



User interfaces and experiences workshops

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Contents

Executive summary	3
1. Background and purpose	4
1.1 Floods and Droughts Research Infrastructure (FDRI)	4
1.2 Rationale for these workshops	4
1.3 Objectives	4
1.4 Participants	5
1.5 Digital interfaces.....	5
2. Workshop outline	6
2.1 Activities and their purposes.....	6
2. About you and your suggestions	6
3. Results and discussion	7
3.1 Summary of the participants.....	7
3.2 External participant awareness of FDRI.....	8
3.3 Understanding the participant needs for FDRI digital interfaces	8
3.4 Participant rating of our draft needs	9
3.5 Participant rating of interface types to meet their needs	10
3.6 Participant feedback on general data resources discovery interface (web pages)	10
3.7 Participant feedback on data catalogue interfaces (web pages)	11
3.8 Participant feedback on spatial and time series graphical interface (web pages).....	12
3.9 Participant feedback on API interfaces	12
3.10 Participant feedback on analytical platforms	13
4. Next steps.....	14

Executive summary

The UK Government funded Floods and Droughts Research Infrastructure (FDRI) is developing a series of data and digital products. The interfaces to these products need to meet the requirements of a number of user communities: UK hydrological researchers, UK hydrological consultants, and other technical experts in organisations that span UK and devolved Governments and their agencies.

Two identical online, interactive workshops were held to understand user needs for finding and accessing data, focussed on five types of digital interface.

Across the two workshops we had 15 external participants, six additional UKCEH participants, as well as contributions from eight UKCEH colleagues who worked directly on FDRI.

The digital interface types for which feedback was sought were: general data discovery, data catalogues, spatial and time series graphical interfaces, APIs (Application Programming Interfaces), and analytical platforms.

Some of the key findings/points were:

- Participants identified the need to programmatically access data as particularly important.
- Interactive spatial and time series interfaces and APIs were the most important interface types, with less interest in general data discovery pages and analytical platforms.
- General priorities for interactive interfaces included the need to be intuitive, quick to use, and to support downloading of data.
- Detailed feedback on API priorities was provided, including the need for simple and unrestricted APIs with clear documentation, worked examples, tools to build queries, and environments to test them.

There was an interest from participants in joining digital user groups, which will enable potential users and early adopters of FDRI interfaces to provide further detailed feedback on outputs as they are developed. These groups will be set up and run from Autumn 2025.

1. Background and purpose

1.1 Floods and Droughts Research Infrastructure (FDRI)

Floods and droughts cause significant economic, social, and environmental impacts and they are predicted to increase in intensity, frequency, and duration in response to changes in climate and human activity. The need for new science to underpin the UK's preparedness and resilience to these extreme events has never been more pressing. The Floods and Droughts Research Infrastructure (FDRI) project is a capital investment by the UK Government enabling essential science and innovation to improve the country's resilience to hydrological extremes. It will enable focused observations of water input, movement, and storage in three river basins, one in England, Wales and Scotland, with mobile instruments available for UK-wide deployment. A significant focus for FDRI will be the delivery of this new observational data, alongside other UK-wide hydrological monitoring data, to users via a new digital infrastructure for hydrological research.

1.2 Rationale for these workshops

In FDRI a series of data and digital products are being developed. To ensure these digital interfaces meet the needs of users, there is a need to engage the main end user communities. These communities are UK hydrological researchers, UK hydrological consultants, and other technical experts in organisations that span UK Government and its agencies. In FDRI's digital work, we want to co-design and iteratively refine these digital interfaces in collaboration with the wider UK user community, so that what is built has the greatest chance of meeting the needs of these end users. These workshops build on previous FDRI digital and wider FDRI engagement activities.

In January 2024, we held two collaborative workshops with about 50 individuals on 'Enabling reproducibility in hydrological research'. In these two, 2025, workshops we will build on three of the 2024 workshop themes: communicating what FDRI is about, the community would like to know which data has been published and support a diverse range of user data processing needs.

1.3 Objectives

We designed these two workshops to meet five objectives:

1. Raise awareness of the data and digital interfaces being produced in FDRI
2. Increase the size of the community of FDRI end users
3. Start developing a digital user group of engaged prospective users, and line up their engagement in development sprints for some of the FDRI digital interface products

4. Get general feedback on what end users would like from the FDRI digital interfaces (GUI, API, and others) to support their use cases; and
5. Get specific feedback on designing the public digital interfaces to FDRI data including landing page, data portal, and how they are accessed.

1.4 Participants

Participants were recruited through a combination of email lists and social media (including the FDRI newsletters and mailing lists, and the British Hydrological Society mailing list). A web-based registration was set up and shared through a range of channels ([Join our workshops on the development of the FDRI digital system user interfaces | Floods and Droughts Research Infrastructure](#)). During sign-up, participants were asked a series of questions about what they would like out of the workshops.

1.5 Digital interfaces

Through a series of meetings, we drafted a typology of digital interfaces. These map onto five interfaces that are being developed by FDRI research software engineers (RSEs). These are:

1. General data resources discovery interface (web pages),
2. Data catalogue interfaces (web pages),
3. Spatial and time series graphical interface (web pages),
4. API interfaces, and
5. Analytical platforms (internal or external applications e.g. JupyterHub).

2. Workshop outline

We designed the workshops to be interactive through the use of an online tool (Mentimeter.com) that allowed questions to be shared with participants and the visualisation of their responses; we also encouraged the participants to share their points verbally. The workshops had two main presenters and another colleague to ensure variety in our delivery, and to reflect on and discuss key points raised by participants.

2.1 Activities and their purposes

The two-hour workshops were designed to meet the five objectives, though a series of eight activities. These were:

1. Introduction to the workshop, housekeeping, and context

To make sure participants were all aware of the workshop objectives and how it was being run, and opportunities for two-way engagement.

2. About you and your suggestions

To learn more about the participants in terms of their roles, organisations, geographic locations, and awareness of FDRI.

3. Overview of FDRI digital work

To bring all participants up to a similar level of understanding of the data and digital work in FDRI.

4. Understanding the participant needs and rating our draft list of needs

To encourage the participants to share their specific needs related to FDRI digital interfaces so they could do something. To learn if our draft list of needs matched their needs to do something.

5. General views on digital interfaces

To learn about the relevance of the five types of interface to their needs to do something. Our list of digital interfaces was: General data resources discovery, Data catalogue, Spatial and time series graphical, API (Application Programming Interface), and Analytical platforms.

6. Designing interfaces to meet the participants needs

To gain more specific information on what the participants needed from each of the five types of interfaces based on four questions designed to learn about their needs and preferences from different angles.

Q1-How would you **describe the ideal interface** to do something?

Q2-What is **essential to you** so you can do something?

Q3-Are there **any pain points/difficulties** that you encounter to do something?

Q4-What **features or improvements** could make these interfaces more user-friendly so you can do something?

7. Digital User Group

To generate interest in a Digital User Group of individuals, who were willing to help the co-design of one or more digital interface products.

8. Evaluation of workshops

To better understand what worked well and what could be improved, we invited the participants to fill in a brief evaluation survey of the workshops.

3. Results and discussion

After setting out the participants for the two workshops, we have combined the results to provide a clearer and more concise summary of the main points raised by them.

3.1 Summary of the participants

Across the two workshops there were a total of 15 external participants and 6 UKCEH participants, in addition to the 8 core FDRI team members. External participants came from academic research (6), industry / consultancy (4), public / regulatory bodies (3), and included hydrologists and research software engineers. The level of engagement was considered appropriate for the workshop format and representative of the potential FDRI user base. A small number of participants dropped out during the first workshop. Future engagements may need to reach out further to groups such as early career researchers and consider how best to maintain engagement throughout an online workshop.

3.2 External participant awareness of FDRI

Participants were asked about their awareness of FDRI before and after the workshops (Table 1). There was a small increase in awareness. The one person who said they had low awareness at the end of the workshop thought the workshops were about another topic.

Table 1. Participant awareness of FDRI before and after our workshops

Awareness level	Before	After
High: keep up with developments	3	4
Medium: had some involvement	7	8
Low: some awareness	3	1
None prior to this workshop	0	0

3.3 Understanding the participant needs for FDRI digital interfaces

A range of needs were expressed supporting teaching, research, and project work.

Researcher's needs

In relation to teaching then one said: "capacity for a platform to support teaching classes of ~30-70 students". That this platform could enable "easy integration of own datasets" maybe including persistent storage.

In terms of research, several use cases emerged, the first was to enable them to "understand what sorts of data are available and how to assess them" supporting research proposals on the "impacts on people". A second use case is around access to a wide range of hydrological data and compare this, including their existing data and "all the data that's being collected by EA/Local Authorities which is currently not accessible". A third use case was about enabling access to a range of data including "river flow/level and precipitation data and regularly updated elevation/ADCP data so that I can validate numerical models". Related to this was a fourth use case for a "platform to combine static and dynamic data" including "access to catchment landcover/soil data for specific (sub)catchments". A fifth specific use case focussed on "working with land managers (farmers) to develop support for more sustainable land management outcomes" to understand the effectiveness of land management interventions, and "enable ecosystem service financial exchange (markets and other mechanisms)".

Consultants and public body analysts' needs

Their use cases centred around finding and accessing a range of related data. For example, a representative from a public body needed to “find soil moisture deficits” and “soil types”. The two consultants required “hydrological data to help predict groundwater levels” and river “flow levels” for flood risk assessments, especially when “EA website or Shoothill Gaugemap isn’t always available”. Another participant needed to “access UK wide 15 min and hourly data for UK regulator benchmarking tests” and the other participant said to “understand the limitations of the data, and better understand how we can quantify uncertainty in the underlying data” and “rescue really old data”. Similarly, a consultant said they needed “easy access to rainfall, flow at daily and sub daily level” to “both develop models, but also allow timely updates to existing models”.

3.4 Participant rating of our draft needs

Each external participant (3 in WS1 and 7 in WS2) was asked to allocate up to 100 points to which of our draft list of needs best fitted theirs. Of the needs in this list, ‘programmatically access data’ was given the highest score, with the other three gaining similar scores (Table 2). There was variation between and within workshops highlighting the different needs associated with different personas.

Table 2. Participant scoring of how our draft needs matched theirs (total and individual workshop scores and ranks)

Draft needs to do something	Total and WS score (3+7)	Rank
Search for and discover data	230 (50+180)	3 (3/4+2)
Explore and understand the potential of a dataset	220 (120+100)	4 (1+4)
Access data and metadata to prototype something	235 (60+175)	2 (2+3)
Programmatically access data	295 (50+245)	1 (3/4+1)

3.5 Participant rating of interface types to meet their needs

External participants were then asked to allocate up to 100 points across five draft interface types based on how important they were to meeting their needs (Table 3). Across the two workshops then 'Spatial and time series graphical' and 'API' interfaces scored most highly, with 'Analytical platforms' and 'General data resources discovery' receiving the lowest scores.

Table 3. Participant rating of interface types to meet their needs

Interface type	Total and WS score (5+7)	Rank
General data resources discovery	172 (100+72)	5 (2+5)
Data catalogue	235 (70+165)	3 (4/5+2)
Spatial and time series graphical	323 (170+153)	1 (1+3)
API	285 (90+195)	2 (3+1)
Analytical platforms	185(70+115)	4 (4/5+4)

3.6 Participant feedback on general data resources discovery interface (web pages)

In activity 6 (sections 3.6-3.10), we had input from six external academic researchers, three colleagues from public bodies, one UKCEH researcher/modeller, and four research software engineers (three of whom who worked on FDRI digital interfaces).

Ideal

The participants ideal interface provided clear information about the data and how to access it and use it, this included map interfaces and ways to get help.

Essential

Essential aspects of an interface included a working search, and information about the data and how to access it, view it, and use it.

Pain points

Participants mentioned a range of pain points from finding and understanding data, and a range of difficulties in accessing/downloading data.

Additional features

Participants said they would like improved search for datasets and navigation including AI help, they also mentioned ability to see the data easily, and ways to select variables and download quickly. Need for user support and information about the QC of the datasets were also mentioned.

3.7 Participant feedback on data catalogue interfaces (web pages)

Ideal

Ability to search by location and time, and by variables in datasets, as well as suggestions for related datasets including a chatbot to aid searching. To be able to preview the data before downloading it. Participants wanted clear, standardised, and accurate metadata.

Essential

Clear instructions on how to use the site. A reliable site with efficient and effective search and provision of data, including the ability to search by a location/region. Easy to select data, including variables, and download in one file in appropriate format along with clear metadata.

Pain points

Knowing which catalogue to use, when there is a proliferation of them. Often interfaces are different and not always intuitive. Search can make it difficult to find data, they wanted good search features including narrowing search to what you want. They want to understand which of multiple similar datasets to use. Searching when not knowing the exact term to use was a pain point. They wanted informative and consistent file names.

Additional features

Knowing which datasets are new. Being able to filter data based on popularity, locations and variables. Rating of datasets and metrics e.g. citation and download metrics. Awareness of when datasets may be updated. Able to select and download multiple datasets at once e.g. basket function. API resources to help you write code to access data.

3.8 Participant feedback on spatial and time series graphical interface (web pages)

Ideal

Overall experience should be fast responses, and intuitive, with interactive and quick search, select and data download/access functionality. Ability to gather feedback from users. Maps should be interactive including zoomable, fast loading, with clear/relevant background maps/tiles. They asked for saved/reproducible searches and accessing of data.

Essential

Find locations/data quickly, easily, and smoothly in line with modern tools. Easy to download data or access through an API. Map interfaces with good filtering, so maps are not messy/too busy. Maps and graphs that are zoomable and filterable.

Pain points

Interfaces need to be reliable. Easy to navigate to find data in a consistent way that does not change too often. Pages and maps that have too much content and too many options, and opaque text.

Additional features

Good mobile experience. Standard familiar interfaces e.g. OpenAPI. Real-time camera feeds for sites. Ability to download multiple datasets at once. Expose data/metadata through APIs for bespoke workflow access. Automate API calls based on selected/downloaded data, so repeatable.

3.9 Participant feedback on API interfaces

Ideal

Good documentation on how to use the APIs with clear error messages. Clear information about the datasets. Test environment to demonstrate the APIs. Ability to build API calls through a graphical interface. Examples of using the data including plotting.

Essential

Reliable service including fast downloads/not rate limited. Easy to use with clear documentation including about licensing with examples. Standard API format including responses and authentication.

Pain points

Unreliable service that is complex to use with poor authentication and limits to download/calls. The need to download software, and related local machine/laptop administration restrictions. Incomplete documentation including about functionality. Changing data with no information about changes. Unable to transfer data between internal users.

Additional features

Language that is intuitive to non-technical expert. Lots of examples with guidance and best practices. Standardised with packages that use different APIs. Wrappers around the API calls for users with a range of skill levels to access. Guided tool to build API queries. Community of users and shared resources. A way to communicate forthcoming updates including a newsletter.

3.10 Participant feedback on analytical platforms

Ideal

Create a closed project resource that is collaborative, that is reproducible, and secure in terms of cybersecurity. Well documented with easy access to help including ability to get help from developers. Clear information on what it is, who it is for, and how it can be used.

Fast and efficient compute next to data. Ability to manipulate data without downloading it locally.

Essential

Support communication for real world projects (not just online technical work) that has version control, is shareable, and can be published. Guided examples and templates for different programming languages. Ability to install packages. Good visualisation tools/packages.

Pain points

Low ease of familiarity and access and need for additional skills. Participants wanted clearly documented access to data from site, so not needing to visit other sites. Slow/long rendering times, and limited compute capacity.

Additional features

Documented workflows for accessing data. AI support. Speedy to use with good compute capacity.

4. Next steps

This report will be widely circulated through FDRI communication channels including the newsletter and shared with the participants. We are currently designing a process (Autumn 2025 onwards) of how colleagues can contribute to the Digital User Groups based on these five digital interfaces and a wider range of FDRI digital products e.g. datasets. This is likely to involve a brief “terms of reference” and timetable of when development activity (sprints) are being carried out by the FDRI RSEs for each of the digital interfaces. We plan to advertise these ‘Digital User Group’ activities, so that anyone else can join one or more of these groups and help co-design these interfaces.

Contact

We welcome opportunities for you to get involved with FDRI. We are looking for early adopters and beta-testers of the FDRI digital infrastructure (members of the Digital User Groups), ideas for future workshops and feedback on your FDRI digital needs. Please get in touch with us by emailing fdri@ceh.ac.uk to discuss opportunities. Alternatively, contact the FDRI digital lead directly:

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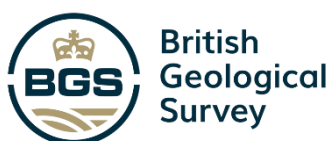
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