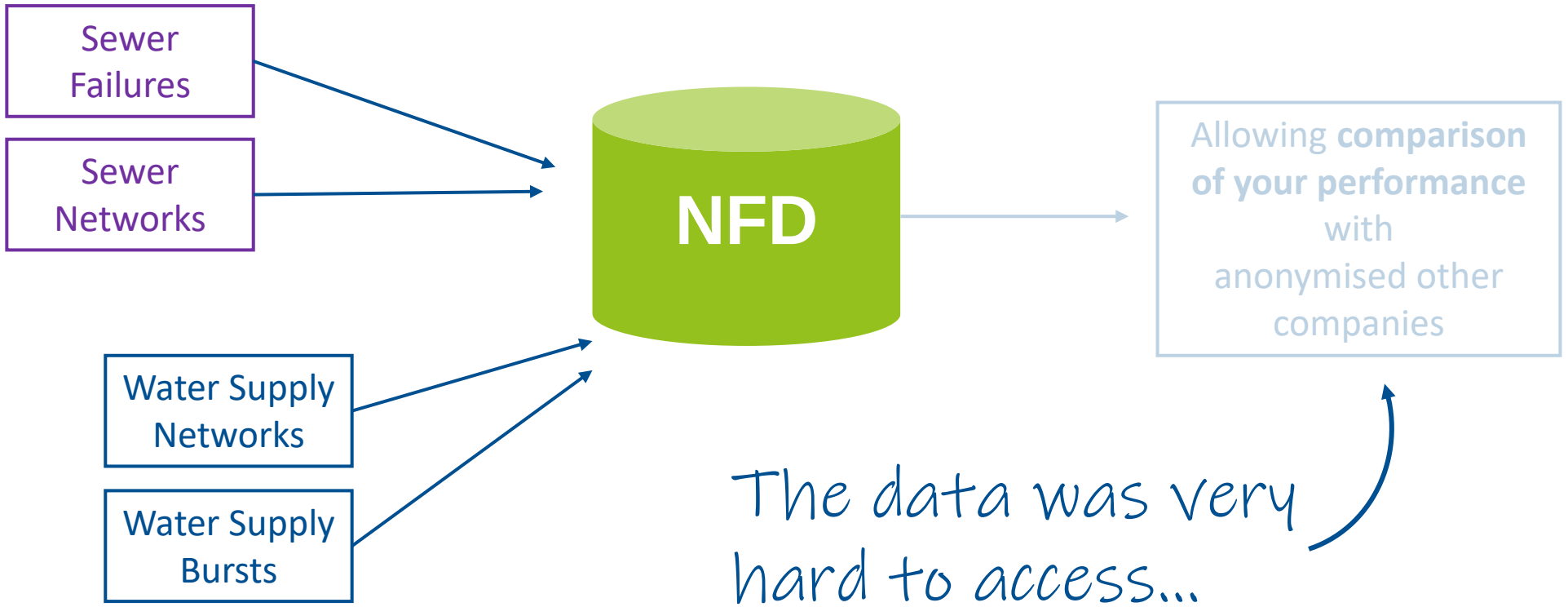
Industry Insight from the UKWIR National Failures Data Base

Dr Tim Farewell - MapleSky Ltd

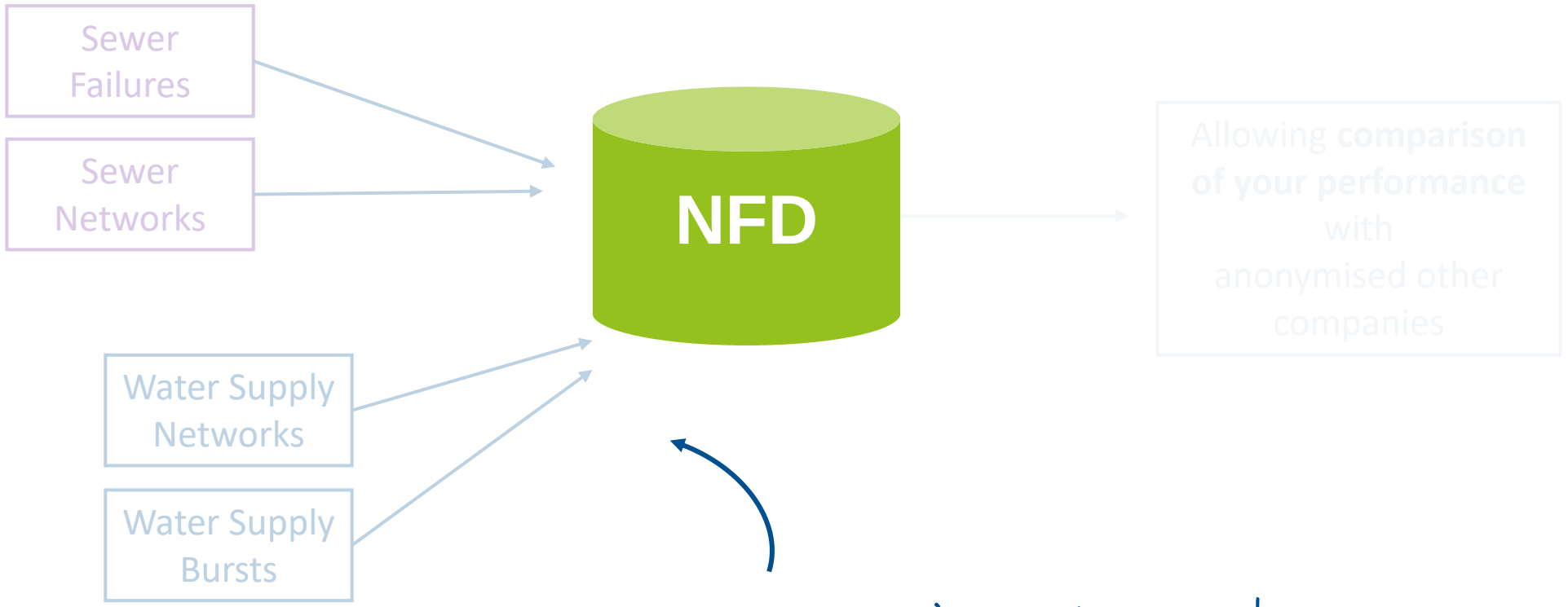
The National Failures Database (NFD)



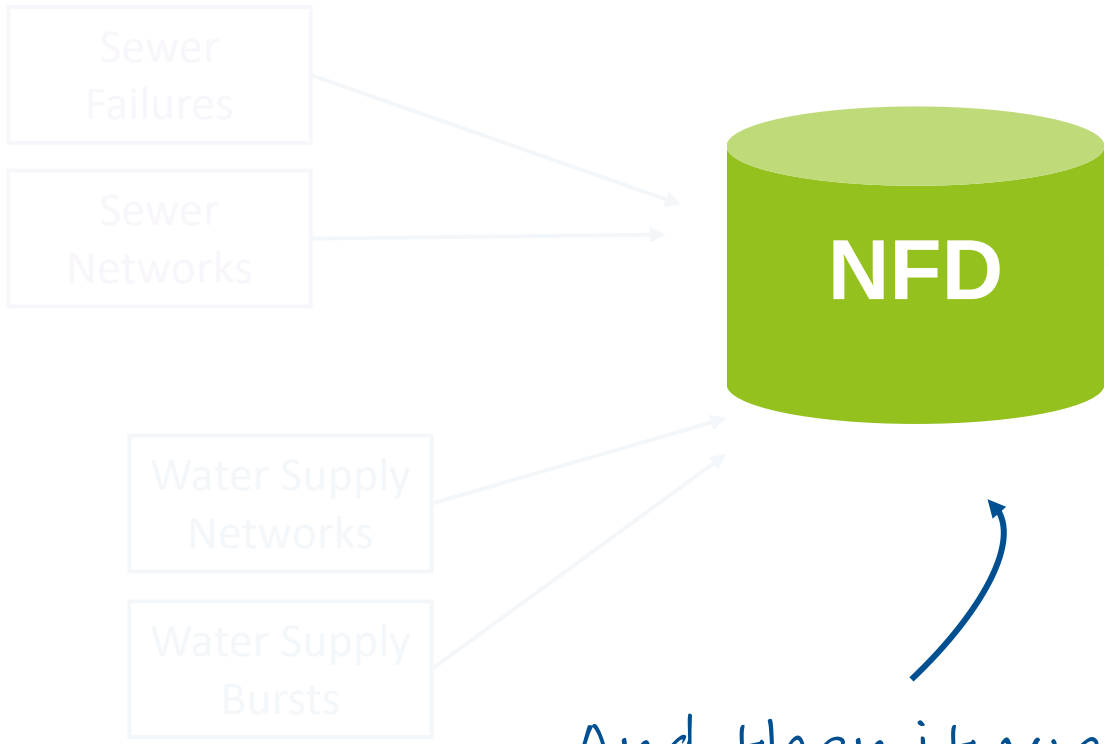
The National Failures Database (NFD)



The National Failures Database (NFD)

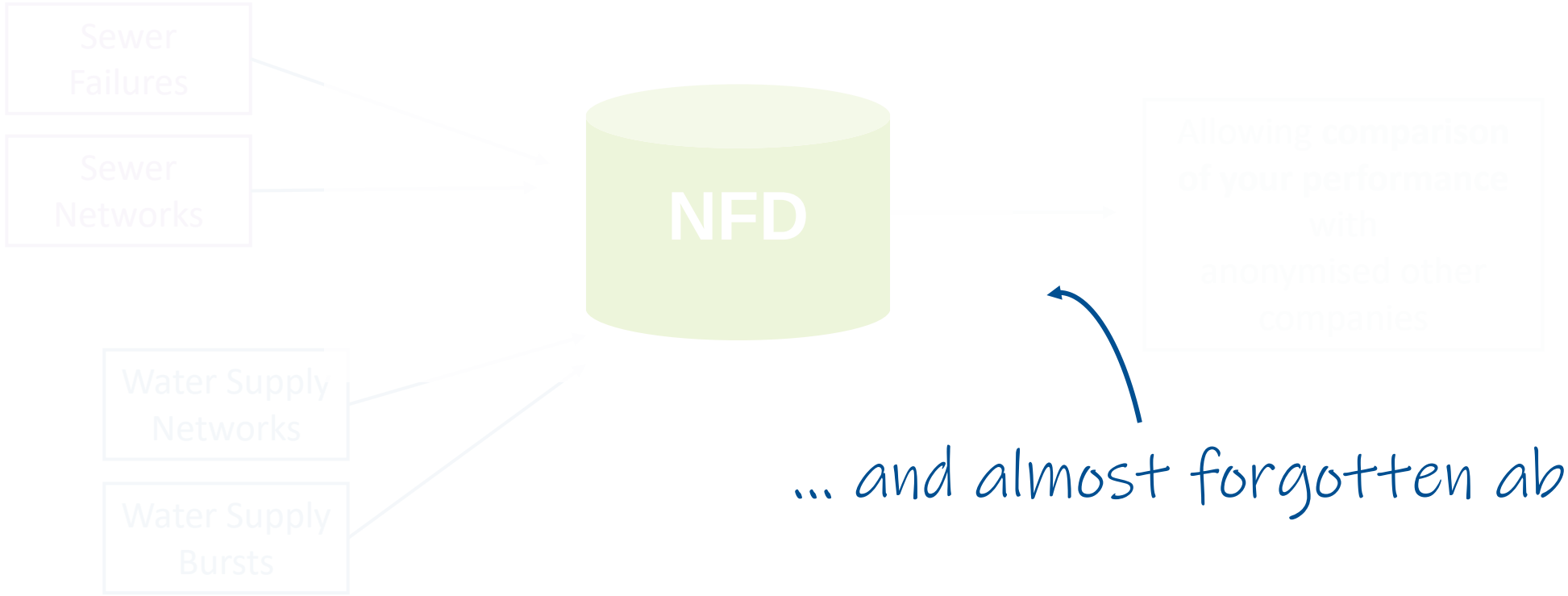


The National Failures Database (NFD)



And then it was locked away....

The National Failures Database (NFD)



But there are new challenges…

- **Zero leakage** & interruptions (Big Questions 2 & 3)
- Deteriorating assets (Big Questions 6 & 8)
- Low carbon future (Big Questions 10)

All made harder by climate change (see last year's talk)

Could a collaborative NFD help the industry?

Can we access the data?

What is even in the NFD?

What can it tell us now? (and what is possible?)

Can we make it accessible to more users?

Is this something we should rebuild?

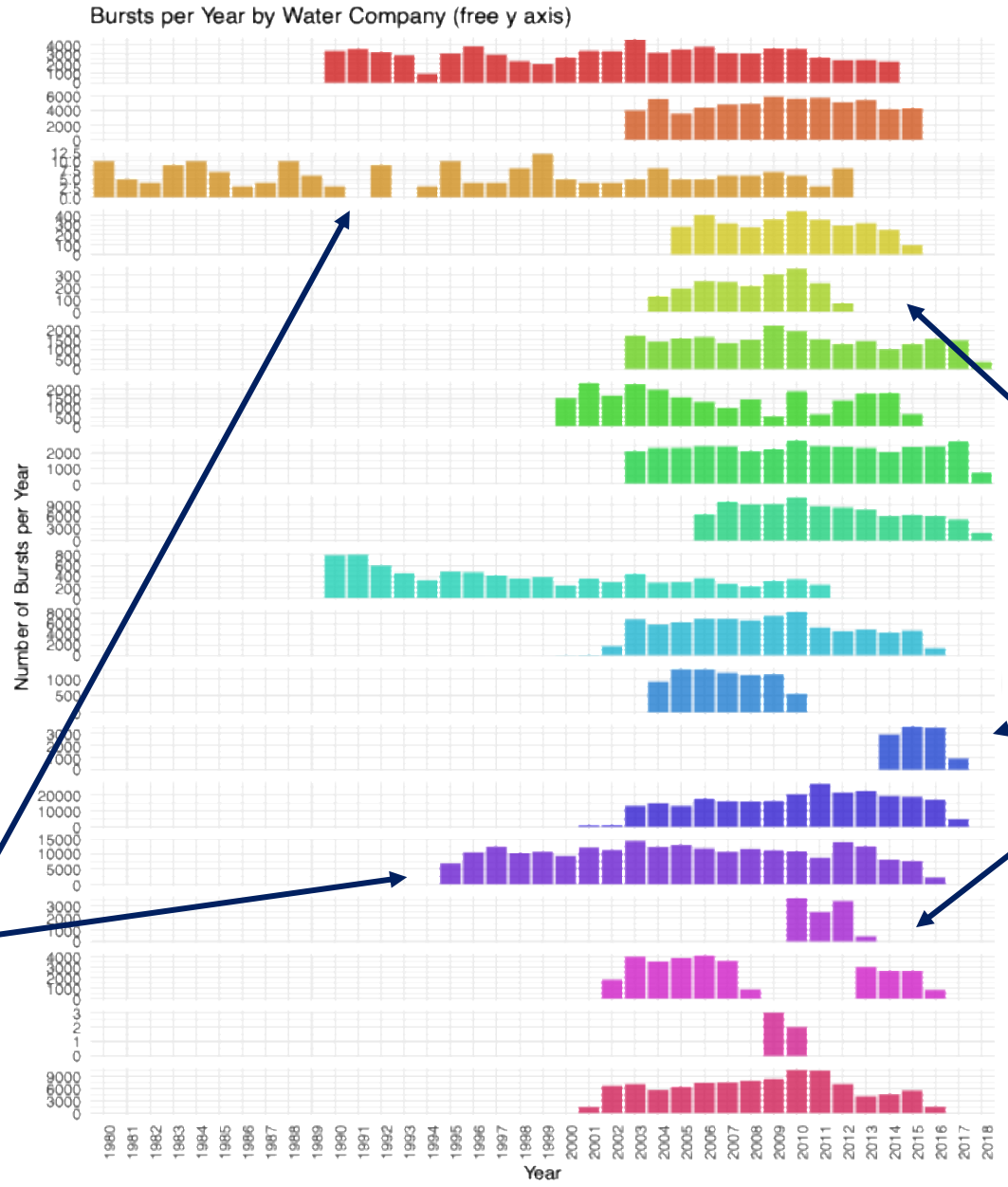
Objectives

- To complete a **review of existing database**, summarising headline facts and figures
- To **establish a series of insights** relevant to, but not limited to pipe age, material type and size
- To make use of **innovative methods and techniques to interrogate the data**
- To present the **findings of the research that are usable** across the sector
- To **recommend any key areas of development** or addition to future datasets

(0) Get the data out…

(1) Analyse and QA it…

Spatial NFD



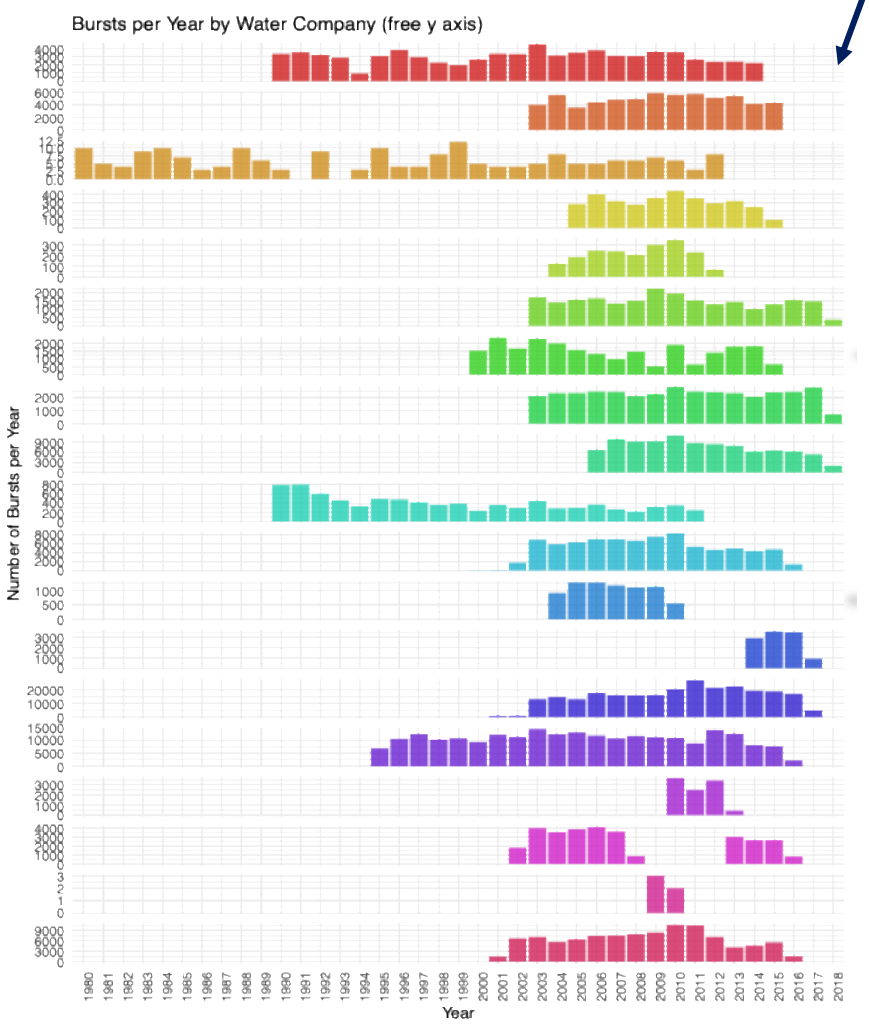
Some companies have consistently contributed data

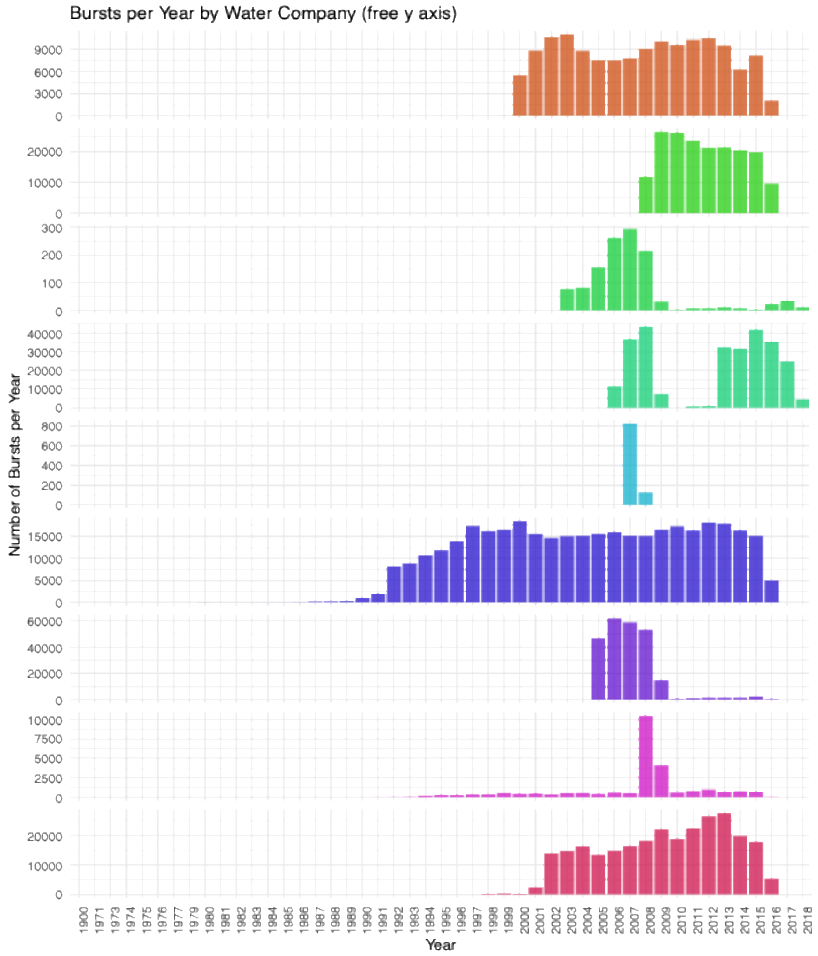
Some companies have only uploaded a few years…

(1) Analyse it…

Burst mains

Sewer Failures



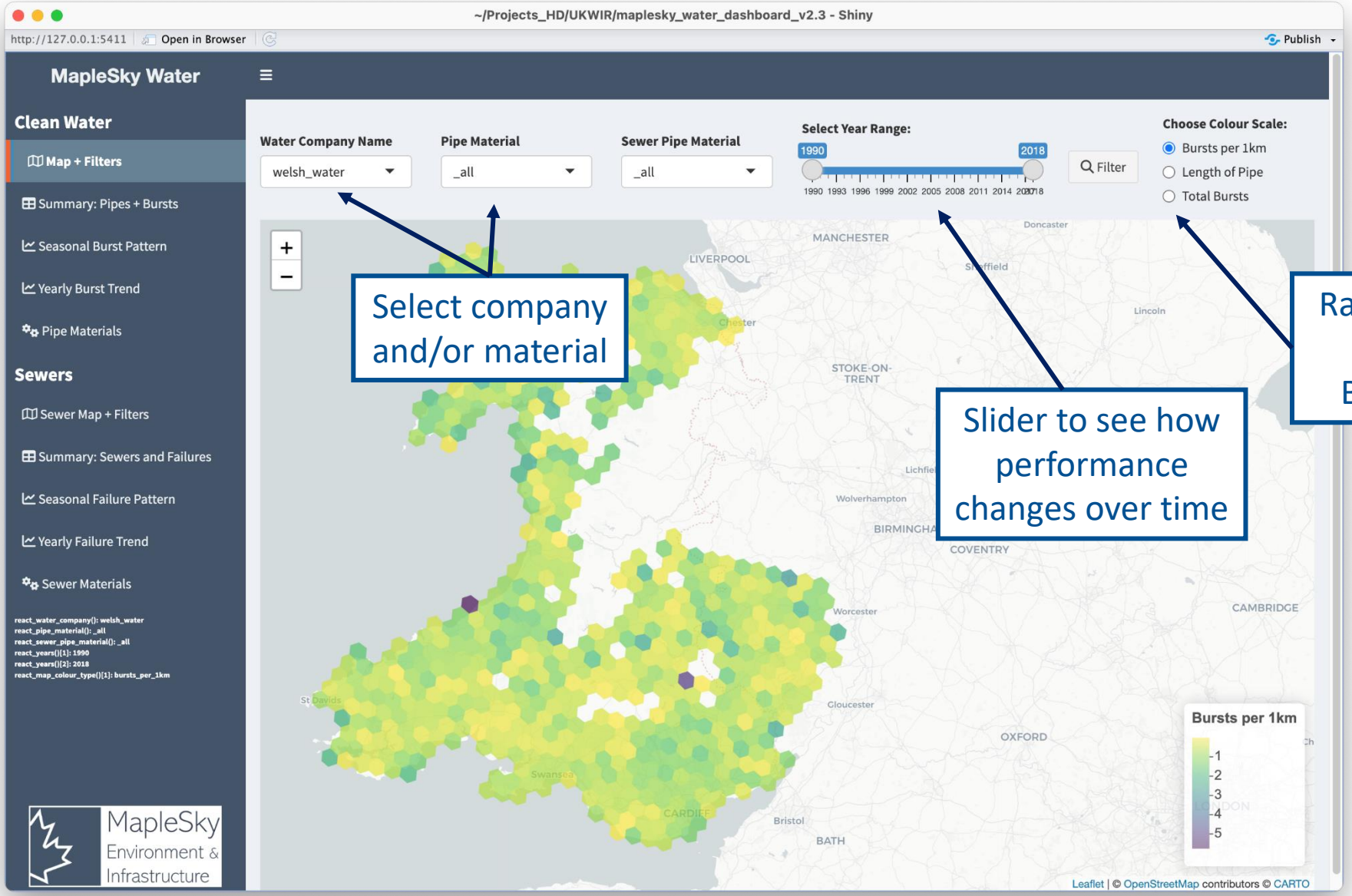


(1) Analyse it…

How complete is each column of data? (by company)

water_company_name	archived_date	company_name	date_pipe_installed	easting	evidence_of_thirdy_party_damage	evidence_of_thirdy_party_damage_name	failure_date	failure_item_id	failure_location_quality	failure_location_quality_name	failure_subtype	failure_subtype_name	failure_type	failure_type_name	failure_type_quality	failure_type_quality_name	how_found	how_found_name	imported_date	lining_type	lining_type_name	northing	pipe_diameter	pipe_diameter_data_quality	pipe_diameter_data_quality_name	pipe_diameter_type	pipe_diameter_type_name	pipe_diameter_units	pipe_diameter_units_name	pipe_id	pipe_id_quality	pipe_id_quality_name	pipe_installed_date	pipe_material	pipe_material_data_quality	pipe_material_data_quality_name	pipe_material_name	pipe_sub_material	pipe_sub_material_name	soil_corrosivity	soil_corrosivity_name	soil_fractivity	soil_fractivity_name	surface_type	surface_type_data_quality	surface_type_data_quality_name	surface_type_name	transaction_id	year_pipe_decommissioned
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	45	45	100	100	100	100	100	100	100	100	100	100	100	100	100	0.1	0	100	0.1	0.1	0.1	0	0	0	0	100	100	96	0	0.1	0.1	0.1	0.1	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100	0
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	7.9	7.9	100	100	100	100	100	100	100	100	100	100	100	100	100	0.2	0	100	0.6	0.6	0.6	0.6	0.6	0.6	0.6	100	100	0	0	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.4	0	0	0.5	0.5	0.5	0.5	100	0
	84	100	0	100	85	85	100	100	100	100	100	100	100	100	100	100	100	100	100	1.2	0.7	100	1.4	1.4	1.4	0.5	0.5	0.5	0.5	100	100	0	0	1.4	1.4	1.4	1.4	1.4	1.4	0.5	0.5	0.5	0.5	1.4	1.4	1.4	1.4	100	0
	0	100	0	100	66	66	100	100	100	100	100	100	100	100	100	100	100	100	100	0.7	0	100	14	14	14	14	14	14	14	100	100	36	0	14	14	14	14	14	14	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	100	0
	0	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	1	0	100	1	1	1	1	1	1	1	100	100	87	0	1	1	1	1	1	1	0.4	0.4	0.4	0.4	1	1	1	1	100	0
	0	100	0	100	61	61	100	100	100	100	100	100	100	100	100	100	100	100	100	0.3	0.3	100	14	15	15	15	15	15	15	100	100	100	0	15	15	15	15	15	15	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	100	0
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	0	0	100	100	100	100	0.4	0.4	100	100	100	100	100	100	100	0	0	100	0.4	0.4	0.4	0	0	0	0	100	100	0	0	0.4	0.4	0.4	0.4	0.4	0.4	0	0	0	0	0.4	0.4	0.4	0.4	100	0
	0	100	0	100	14	14	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	100	100	87	0	0.5	0.5	0.5	0.5	0.5	0.5	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0.1	0.3	0.3	0	0	0	0	100	100	0	0	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.1	0.3	0.3	0.3	0.3	100	0
	0	100	0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	92	100	100	0	14	14	14	14	14	14	14	14	14	14	14	14	14	14	100	0
	4.3	100	0	100	45	45	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0.4	9.5	9.5	4.8	4.8	4.8	4.8	100	100	100	0	9.5	9.5	9.5	9.5	9.5	9.5	0	0	0	0	9.5	9.5	9.5	9.5	100	0
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	0	0	0	0	0	0	0	100	100	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	2.3	2.3	2.3	2.3	2.3	2.3	2.3	100	100	100	0	2.3	2.3	2.3	2.3	2.3	2.3	0	0	0	0	0	0	0	0	100	0
	0	100	0	100	70	70	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	1.5	1.5	1.5	0.1	0.1	0.1	0.1	100	100	0	0	1.5	1.5	1.5	1.5	1.5	1.3	1.1	1.1	1.1	1.1	1.5	1.5	1.5	1.5	100	0
	0	100	0	100	0	0	100	100	100	100	100	100	100	100	100	100	100	100	100	0	0	100	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	0	0	0	0	100	100	100	100	100	0
	23	100	0	100	38	38	100	100	93	93	100	100	100	100	100	100	100	100	100	0.8	0	100	2.1	2.2	2.2	1.3	1.3	1.3	1.3	100	100	100	0	2.2	2.2	2.2	2.2	2.2	2.2	0	0	0	0	0.9	0.9	0.9	0.9	100	0

(2) “Art of the possible” dashboard

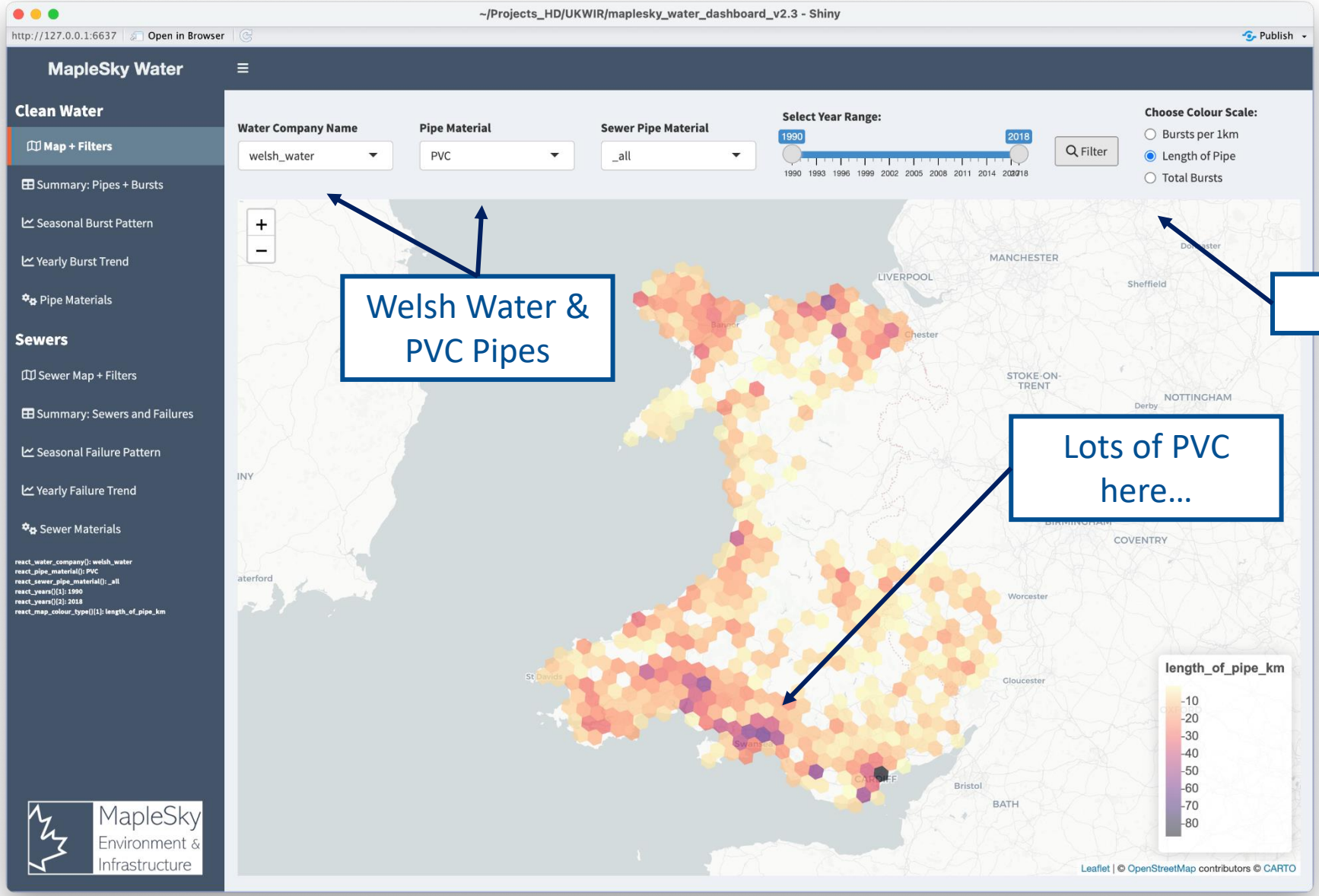


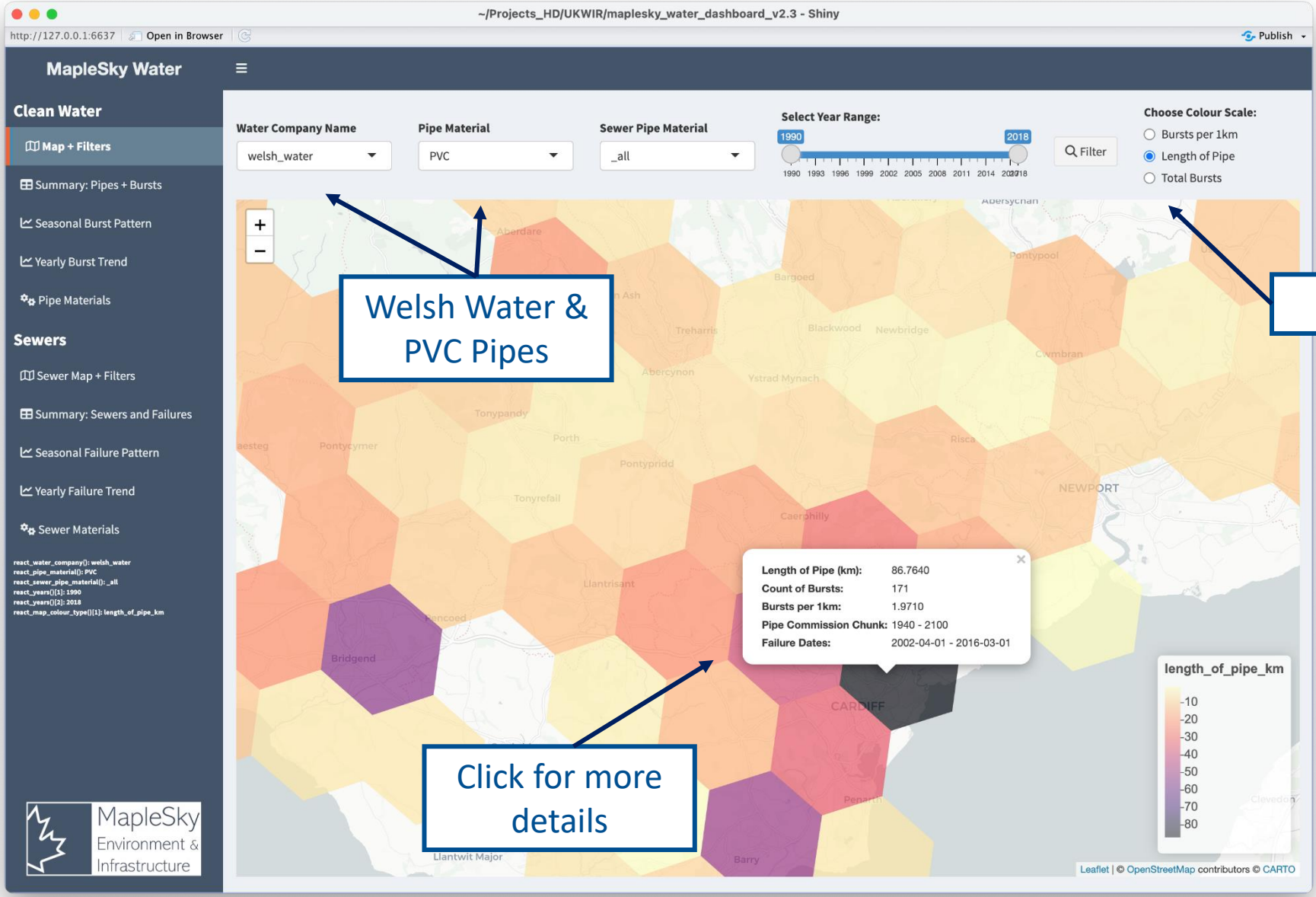
Suite of analytical tools for water supply and sewers

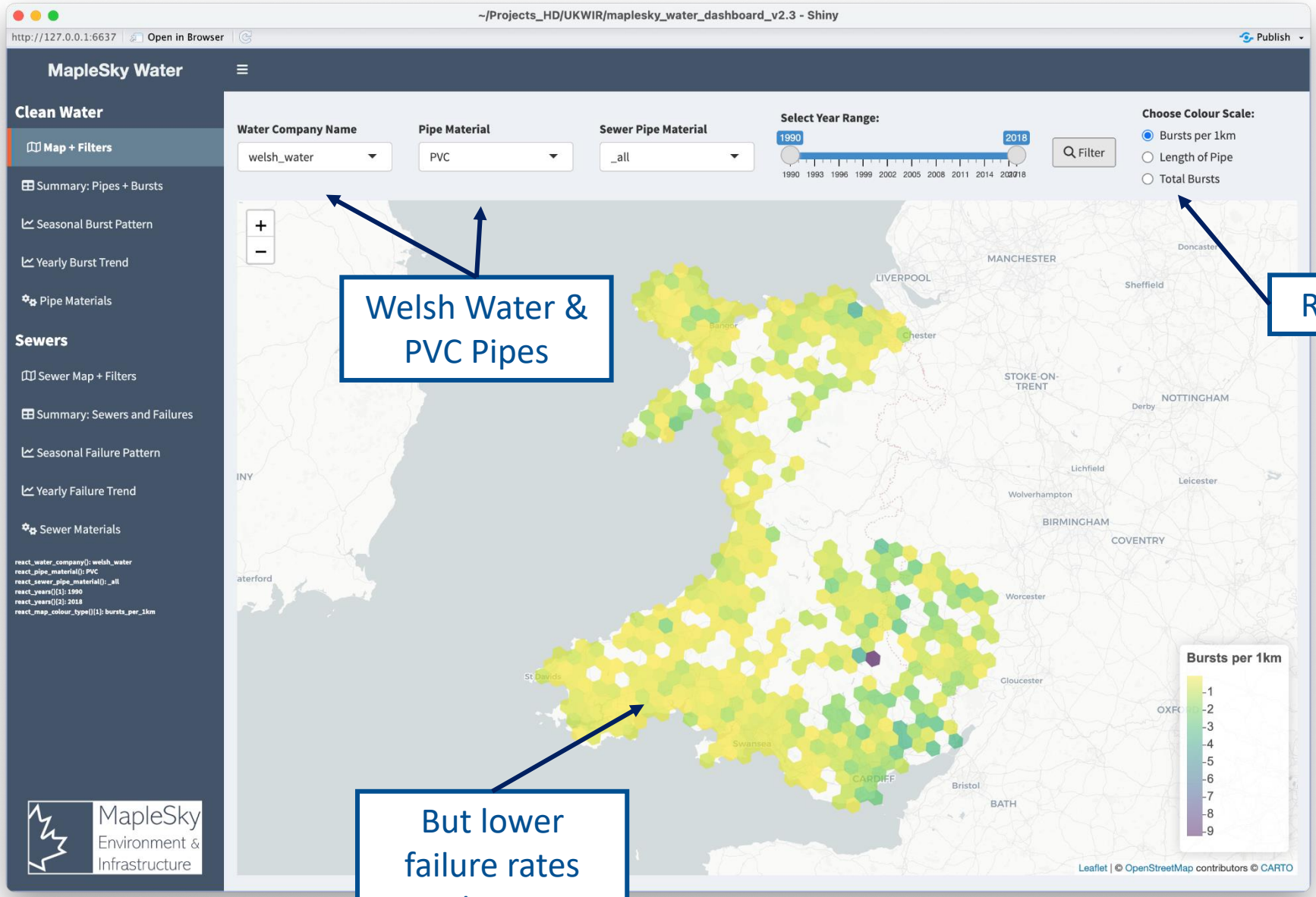
Select company and/or material

Slider to see how performance changes over time

Rate of failure, Length or Burst Count


~/Projects_HD/UKWIR/maplesky_water_dashboard_v2.3 - Shiny
http://127.0.0.1:6637
Open in Browser
Publish
MapleSky Water
Clean Water
Map + Filters
Summary: Pipes + Bursts
Seasonal Burst Pattern
Yearly Burst Trend
Pipe Materials
Sewers
Sewer Map + Filters
Summary: Sewers and Failures
Seasonal Failure Pattern
Yearly Failure Trend
Sewer Materials
react_water_company(): welsh_water
react_pipe_material(): PVC
react_sewer_pipe_material(): _all
react_years()[1]: 1990
react_years()[2]: 2018
react_map_colour_type()[1]: length_of_pipe_km
Water Company Name
welsh_water
Pipe Material
PVC
Sewer Pipe Material
_all
Select Year Range:
1990
2018
1990 1993 1996 1999 2002 2005 2008 2011 2014 2018
Filter
Choose Colour Scale:
Bursts per 1km
Length of Pipe
Total Bursts
Welsh Water & PVC Pipes
Length
Lots of PVC here…
MANCHESTER
LIVERPOOL
Sheffield
Chester
STOKE-ON-TRENT
NOTTINGHAM
Derby
COVENTRY
Worcester
Gloucester
Bristol
BATH
length_of_pipe_km
10
20
30
40
50
60
70
80
Leaflet | © OpenStreetMap contributors © CARTO
MapleSky Environment & Infrastructure

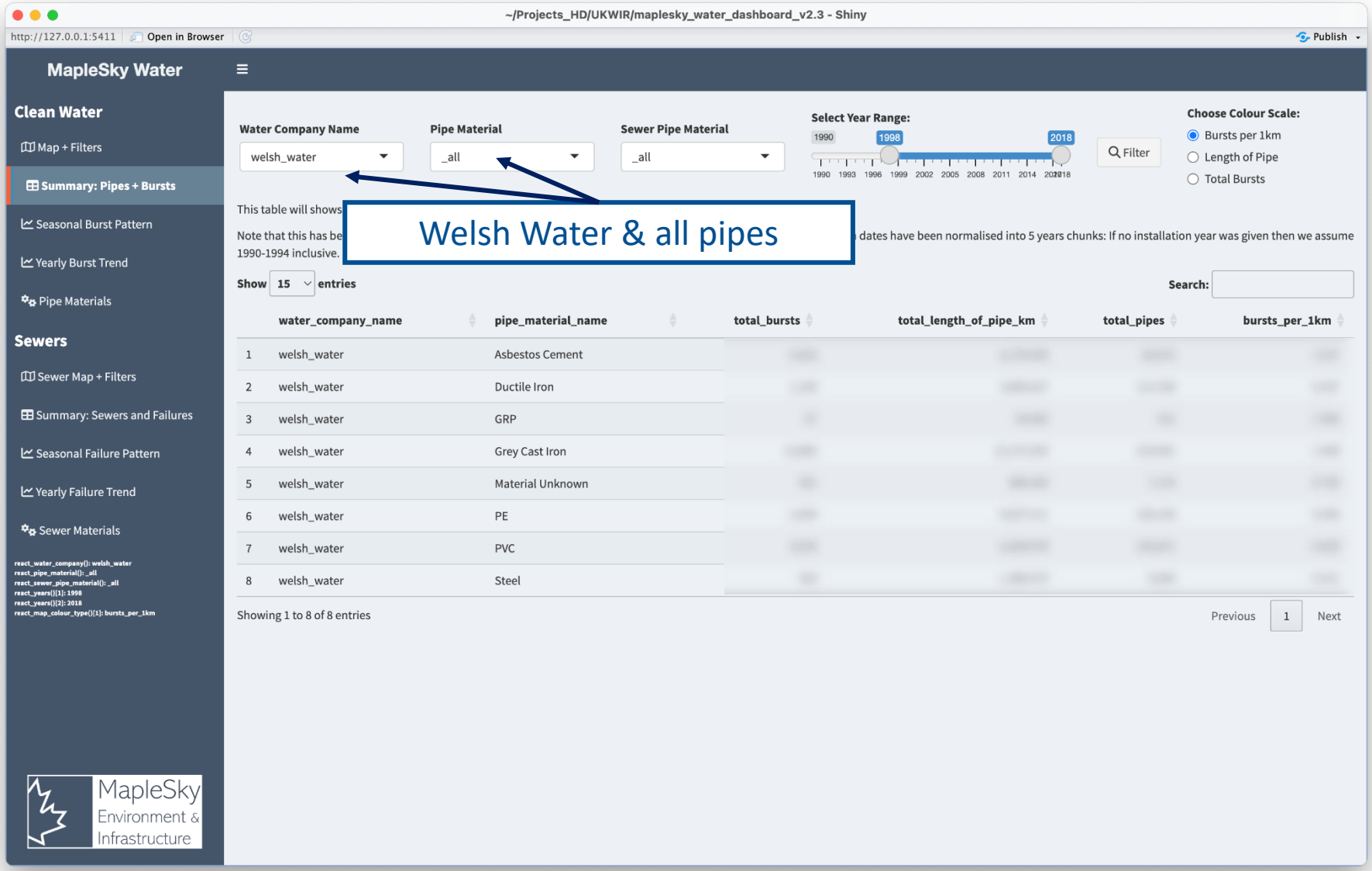

~/Projects_HD/UKWIR/maplesky_water_dashboard_v2.3 - Shiny
http://127.0.0.1:6637
Open in Browser
Publish
MapleSky Water
Clean Water
Map + Filters
Summary: Pipes + Bursts
Seasonal Burst Pattern
Yearly Burst Trend
Pipe Materials
Sewers
Sewer Map + Filters
Summary: Sewers and Failures
Seasonal Failure Pattern
Yearly Failure Trend
Sewer Materials
react_water_company(): welsh_water
react_pipe_material(): PVC
react_sewer_pipe_material(): _all
react_years()[1]: 1990
react_years()[2]: 2018
react_map_colour_type()[1]: length_of_pipe_km
Water Company Name
welsh_water
Pipe Material
PVC
Sewer Pipe Material
_all
Select Year Range:
1990
2018
Filter
Choose Colour Scale:
Bursts per 1km
Length of Pipe
Total Bursts
Welsh Water & PVC Pipes
Length
Length of Pipe (km): 86.7640
Count of Bursts: 171
Bursts per 1km: 1.9710
Pipe Commission Chunk: 1940 - 2100
Failure Dates: 2002-04-01 - 2016-03-01
Click for more details
length_of_pipe_km
10
20
30
40
50
60
70
80
Leaflet | © OpenStreetMap contributors © CARTO
MapleSky Environment & Infrastructure



Welsh Water & PVC Pipes

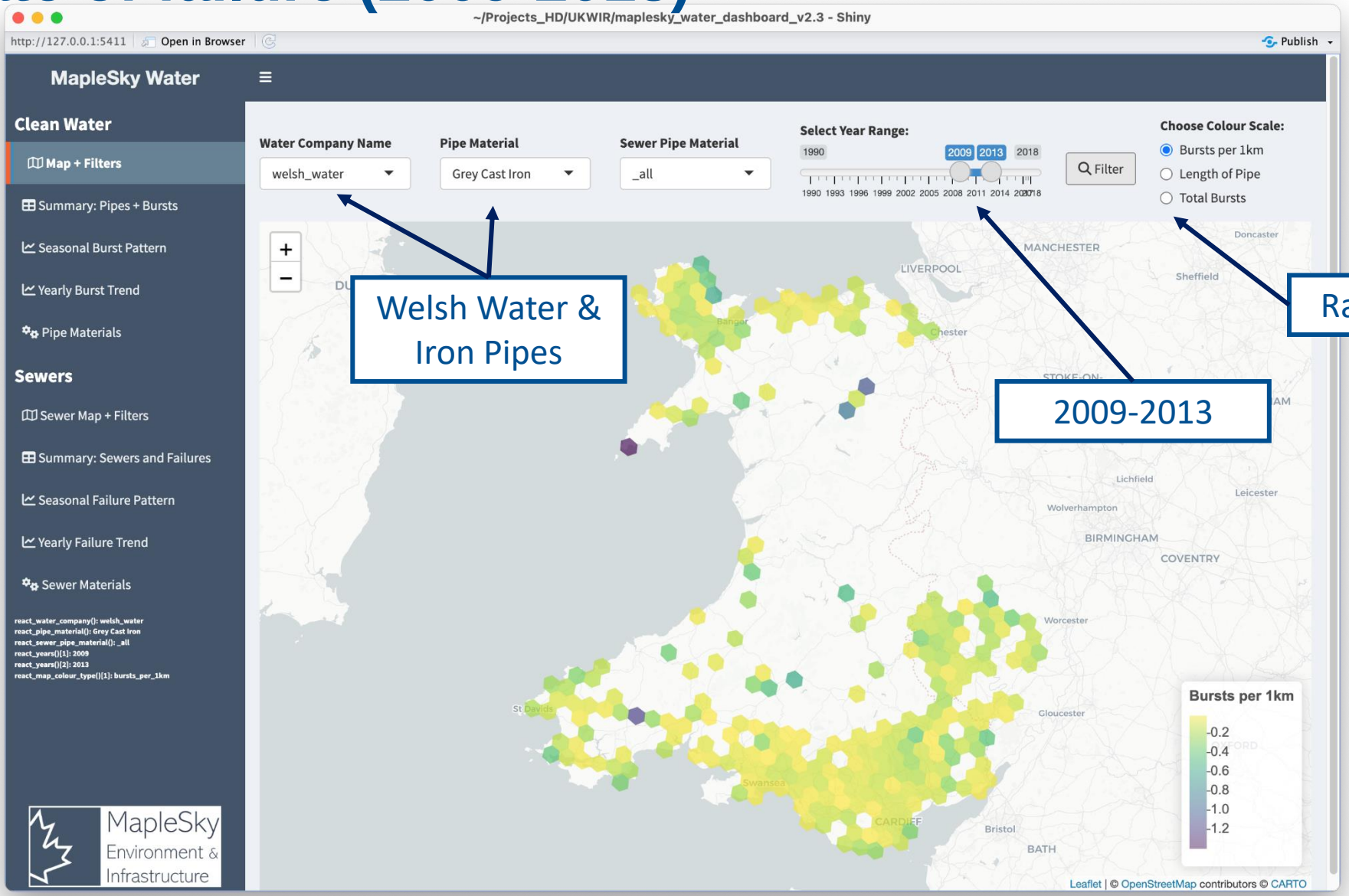
Rate of failure

But lower failure rates near the coast…



Linked table can be sorted

Rate of failure (2009-2013)

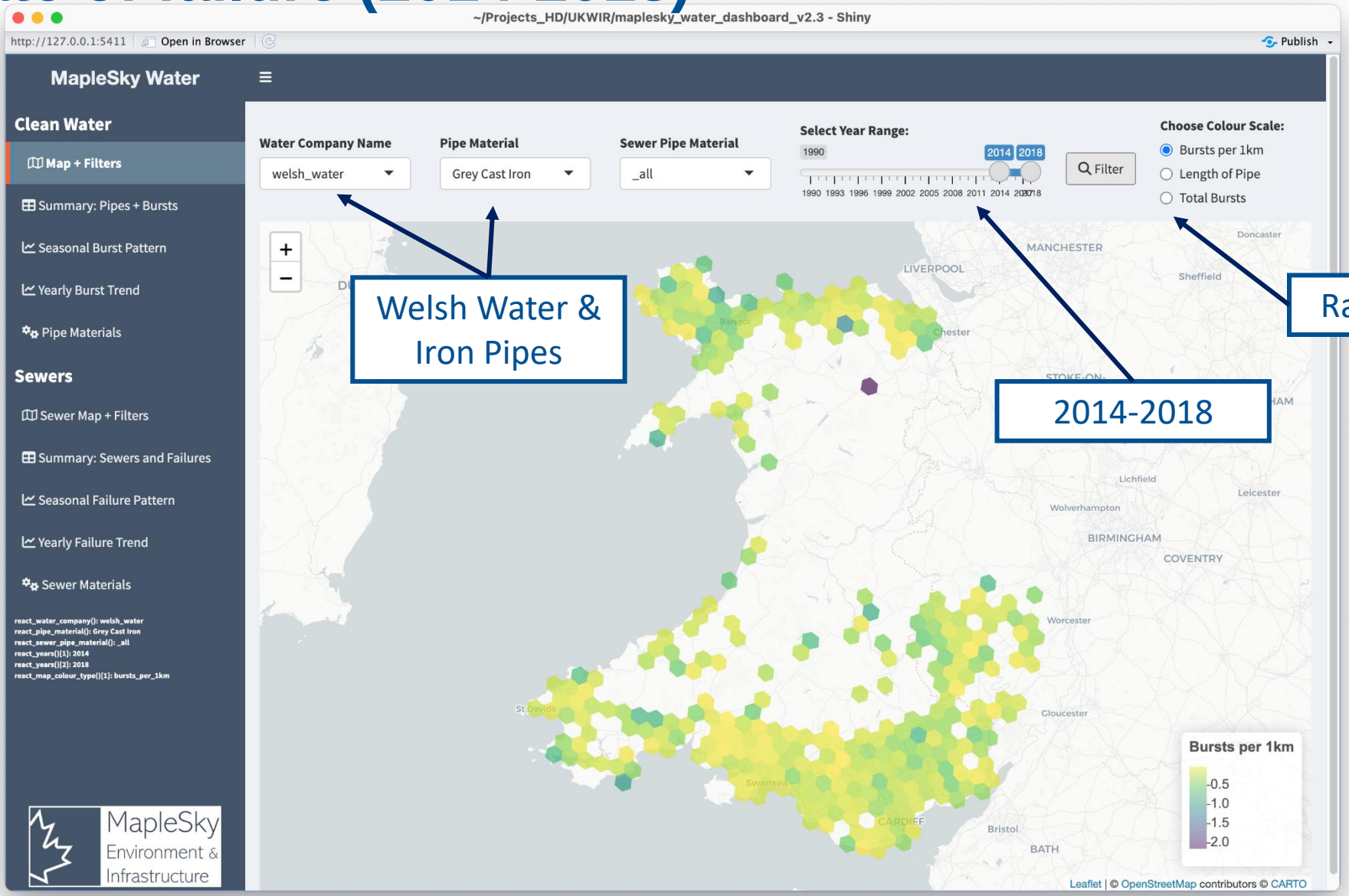


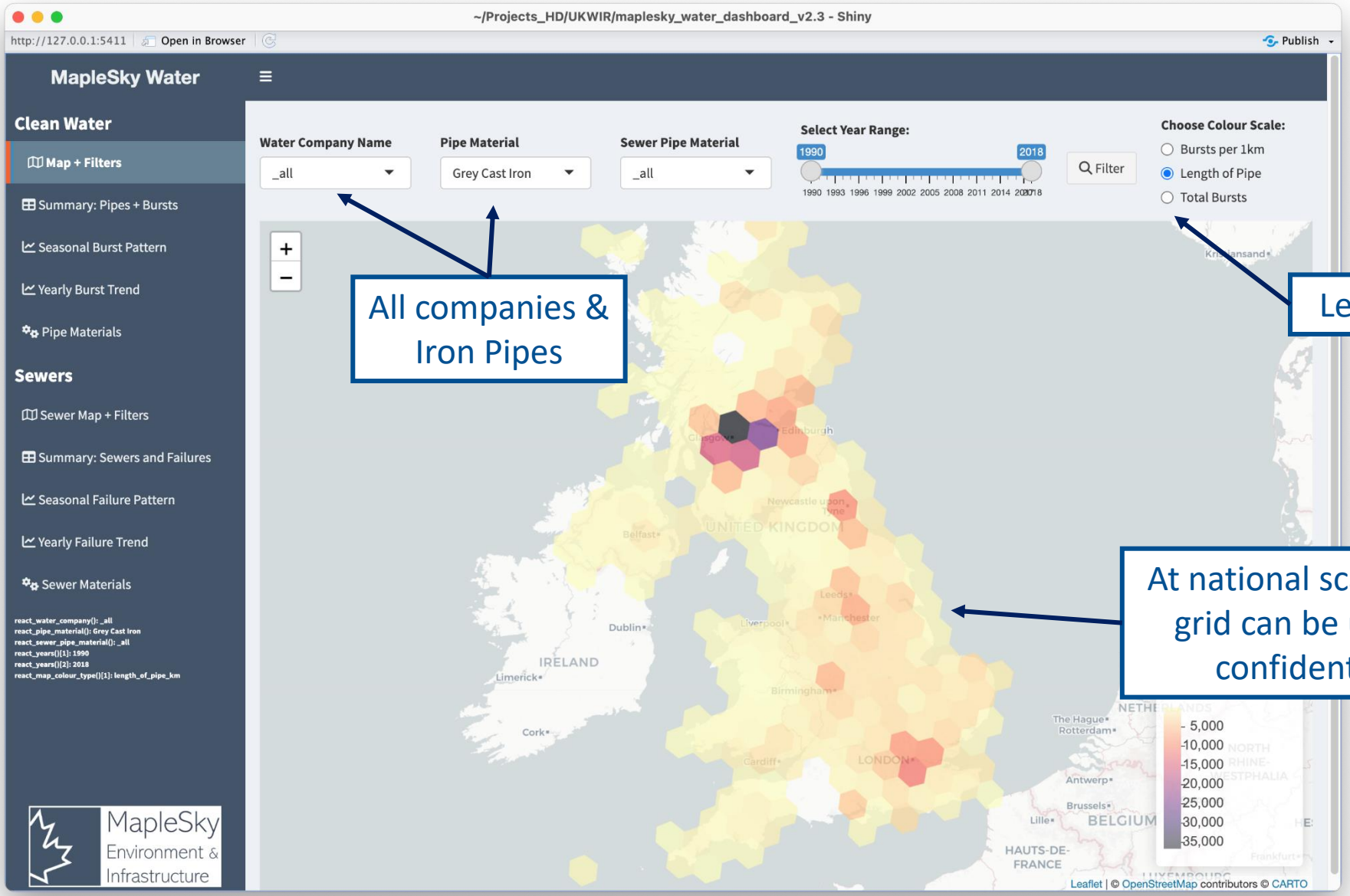
Welsh Water & Iron Pipes

2009-2013

Rate of failure

Rate of failure (2014-2018)

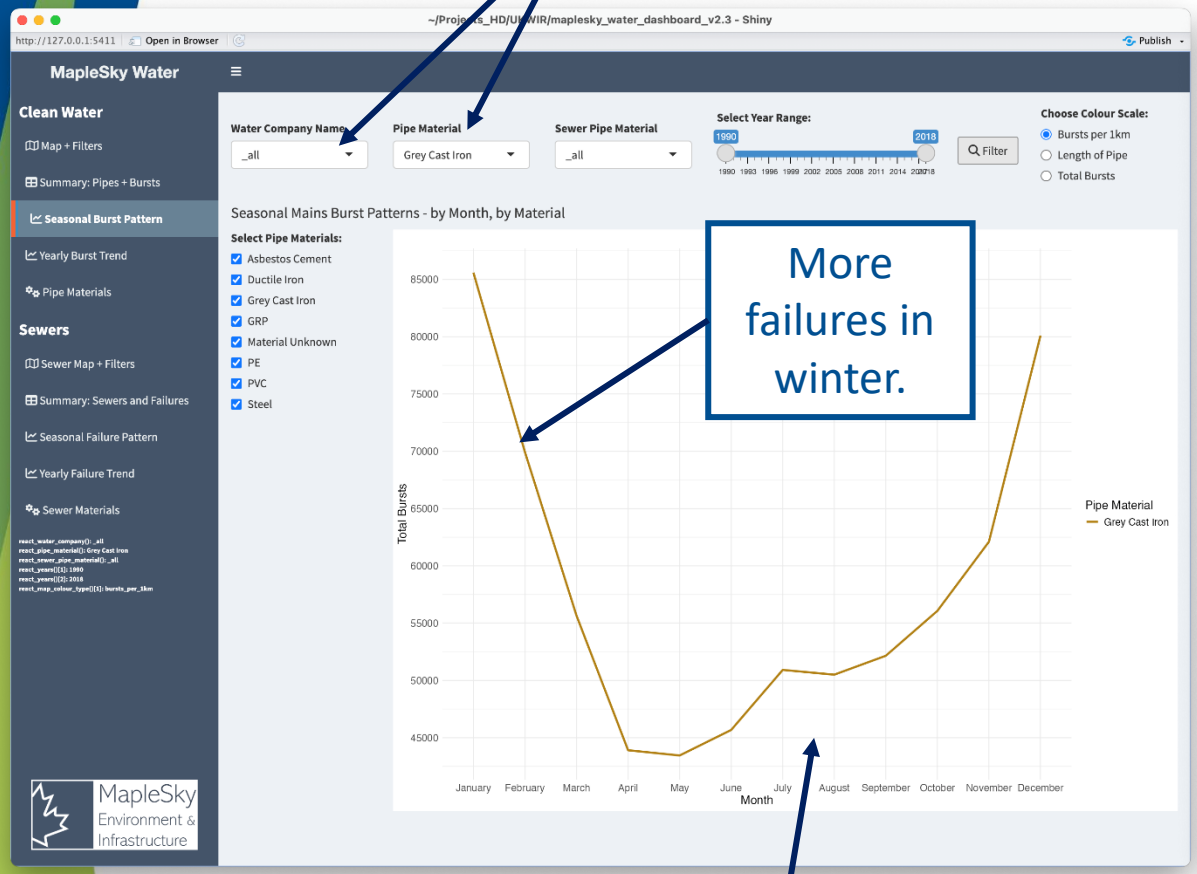




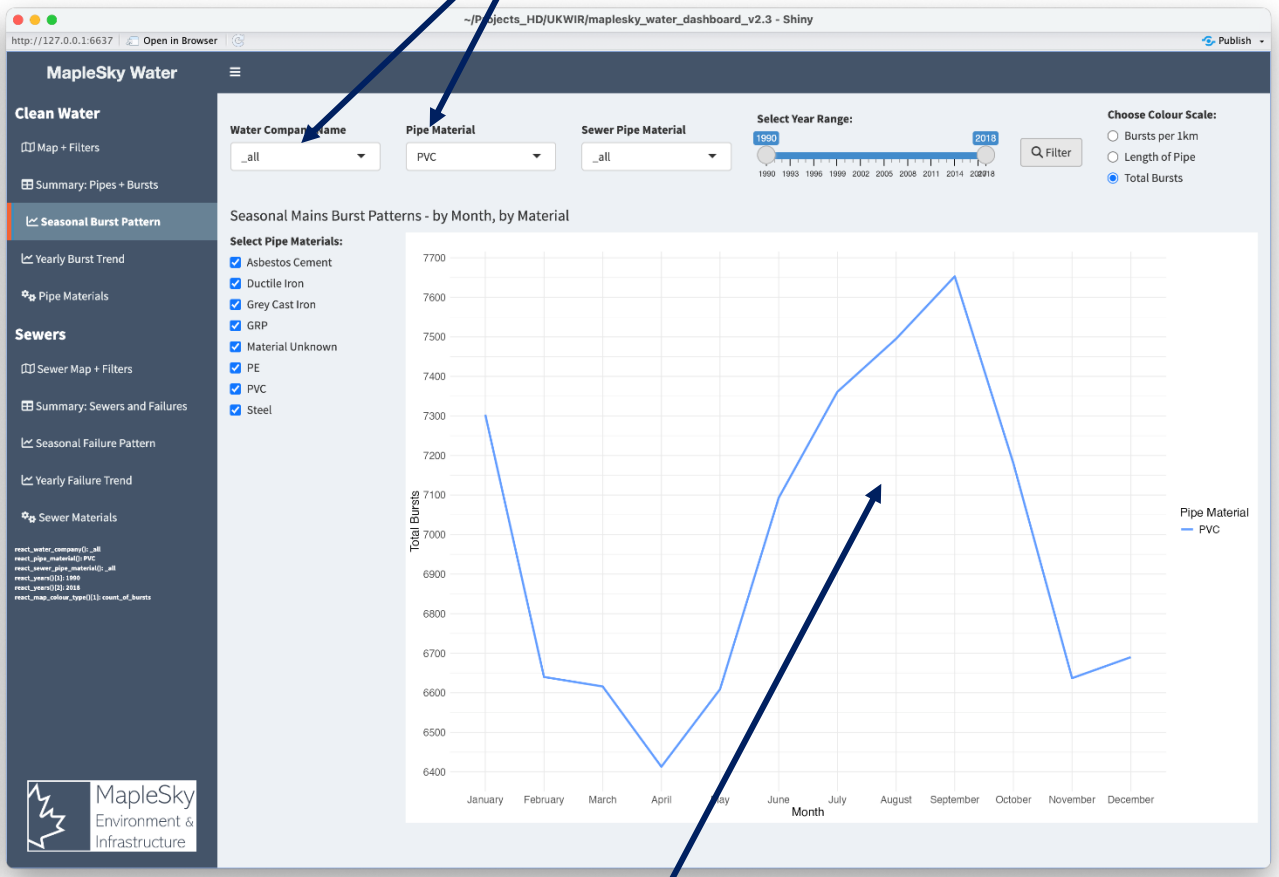
MapleSky Environment & Infrastructure

All companies & Iron Pipes

All companies & PVC Pipes



More failures in winter.

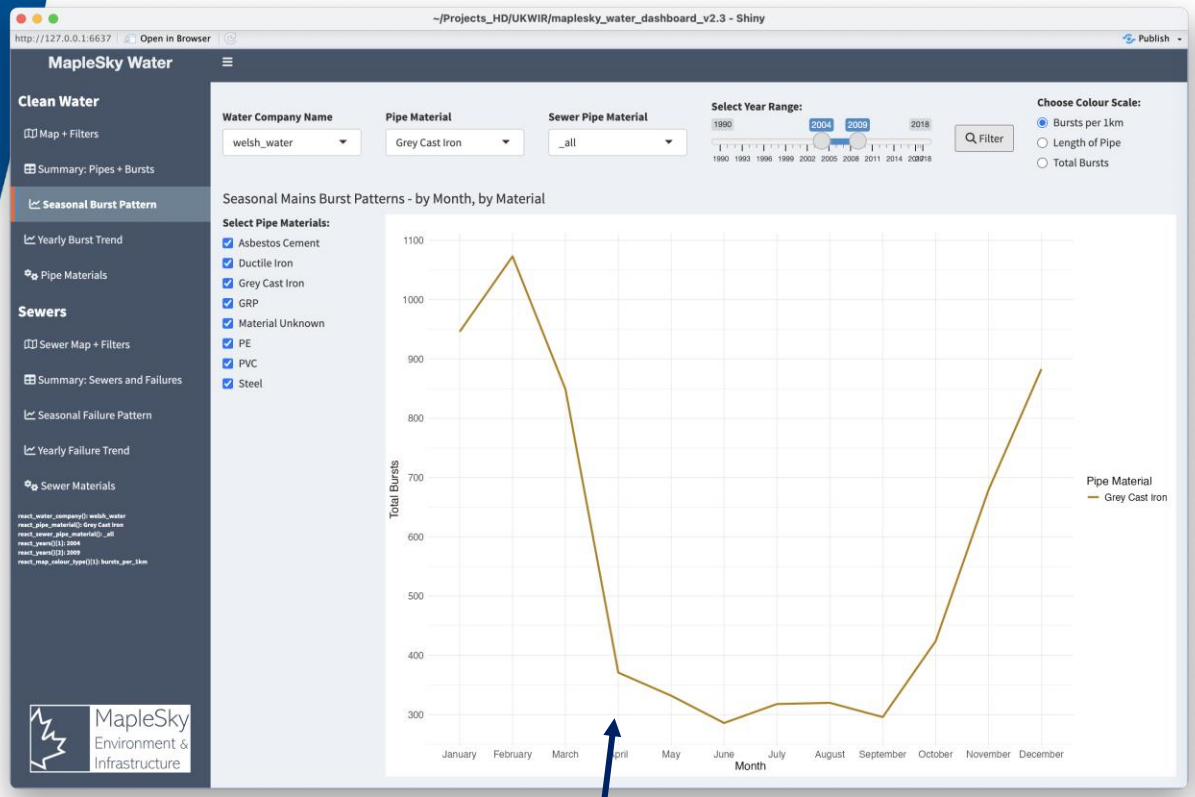


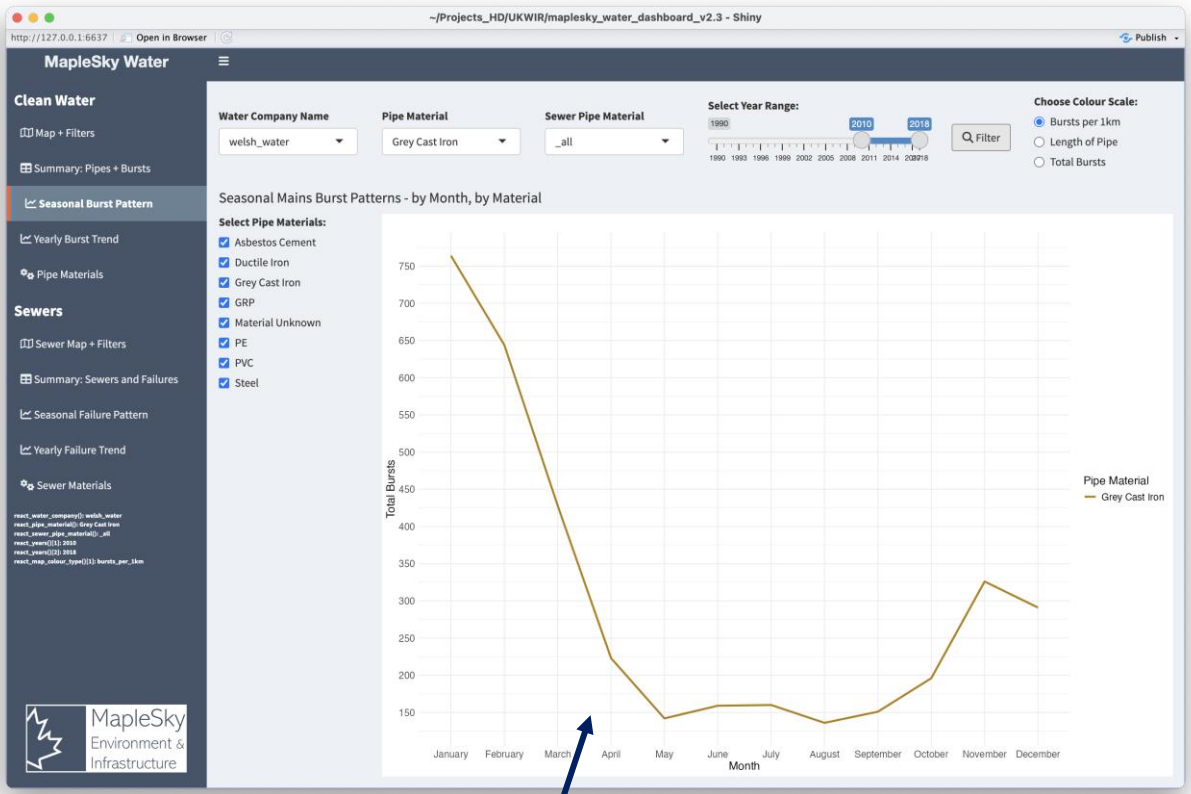
Iron: Small peak in summer

PVC: Large peak in summer

MapleSky Environment & Infrastructure

Compare failure patterns through time



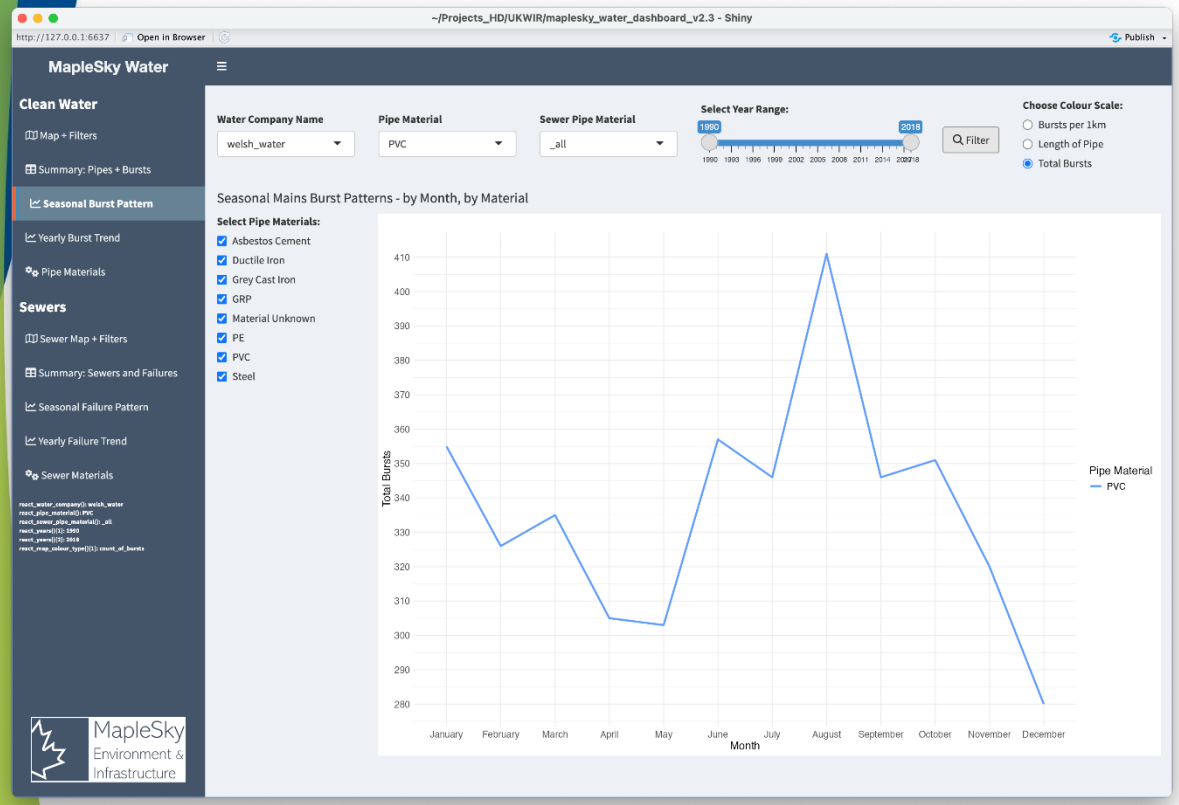


2004-2009

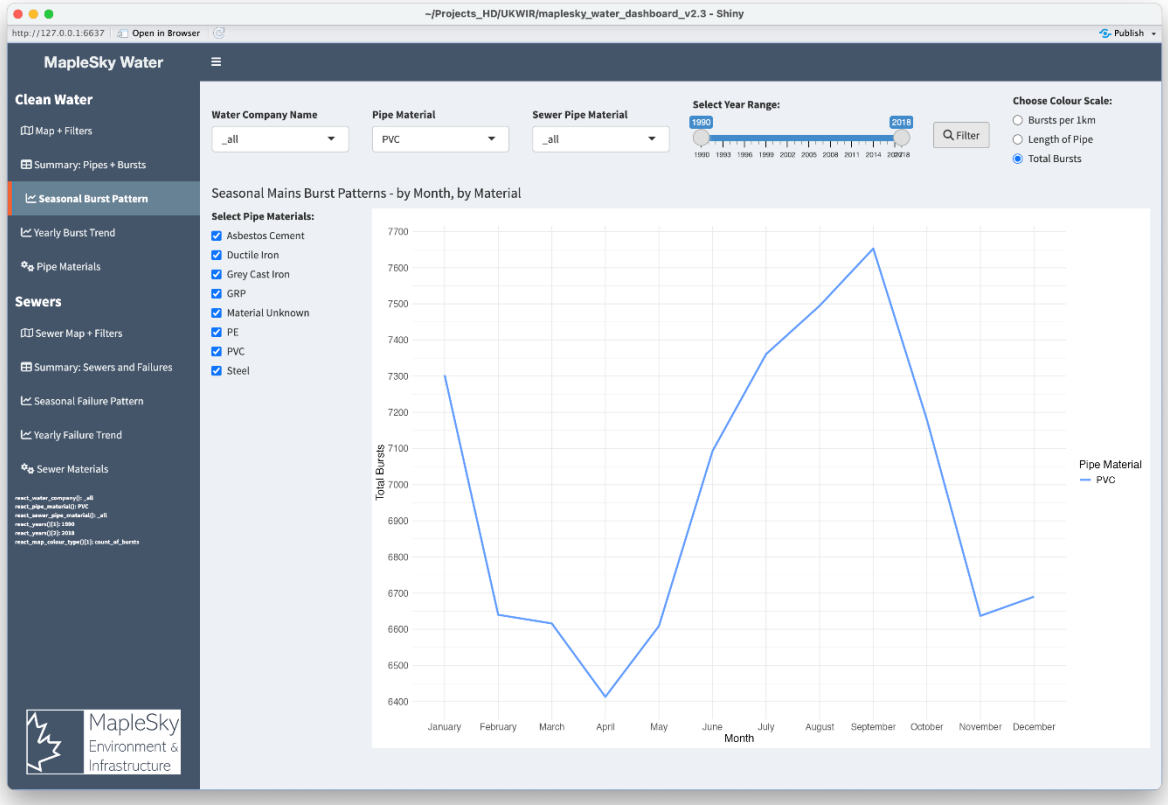
2010-2018

MapleSky Environment & Infrastructure

Compare your company's performance with the national trend

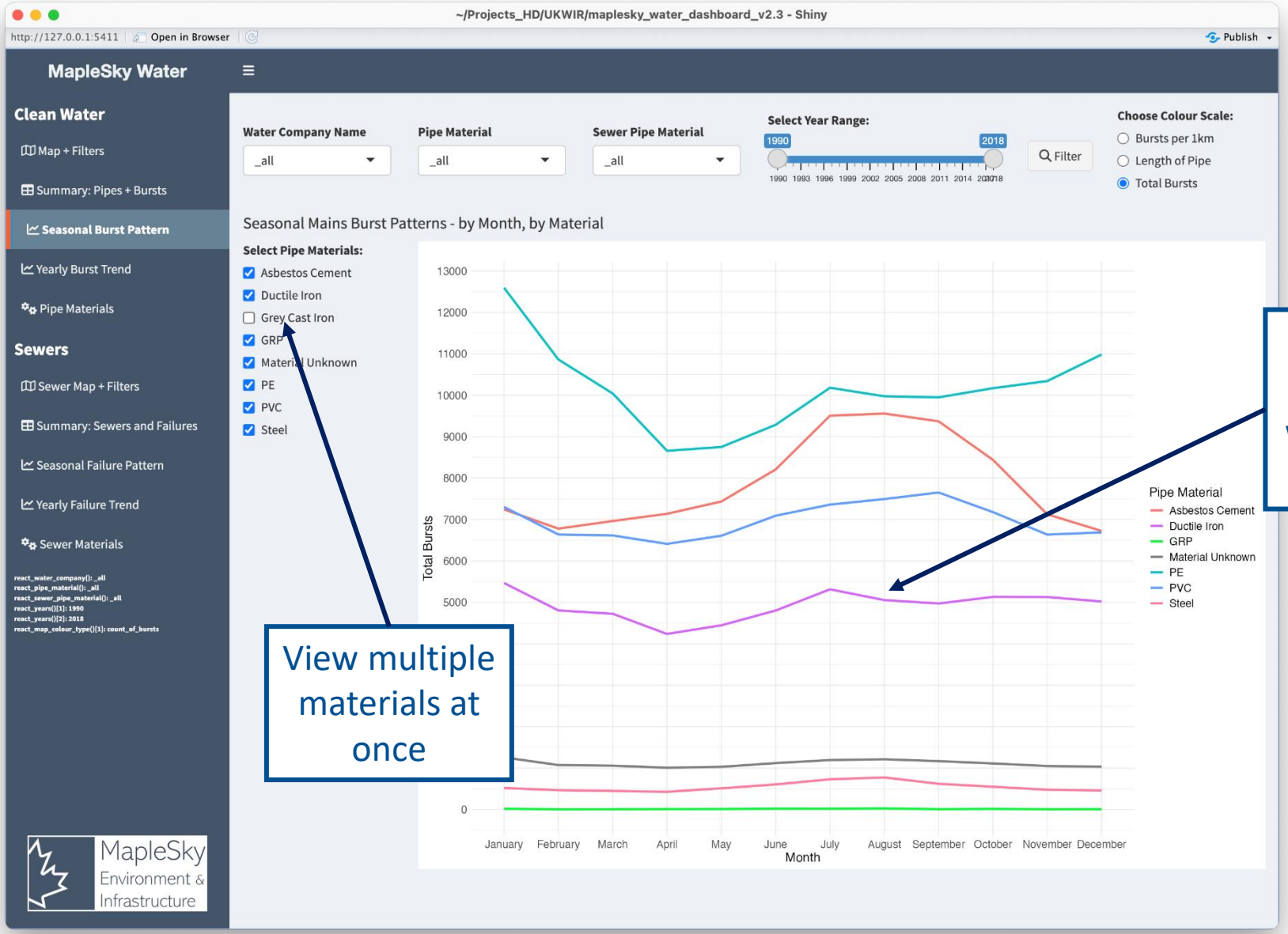


Company seasonal pattern for PVC



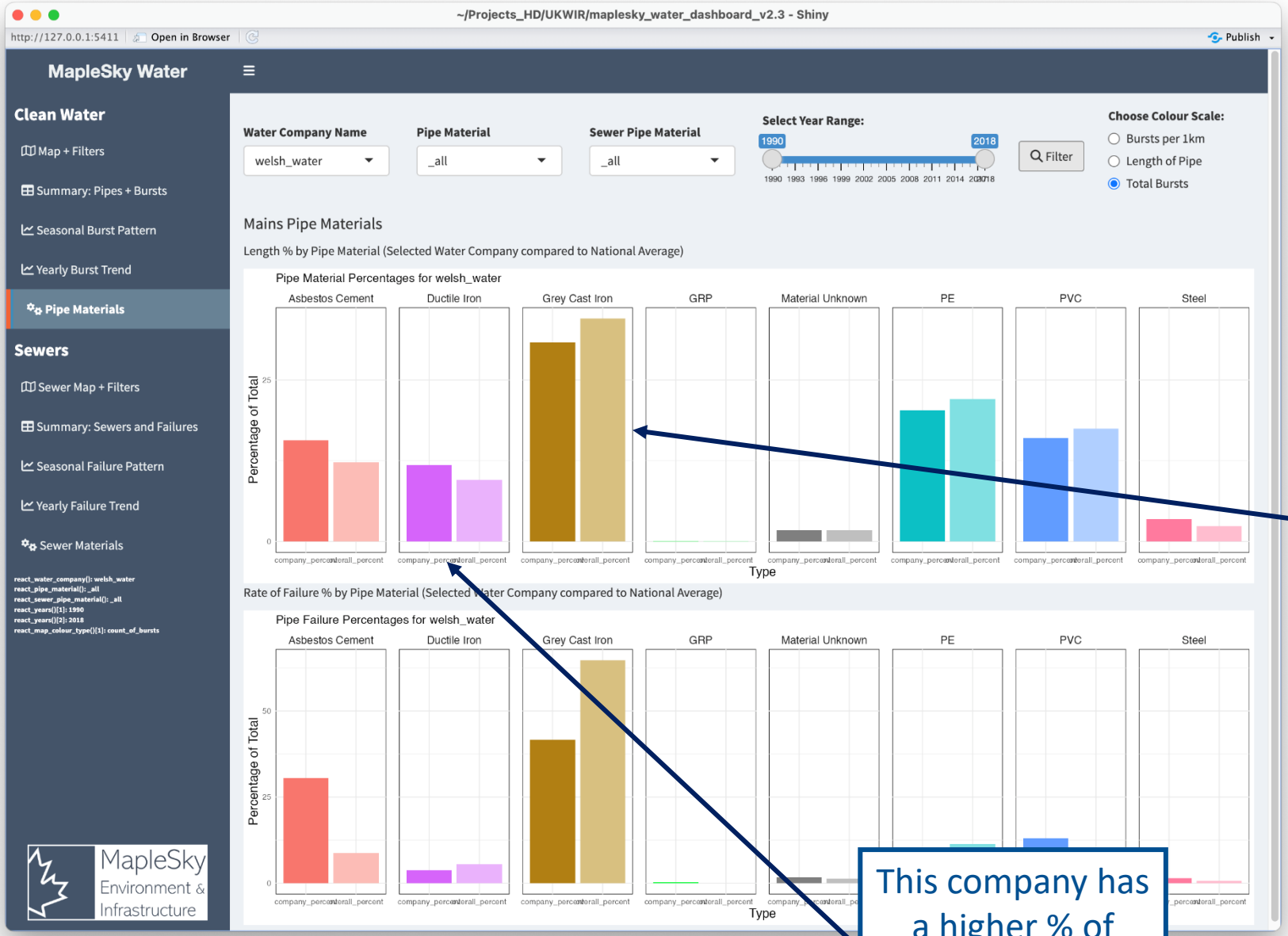
National seasonal pattern for PVC

MapleSky Environment & Infrastructure



View multiple materials at once

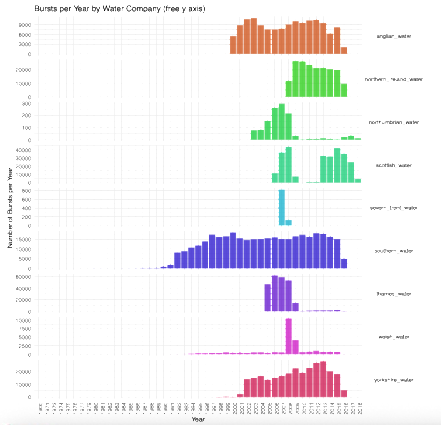
Ductile is more resilient to cold weather than cast iron…

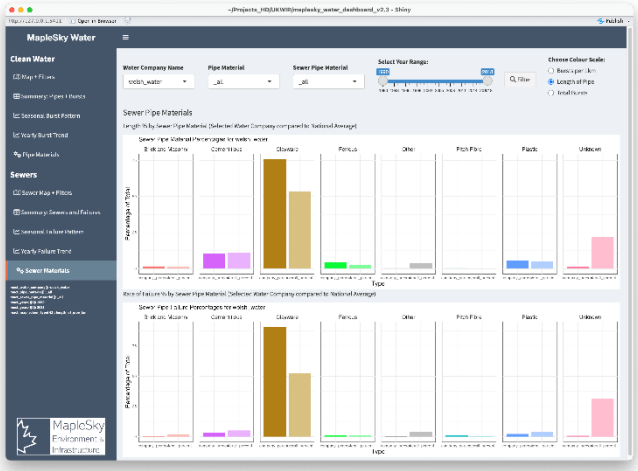


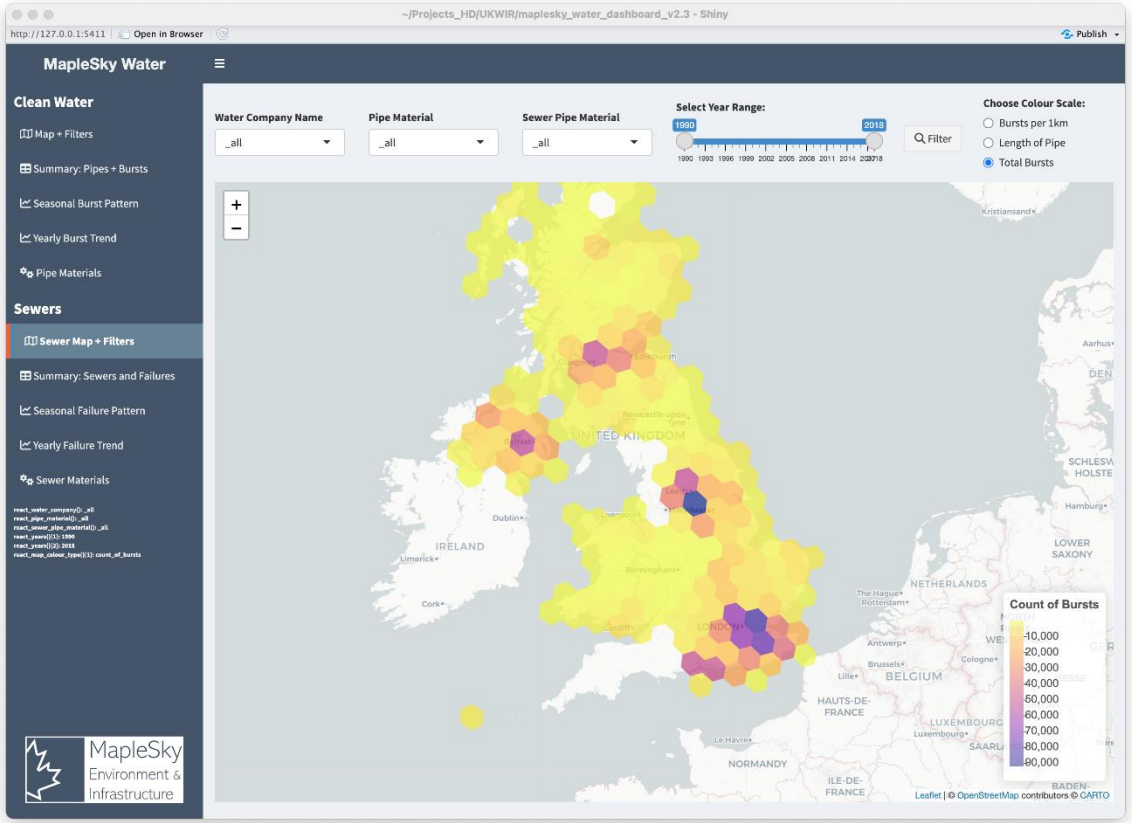
This company has a lower % of Cast Iron than the national average

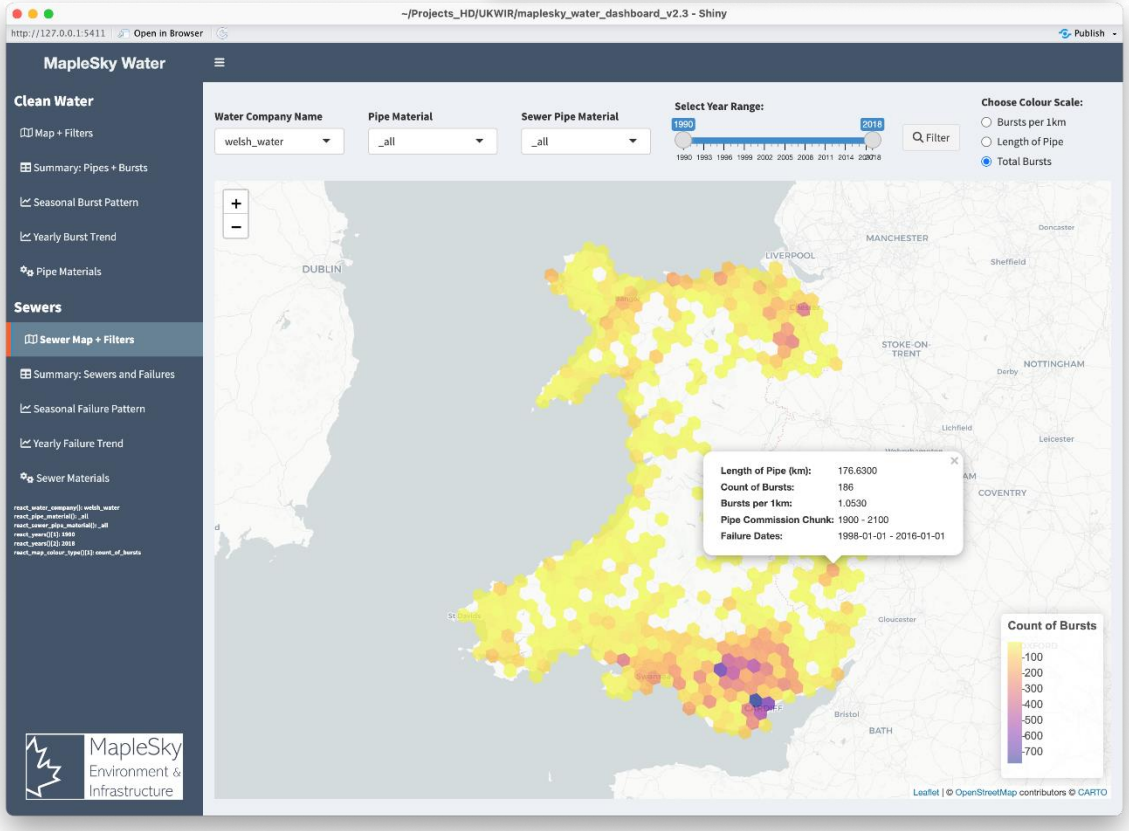
This company has a higher % of Ductile Iron than national average

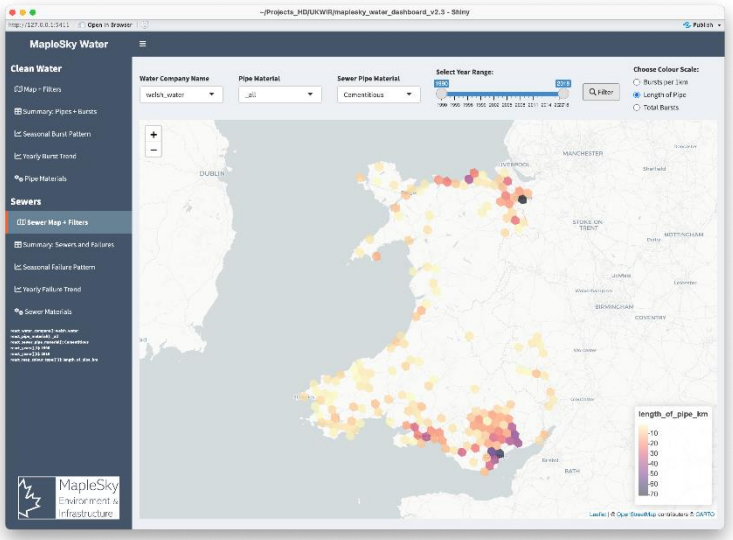
Sewerage too!





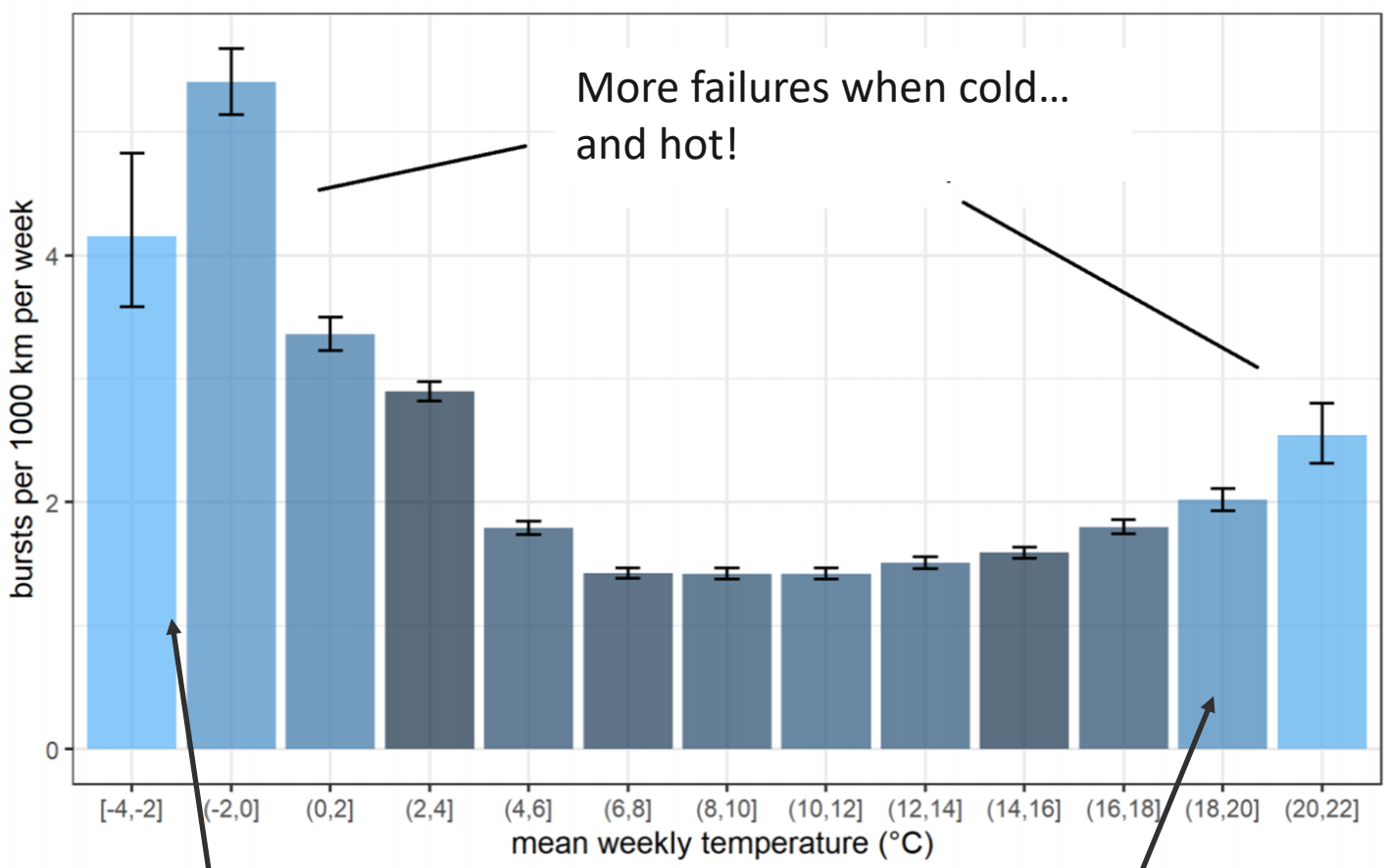






MapleSky Environment & Infrastructure

Next steps… Incorporation of weather data



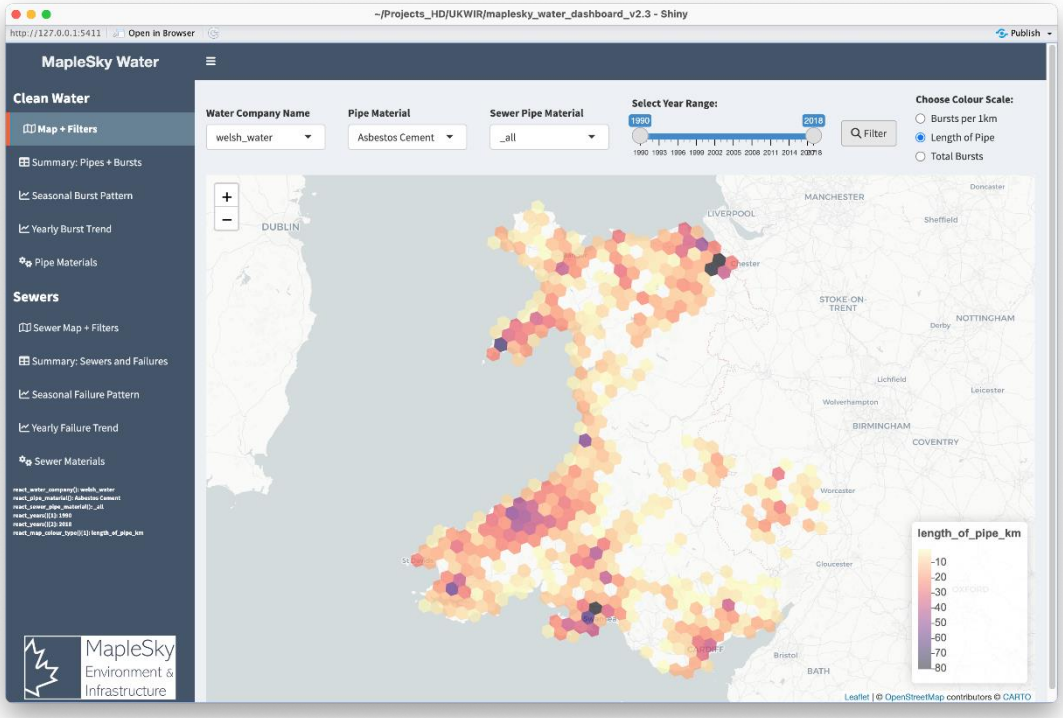
cold weather

hot weather

How could you use this to reduce leakage?

Next Steps

- Incorporation of **weather data**
- Uncover **insights** from the data in the NFD
- **Recommendations** for development



Dissemination Event in Summer 2025

How could you use a tool like this to help **reduce leakage?**

What feature would help you the most?