

Space4Climate, University of Reading

# Space4Climate Services Directory

**Technical brief specification**

**Space4Climate is a stakeholder-led and funded community, chaired by the UK Space Agency, representing the UK's world-leading Earth Observation expertise and global collaborations regarding climate data from space.**

**The group members work together in delivering, sustaining and making use of trusted climate intelligence from space to drive global economic and societal benefit towards reaching a net zero, climate resilient future.**

**The group is hosted by the National Centre for Earth Observation. For more information on Space4Climate visit [www.Space4Climate.com](http://www.Space4Climate.com)**

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## 1. Introduction

### MOTIVATION

The motivation behind the development of the Space4Climate Services Directory is based on reaching out to target sectors, profiling and making discoverable UK world leading expertise in producing and exploiting climate data from space, including designing, exploiting and quality assurance of services derived from space-based climate data.

The Directory project was initiated by the group because potential [beneficiaries](#) of climate satellite data derived services from across policy, industry and the third sector, across a variety of sectors, (hereafter referred to as **users**) had questions which tended to focus around one of three themes:

- **Data** Where can I find robust climate data/further information about satellite climate data?
- **Providers** Who has experience and skill of designing and developing sensors and missions to produce climate data, of processing the data and of turning it into a product/service in my sector?
- **Connecting with experienced providers** How can I get in contact with them?

The Space4Climate group therefore wish to develop a Directory of providers of Earth observation (EO) climate data -based services. The Directory will provide information on capabilities of providers, meta-data descriptions of datasets and case study examples of applications using the datasets, that are geared towards the criteria the user community (those making use of space-enabled climate services to produce the information being sought). From scoping research Space4Climate has identified three key criteria for Directory functionality those seeking UK expertise in this area want :

- 1) To provide a single-entry point for those who are taking climate action decisions or advising on informed climate action. These might not just be end users, these will include users who are part of the climate services value chain/beneficiary for economic and, or, society benefit, as well as those that are new to/interested in EO/climate.
- 2) To specifically highlight and improve ability to connect with UK capabilities
- 3) To organise the information in a fashion that is more logical to the users

The Directory will contribute to the overall goal of profiling the growing extent of UK capability in exploiting climate data from space. Its intended purpose is to help users to:

- Understand how EO climate data can help with different kinds of challenges;
- Find the different kinds of data and services that are available;
- Find out which UK suppliers can provide data, services and expertise to help with challenges;
- Have confidence that suppliers have the right expertise and that the information in the Directory is up to date.

The Directory will also provide Space4Climate members with the following functions:

- 1) Grow their customer/stakeholder base
- 2) Help analysts find and understand datasets
- 3) Promote research, products and services, making use of EO climate data, developed through UK provider involvement

### RATIONALE

This Technical Brief is the result of a consultation process with various Space4Climate members and experts across the space and climate services sector. An initial vision was presented to the Space4Climate members, in the form of an introductory presentation and an online mock-up. Feedback was sought from members, resulting in a final concept which informs this technical brief.

## VISION

Success would be: establishing the Directory as a popular EO climate centric go-to Directory with high numbers of web visitors channelling through to provider pages.

## DESIRED OUTCOMES

1. Create a directory
2. Confirm support and management arrangements
3. Create and measure metrics
4. Self-financing model

## PURPOSE OF DIRECTORY

The priority is directing users to discover UK providers of data and expertise relevant to their needs.

To do this:

- the material in the Directory should be less technical and aim at a wider audience
- the material should be more relevant, and better-organised, than a general web search, signposting to providers, informative articles and relevant datasets - the user might enter the search facility via a particular key word or dataset/parameter, curious/open to finding out more.
- the Directory will focus on promoting sustained capability, rather than short-term projects (although projects will make interesting case studies, see below)

## DIRECTORY REQUIREMENTS

- **Highly linked** network of information pages, with a front end that provides an accessible user experience
- **Search functionality** and the ability to add new search terms and fields
- **Content** will be a combination of case studies, company / contributor pages, and company information (e.g. contributing personnel, company registration location, etc)
- **Queries:** ability to search via multiple fields
- **Analytics:** basic automated recording of analytics- web traffic, recording visits to particular pages (e.g. FAQ page), requests for contact via webforms etc.
- **Easily maintainable**
- **Future-proof design:** easily expandable and ability to retrospectively add fields to the database
- **Back End:** Modular design to cater for expansion - core phase expects several hundred user profiles and associated articles, an expansion plan will need to scale for tens of thousands of entries.
- **Plugin compatible:** design needs to accommodate the ability to add additional functionality in a modular fashion. Some examples might be:
- **Content extraction and re-branding:** ability to develop new queries, which cater for special interest groups.
- **Community-sourced content** - e.g. moderated forum pages to facilitate community discussion

## DIFFERENTIATION FROM EXISTING RESOURCES

There are existing directories, particularly of datasets, however, these resources are usually rather specialist and geared at those already with Earth observation expertise.

The Directory must appeal to **new audiences** who are not specialists in EO data, climate data or the industry landscape. The Directory will be different from these existing resources in the (although it will link to these resources where relevant):

- The Directory will have a sharper focus on the field of climate data\* from space
- There must be a component of climate satellite data. This could include design and production of new forms of it, combinations of it with other data in the dataset, service or

case study. There must be UK-based expertise in climate satellite data in there somewhere for a capability/project/case study/provider to be included in the Directory.

- Standard weather forecasts are out of scope as is purely Near Real Time data (NRT). However, articles, datasets and providers demonstrating use of NRT monitoring being set up in such a way as to be reviewed in the future for building up a climate data record and/or trends over time would be within scope.

\*Definition:

The Directory focus on the word "climate" should be taken fairly broadly, not restricted to climate change and if possible defined<sup>1</sup> in a way as to include information on past or future changes in "typical" environmental conditions experienced in a region of interest. Understanding variability in a location, what is 'normal' as well as how this is changing is important underpinning information for a variety of climate services. These may be due to greenhouse gases, land use change, natural oscillations (e.g. El Nino, NAO), water extraction.

## EXAMPLES IN SCOPE

Currently, there are many resources containing relevant information, including:

- Directories of missions
  - E.g. CEOS, Satellite Applications Catapult
- Directories of European service providers
  - E.g. EARSC
- Data catalogues
  - E.g. CEDA, SEDAC, SentinelHub, GEOSS, C3S, CCI
- Project websites
- Unstructured information in personal and institutional blogs, websites, etc.

The following examples of data/services are therefore in scope:

- Essential Climate Variables and Fundamental Climate Data Records (as defined by GCOS) with UK involvement in their creation.
- Data Cubes, in the sense of the Australian Geoscience Data Cube. The AGDC processed Landsat data to make it more amenable to analysis, enabling more users to answer questions such as "how often is this lake dry in summer" by inspecting the imagery and the derived metrics.
- Copernicus Climate Change Service services (both the baseline data and the sector-specific services) where they include EO data *and* have had UK involvement in design, creation, maintenance, evolution and/or quality assurance.
- Any datasets/services showing relatively long-term variability of environmental variables of interest.
- Reanalyses when produced robustly by a UK based institution, demystify it and make clear any caveats
- Applications using climate satellite data – e.g. RESAT by the Institute for Environmental Analytics - this uses EO data alongside other datasets (e.g. models) to establish "typical" solar and wind conditions at a location: the EO data compensates for the absence of sufficient in situ observations. Here the EO climate data is helping to establish a climatology, important for informing decisions on location of renewables.

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<sup>1</sup> For quick reference use the WMO 2011 definition within the Global Framework for Climate Services "Climate services encompass a range of activities that deal with generating and providing information based on past, present and future climate and on its impacts on natural and human systems."

Climate in a narrow sense is usually defined as the "average weather," or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO).

## POTENTIAL BENEFICIARIES

The potential beneficiaries (referred to in this document as 'users') of such a Directory include:

- **Problem-owners** (e.g. management in a customer organisation)
  - will see how EO-climate data can help solve their problem
  - will find UK providers to help them
- **Data Intermediaries and Analysts** (in customer organisations)
  - will be able to find datasets and processing facilities that they can access
- **Climate services value chain members**
  - will see how EO-climate data can help enhance their product/service
  - will find UK providers to work with to make use of climate EO data
- **Consulting companies**
  - To use the data to aid other organisations and their clients
- **Influencers** (e.g. trade press, funders, networkers)
  - Will find inspiration for articles, funding calls, events etc.
  - Will find specialists to approach with media opportunities
- **Funders** (e.g. capital investors, fund managers and other elements of climate finance)
  - Will find climate mission concepts, algorithms and services that might be seeking green investment/able to unlock/monitor green investments
- **UK Government departments, NDPBs, Space4Climate Board and staff**
  - Will have collateral with which to advocate for UK capabilities
- **UK climate EO experienced service and data providers**
  - Will have a means to advertise their capabilities and find other organisations they wish to work with/procure services from
- **UK and International researchers**
  - Seeking to collaborate with UK EO partners
- **UK Industry**
  - using climate data to understand their emissions and climate risks for reporting, climate resilience and emission reduction strategies

## ONLINE MOCK-UP

Readers of this document are encouraged to study the online mock-up, which provides more information on how the information in the Directory can be structured and function. Note that the mock-up does not represent the design aspirations of Space4Climate. It is **not fully developed, styled or branded**. It is intended to be informative, but not to be followed precisely. The mock-up can be accessed at <https://palk7n.axshare.com/>, with the password "space4climate".

It illustrates three possible levels of complexity for the Directory:

- **Level 1:** All content is free-text, searched only by matching of text strings. Information is manually curated and edited. (To illustrate this, search for "soil moisture" in the mockup.)
- **Level 2:** Information is more structured and linked, permitting a more advanced and intelligent search. Information is manually curated and edited. (To illustrate this, search for "soil moisture 2" in the mockup.)
- **Level 3:** Information is harvested automatically from a range of catalogues, permitting more advanced search (e.g. spatial searches). (To illustrate this, search for "soil moisture kenya" in the mockup.)

Guidance from the Group indicated that they wished to have the functionality corresponding as a minimum with "Level 2" and enable elements and futureproof for a self-sustaining Directory with functionality in "Level 3" in the above list. The remainder of this document describes the scope of that design in more detail and adds information about the necessary processes for updating and maintaining the Directory.

With futureproofing in mind, the Directory will need to be able to:

- Include more information to the user to guide their searching

- Provide a question submission and triaging mechanism
- Further options for people searching to filter their search to their needs e.g. "free", "academic", "commercial", "data available at", "data available on request" etc.
- As we get more detailed dataset and product and service entries, we might need to provide guidance to the user on how to interpret information viewed. For now it doesn't matter but the system must be developed in a way that renders it flexible and easy to adapt as we go through further evolutions of the Directory.

## 2. High-Level Directory Functionality/Concepts

Here we outline the intended functionality of the Directory at a high level, outlining the nature and scope of the information in the Directory and how it is consumed and created.

### CLASSES OF INFORMATION

The Directory will contain five main classes of information:

1. Information about the capabilities of UK organisations (industry and academic) – these are known as **Providers** and could be made up of individuals (including Experts), groups of individuals within and whole organisations.
2. Information about **Datasets** with which these organisations have expertise.
3. **Articles** describing particular concepts, datasets and/or examples of applications - Case Studies, in order to educate the audience and help them see the "art of the possible" (these should be possible to link to relevant providers and/or datasets involved).
4. **Skills** are where different scientists and individuals can upload capabilities onto their profiles in the Directory for others to search for them
5. **Careers and Opportunities** where members can post opportunities related to EO-climate data through jobs, training, career, research and/or surveys for [users](#) to take advantage of

### INFORMATION SEARCH FUNCTION

[Users](#) will discover information through browsing, searching and following links. (The [mockup](#) illustrates examples of these.)

**Browsing** lists all entries in the catalogue of a certain type, then allows them to be filtered. For example:

- List all Providers in the Directory and filter by sector, capability or a search term
- List all Datasets in the Directory and filter by search terms
- List all Articles (including Case Studies) and filter by sector or a search term
- List all Experts in the Directory and filter by data-type, skills knowledge (coding languages etc)
- List all Opportunities and filter by region, job-level and type

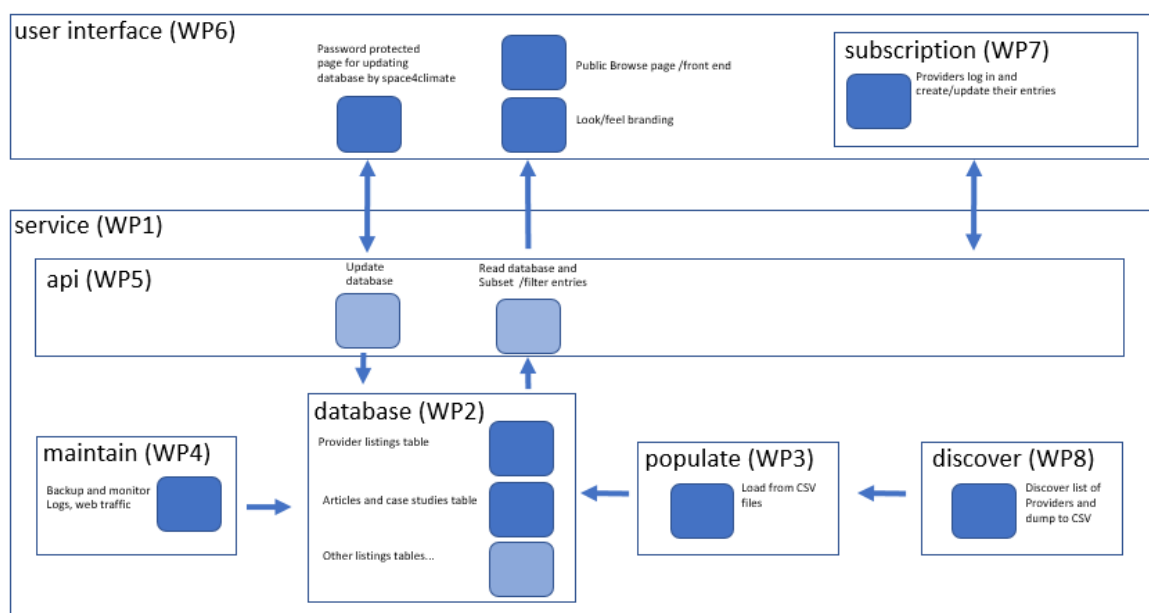
The **search** function is conceived to be quite simple for the user, allowing the user to enter some free-text search terms in a single box (rather than a complex form). The Directory presents a list of matching results of all information categories, organised by category type. Search results will include items that are found "indirectly" – for example, a search for "soil moisture" may reveal a certain provider who is connected with a Case Study on this subject, even if this phrase does not appear directly in that provider's description.

Entries in the Directory are **linked** to each other. For example, Case Studies are linked to pages describing the provider(s) that contributed to them and any datasets/satellites referenced as used. Datasets are linked to providers that are known to have competency in handling them.



### 3. Work Packages

#### Directory work packages



In this section the Directory is divided into 8 separate work packages. Each work package is described in the sections below.

Bids are invited for one or more of the following:

- Work Packages 1-7
- Work Package 8
- All Work Packages 1-8

All source code will be delivered to space4climate's github organisation and should conform to coding standards, including:

- **Documentation and Comments** to help maintain and expand the code base in future
- **Test Cases** that demonstrate the code works correctly
- **Code formatting** depending upon language, for example PEP8 for python

#### WORK PACKAGE 1 – SERVICE

The **service** work package provides an easy way to deploy the Directory system consisting of all components, each described by a separate work package.

It should be possible to easily deploy the Directory system on a linux virtual machine. Use of letsencrypt for SSL certification and open source components such as NGINX (or equivalents) are expected to be utilised here.

This work package should document the deployment processes and state any pre-requisites (operating system packages required, resource requirements in terms of memory and disk, user accounts that need to be set up).

## WORK PACKAGE 2 – DATABASE

The **database** work package selects a database system and implements the database tables according to a schema that space4climate will define. The schema will consist of a table for each distinct entity to be stored in the database and some foreign key relationships between them (for example, a case study is associated one or more providers).

The database system to be selected should be very simple to operate and maintain. An open source database such as SQLite would be expected.

Implementation of this and other work packages should allow for easy extension of the database schema to add new fields to the database.

Any implementation should provide for portability, allowing a different database system to be adopted (for example, if larger capacity is needed in future).

See the **database schema** section for more details.

## WORK PACKAGE 3 – POPULATE

The **populate** work package will provide a program to bulk load the database tables from CSV files, with error checking and reporting of any issues during the loading process. The load program will be run infrequently and can be invoked from the host / virtual machine running the Directory service and database.

The program should be designed to avoid duplicating rows in the database table using a simple algorithm. For example, if an existing database row exists with the same provider name as a row in the CSV file being loaded, print a warning and update that database row rather than creating a new database row.

The CSV file that will be loaded could be created by WP8 (discover).

## WORK PACKAGE 4 – MAINTAIN

The **maintain** work package supports regular maintenance activities related to the Directory service and database, including:

- Stop and start the service and database
- Backup the database to file(s) and restore the database from backup
- Extract common metrics from weblogs including daily unique visitors to a csv file

This work package should implement any required programs and document the procedures for performing these maintenance tasks by a non-technical administrator.

## WORK PACKAGE 5 – API

The **api** work package defines a web service that offers:

- **Public query api endpoint** to search the database and return paged results as JSON formatted documents, must include:
  - Search by free text in one or more fields
  - Search by tag
  - Search by category within a taxonomy defined by space4climate
- **Private update api endpoint** to create, update or delete an entity in the database. Access to this endpoint must be restricted to logged in users, for example using access tokens.
- **Public update request** endpoint allowing a provider to request the creation of, deletion of or update to their details stored in the database.

- **Public metadata api endpoint** allowing the taxonomies and search tags to be retrieved from the service as a JSON document. See section on taxonomies and search tags, below.

The api web service should be implemented using well known programming languages and open source technologies, for example Python and Django.

## WORK PACKAGE 6 – USER INTERFACE

The user interface will be implemented in work package 6, consisting of:

- A main front page allowing the user to create and submit directory searches and traverse the resulting results. This front page will retrieve and display data obtained from the **public api endpoint**. See the section **INFORMATION SEARCH FUNCTION** for a description of the expected search functionality.  
The search results will exclude providers whose PUBLISHED flag is set to "NO", and datasets/articles/experts/opportunities created by such providers.
- The user interface will load taxonomy and search tag metadata from the **public metadata API endpoint**.
- Password protected administration pages to be used by space4climate to quickly and easily update the database by submitting updates to the **private update api endpoint**. These pages will allow the different entity types to be created, updated or deleted and associations between different entities to be added and removed.

The user interface should separate out the branding (CSS stylesheets and logos) from the page designs, allowing branding to be easily modified or switched. This should be documented for non-tech.

The user interface should conform to the WCAG 2.1 accessibility standard (see <https://www.gov.uk/service-manual/helping-people-to-use-your-service/understanding-wcag>)

Refer to the mock up (<https://palk7n.axshare.com/>) to get a feel for the kind of functionality the user interface should offer, but the look and feel should be much more modern.

## WORK PACKAGE 7 – SUBSCRIPTION

This work package implements web pages which allow providers to submit entries for inclusion into the Directory, and update entries. The user interface will therefore support web pages that allow a provider to sign up as a subscriber with the Directory with the following process:

1. Providers start by filling out an online form similar to how UK Water Partnership do here: <https://www.theukwaterpartnership.org/initiatives/uk-water-capabilities-directory> and also select a membership tier.
2. Providers will need to select what type of package, priced depending on the information they would like to include in the Directory. Providers are encouraged to consider both the short-term and long-term costs associated with different options for this process, as the volume of information in the Directory grows.
3. Information submitted by new provider will be placed into the database's PROVIDER table but the "PUBLISHED" column value will be set to "NO" initially. These details will not be yet visible to a Directory user.
4. After providers submit their form, Space4Climate will review entries with the Board and seek approval for inclusion. Once this has been granted, the Space4Climate coordinator will alert the provider of the outcome and payment. Following this, the information will be published to the Directory, by setting the "PUBLISHED" column value to "YES". These details will then become visible to a Directory user.
5. Subscribers will then have an account that they can use to update their information, upload data and make payments.

Further functionality requirements:

- Subscribers can add details on Experts (individuals or groups) and their skills.
- Groups and provider personal affiliated with NCEO and/or representing the UK on international groups such as GEO and CEOS must be labelled/tagged as such. Additional national representative bodies might be requested by the board to be added so please make provision for this – see REPRESENTS\_UK column of the PROVIDER table.
- Articles / Case Studies can only be supplied by the space4climate group coordinator and registered Service Providers.
- Datasets and satellite missions are only included in the Directory if they have a link to a published Provider or Case Study (it is not the aim of the Directory to publish an exhaustive list of Datasets nor satellite missions).
- The Directory shall provide functionality (as in the mockup) for a Provider to declare their UK-based competence in building a relevant satellite/handling a Dataset/other climate EO capability. Having done so, an Editor will verify this and link the Provider to the dataset.

## WORK PACKAGE 8 – DISCOVERY

This work package will provide a tool for discovering providers (private companies and other types of organisation) that will potentially meet the criteria for inclusion in the Directory – generally that they are involved in an aspect of the Climate data from space supply chain, the majority will work with climate Earth observation data and can use in connection with climate analysis and decision making.

This tool must be as automated and accurate as possible in the search for candidate providers. It could be implemented by conducting web scraping or via access to a paid API service to conduct the search.

The tool will output results to a CSV file containing as much information as possible to support fields from the PROVIDER table in the database schema. The following columns should be yielded from the discovery process:

NAME  
 TYPE  
 POSTAL\_ADDRESS  
 PHONE\_NUMBER  
 EMAIL  
 URL  
 COMPANY\_ID (\*if known)  
 SHORT\_DESCRIPTION  
 SECTOR(S)

### Database Schema

The database schema models data on the following main entities and the relationships between them.

- PROVIDER
- ARTICLE
- DATASET
- EXPERT
- OPPORTUNITY

The database schema will consist of the following tables (or an equivalent).

The database schema is not yet finalised but is expected to resemble:

<b>PROVIDER</b>	
Store details on a provider of services, data or expertise	
Column	Notes
PROVIDER_ID	Primary key - automatically generated
PUBLISHED	YES / NO
NAME	Required
TYPE	Type of the organisation, eg "SME", "Academic", "Social Enterprise", "Non Profit"
SPACE4CLIMATE_MEMBER	YES / NO
POSTAL_ADDRESS	
PHONE_NUMBER	
EMAIL	
URL	Required
LOGO	Binary Image Data
SHORT_DESCRIPTION	Short Description (250 characters)
FULL_DESCRIPTION	Longer description
COMPANY_ID	if registered at Companies House
REPRESENTS_UK	If represents UK in an official capacity
TAGS	Colon (:) separated list of search tags
SECTORS	Colon (:) separated list of categories from the sector taxonomy
CAPABILITIES	Colon (:) separated list of categories from the capability taxonomy

<b>ARTICLE</b>	
Information on an article or case study	
Column	Notes
ARTICLE_ID	Primary Key - automatically generated
PROVIDER	Optional – the PROVIDER_ID that published the article, if in the directory
TITLE	
URL	
DESCRIPTION	

<b>ARTICLE_PROVIDER</b>	
Store an association between an article and a provider.	
Column	Notes
ARTICLE_ID	Primary Key (part of) Foreign key to ARTICLE
PROVIDER_ID	Primary Key (part of) Foreign key to PROVIDER

<b>DATASET</b>	
Store details on a dataset	
Column	Notes
DATASET_ID	Primary key - automatically generated
PUBLISHER	Optional – the PROVIDER_ID that published the data, if in the directory
URL	Required
SHORT_DESCRIPTION	Short Description (character limit)

FULL_DESCRIPTION	Longer Description
TAGS	Colon (:) separated list of search tags
SECTORS	Colon (:) separated list of categories from the sector taxonomy

### DATASET\_PROVIDER

Store an association between a dataset and a provider, indicating that the provider can work with this dataset.

Column	Notes
DATASET_ID	Primary Key (part of) Foreign key to DATASET
PROVIDER_ID	Primary Key (part of) Foreign key to PROVIDER

### ARTICLE\_DATASET

Store an association between an article and a dataset.

Column	Notes
ARTICLE_ID	Primary Key (part of) Foreign key to ARTICLE
DATASET_ID	Primary Key (part of) Foreign key to DATASET

### EXPERT

Store details on an individual or group (within a provider) and their skills/capabilities

Column	Notes
EXPERT_ID	Primary key - automatically generated
PROVIDER_ID	The PROVIDER_ID that published the expert details. Experts can be linked with other providers via the EXPERT_PROVIDER table.
NAME	
EMAIL	
URL	Required
DESCRIPTION	Describe the expertise
SKILLS	Colon (:) separated list of categories from the skills taxonomy
SECTORS	Colon (:) separated list of categories from the sector taxonomy

### EXPERT\_PROVIDER

Store an association between an expert and a provider.

Column	Notes
DATASET_ID	
PROVIDER_ID	

### OPPORTUNITY

Store details on a job vacancy or other type of opportunity and the required skills. An opportunity is associated with an offering provider.

Column	Notes
OPPORTUNITY_ID	Primary key - automatically generated
PROVIDER_ID	The associated offering provider

REGION	The UK region(s) where the opportunity is located, eg "North East" or "Bristol Area"
TYPE	Type of opportunity, eg "RESEARCHER"
JOB_LEVEL	Describe the level, eg "GRADUATE", "SENIOR", "EXECUTIVE"
URL	Link to provider's site for applying
CLOSING_DATE	
DESCRIPTION	Short Description
SKILLS	Colon (:) separated list of categories from the skills taxonomy
SECTORS	Colon (:) separated list of categories from the sector taxonomy

### Taxonomies and Search Tags

Separate taxonomies and search tag lists will be provided by space4climate and will be defined in configuration files.

For example, the sector taxonomy file might look like:

```
# --- sector_taxonomy.txt ---
AGRICULTURE -> ARABLE
AGRICULTURE -> FISHERIES
TRANSPORT -> ROAD
TRANSPORT -> SHIPPING
ENVIRONMENT -> MONITORING -> RIVERS
...
```

The following taxonomies will be defined and used in the Directory:

- sector\_taxonomy.txt  
Hierarchy of sectors where EO may be used (see example above)
- skills\_taxonomy.txt

Hierarchy of EO/Climate analysis/Science/Engineering skills

- capabilities\_taxonomy.txt

Hierarchy of capabilities that providers may offer

The search tag definition would look like:

```
# --- provider_search_tags.txt ---
SOIL MOISTURE
URBAN HEAT
FLOODING
MATERIAL RESILIANCE
...
```

These taxonomy and search tag files are expected to be modified over time by Space4Climate and should be loaded by the API service (and not hard-coded into the user interface or API). Space4Climate will provide initial samples of the taxonomy and search tags files to the developer.

## 4. Pages in the Directory

The mock-up shows the main information flows between pages in the Directory but does not provide examples of full details for all information classes. Potential suppliers of the Directory should use the mock-up as a starting point for their design, but also note the following important points to augment it:

1. The mock-up does not show how to display information about Providers. The supplier must design a page to do this, based upon the information collected when Providers register with the Directory.
2. Based on feedback from members of Space4Climate, the front page of the Directory should enable the user to browse all the information in the Directory by industry sector (e.g. agriculture, finance, built environment -built up from the information provided in the provider forms and tags from case studies ).
3. The list of capabilities (e.g. used to filter the list of Providers) must be updated to reflect the latest version.
4. Search results should be presented as they are in the "Search Results 2" page of the mock-up, which corresponds with the "Level 2" option described in section 0 above.
5. Pages representing Datasets should place particular emphasis on how the Dataset is intended to be *used* (or has been used), with the full technical details being de-emphasised. (The mock-up includes examples of this approach.) Recall that the purpose of these pages is to attract new audiences – full details are usually available on third-party websites, to which the Directory will link.
6. Pages representing Datasets should also link to processing facilities where the Dataset can be processed. As this information could become outdated, it would be helpful to have an indication on this page of when it was last updated.
7. Particular attention should be devoted to the design of the front page, to ensure that it is highly attractive, usable and accessible, clearly explaining the purpose of the Directory.

## 5. Online Help

The Directory should be as intuitive as possible, requiring the minimum of user instruction, but should also contain help information to guide the user as to the purpose of the Directory, how to use it and how to contribute to it. The mock-up gives some examples, in the form of inline text, mouse-over tips and help pages.

## 6. Process for Entering Information Into The Directory

### INTERNAL

It is envisaged provider information will be manually created and edited, in order to ensure quality and relevance. If an automated system with authorship status to nominated personal from the approved providers cannot be included, then the article and dataset entries must be included in the editorial capacity provided by the supplier of the Directory which must be costed for until the end of the maintenance period, the process is outlined in work package 7.

## 7. UK based companies

Examples of companies based in the UK that produce and/or work with climate data and would be included on the register -please also take a look at the most up to date Space4Climate list of members online, the providers in this Directory will span industry, academia, government and the third sector <https://space4climate.com/our-community/>.



- Airbus - <https://www.airbus.com/en/sustainability/environment/climate-change/earth-observation-for-climate-action>
- [Assimila \(assimilaltd.com\)](https://www.assimilaltd.com) – Assimila Ltd use climate data in many uses cases, especially in the agriculture sector
- Capella Space - <https://www.capellaspace.com/>
- CGI - <https://www.cgi.com/uk/en-gb>
- Earthi - <https://earth.space/products-and-services/>
- EarthSense [Air Quality](#) | [EarthSense](#) | [England](#) – using pollution data to monitor the effect of vehicle pollution through Nitrogen Dioxide (emitted from vehicles)
- [GhGSat](#) – is the first and only company that has a constellation capable of measuring both methane and carbon dioxide specifically designed for detecting and quantifying GHG emissions from point sources as small as individual oil and gas wells.
- GMV - <https://www.gmv.com/en>
- Hydrosat - <https://www.hydrosat.com/> : company producing thermal data
- [Satellite Vu](#) is the first company to be launching a thermal imaging satellite into a low earth orbit at the beginning of 2023
- Telespazio UK - <https://telespazio.co.uk/en/home>
- UK Ordnance Survey - <https://ordnancesurvey.co.uk/>

## 8. Case Studies/Articles

We would like to include numerous case studies within the directory, some of these are related to articles presented in Annex A.

## 9. Scope

The scope of work is to create a directory with all stated functionalities, features and UI requirements in line with Space4Climate branding.

This will be tested and validated amongst Space4Climate members and after two rounds of this refinement can the deployment take place. The phases within the scope are below.

### PHASE 1: DISCOVERY & PROTOTYPING

The first phase is to gather data sets, validate UI requirements and all technical pieces to enable building.

### PHASE 2: DEVELOPMENT

Involves testing, validating and ensuring that the Directory is complete and given clearance from the Space4Climate Board.

### PHASE 3: DEPLOYMENT AND MAINTENANCE

Costs for the project must include all costs associated with web hosting, backup, DNS registration and upgrades. The Directory must be maintained until September 2022 – this maintenance includes keeping the Directory running and editing any new content that is submitted. Suppliers should specify level of new content that can be accommodated within the budget and give costing for additional content packages.

## 10. Hosting and legacy protection

Currently the Space4Climate group is hosted by the University of Reading. However, suppliers should note that the running of the Directory could in the future be transferred to another organisation, and so the supplier should ensure that the Directory and its contents can be

packaged and moved to a different hosting environment at minimum cost. The use of containerisation technologies such as Docker or JASMIN may aid with this. Adequate documentation must be provided to enable this transfer.

## 11. Future capabilities

It is anticipated that the process of submitting and verifying content will become increasingly streamlined with time. One example of this is that, in the future, the process of confirming competence of an organisation or person may be delegated to a relevant professional body – therefore such a body may require certain access privileges to the system. Although beyond the immediate scope of this work, the supplier is encouraged to bear this in mind in their design, to maximise the opportunity to implement this in future.

The Directory will need to become self-financing. Ideas such as payment for listing to cover administration costs, premium payments for enhanced branding and signposting fields and promoted search rankings have been discussed and the Directory should be built in a manner that allows this type of facility in the future.

## 12. Branding and design

The Directory must adhere to the Space4Climate brand guidelines. These, along with logos and a set of icons for the Directory functions and themes of case studies and datasets will be provided for use by contractor.

## 13. Fee

Expressions of interest should only be submitted by suppliers who can deliver the deliverables within the delivery timetable. The payment schedule will be in accordance with part 1 (30%), part 2 (25%) and part 3 (45%)

## 14. Delivery timetable

Invitation to tender and bid template issued: 15 March

Bid submission deadline: 25 March 10am

Proposal Presentation (by invitation): 29<sup>th</sup> March, a slot between 9am-midday\*

Bid outcome notification: 31<sup>st</sup> March

Contract start date: w/c 4<sup>th</sup> April

\*Presentation will be 15minutes long and cover two parts 1. Response to brief 2. example from portfolio of a similar project

## 15. Deliverables

### PART 1

Delivered by w/c 25<sup>th</sup> April

- Working prototype of the Directory, subject to information provided
- Need to present as a main item at a group meeting on 3<sup>rd</sup> May from 12:30-13:30.

## PART 2

Delivered by 13<sup>th</sup> June 2022

- Completed Directory with all functionalities ready for review by Space4Climate Board 21<sup>st</sup> June and further refinement prior to being issued for testing with Space4Climate members and associated organisations at the group meeting on the 7<sup>th</sup> July
- Testing period will be 7 –29<sup>th</sup> July

## PART 3

Delivered by 1<sup>st</sup> September 2022

- Official deployment of completed Directory and ongoing maintenance of the Directory up to 31 March 2022.
- Slide deck for soft launch to Space community at EO Week w/c 5 September 2022.

## Annex A

Below are some examples of websites in which we will take case studies from

- [Measuring Lake Water Temperature From Space | Weather and Climate @ Reading](#)
- [Tropical rainfall and sea surface temperature link could improve forecasts \(reading.ac.uk\)](#)
- National Centre for Earth Observation (NCEO) used climate data based on land surface temperature to create an Urban heat Island index - <https://www.ordnancesurvey.co.uk/newsroom/news/space-data-helping-earth-adapt-to-challenges-of-climate-change> (working with OS at the moment, funded by the UKSA)
- [Water Pollution Detection Using High Resolution Thermal Data — Satellite Vu](#) – Satellite Vu using thermal imaging data to detect water pollution
- 4EarthIntelligence (4EI)- [Applied Earth Intelligence Experts | 4 Earth Intelligence](#) - use Earth intelligence and analytics to deliver evidence-based insights (Donna and Amy used to work here so have connections).
- Air Quality Monitoring: [Air Quality Modelling Products | 4 Earth Intelligence](#)
- Heat Hazard Index: [Heat Hazard Products | Heat Data and Index | 4 Earth Intelligence](#)
  - <https://www.4earthintelligence.com/insights/4-earth-intelligence-publishes-heat-hazard-data-as-vulnerable-population-remains-in-lockdown/> - more information on the heat index
- <https://www.4earthintelligence.com/insights/empowering-the-circular-economy-with-earth-observation/> - interesting article on the circular economy and how 4EI fit into it
- Assimila Ltd example of using climate data to help agriculture - [BioSpace – Assimila](#)
- Airbus - <https://www.airbus.com/en/newsroom/news/2016-10-farmstar-from-satellites-to-farms> used EO to create FARMSTAR, a product which combines farming and EO data
- CGI:
- <https://www.cgi.com/uk/en-gb/blog/space/seabed-space-role-data-delivering-sustainable-future>
- <https://www.cgi.com/uk/en-gb/blog/space/out-of-this-world-can-space-data-help-tackle-climate-change>
- Capella Space - Synthetic Aperture Radar (SAR) data <https://www.capellaspace.com/using-sar-data-to-monitor-the-impacts-of-illegal-mining-in-istmina-colombia/>
- Satellogic, Using EO data to respond to floods - <https://satellogic.com/2021/10/18/rain-season-using-eo-data-to-prepare-for-and-respond-to-floods/>