D5.6

Data Management Plan (DMP), version III

WP5 Project Management and Impact Activities

Status: Final

25 February 2025

Grant Agreement No 101084261

Funded by the
European Union

Document Information

Title	Data Management Plan (DMP), version III
Distribution	Public
Deliverable Leader	UCC
Contributing Authors (Name, Organisation)	Rebecca Buckley (UCC Academy), Anna Power (UCC Academy), Ailbe Ó Manacháin (UCC), Aoife Coffey (UCC)

Funding

This project has received funding from the European Union under grant agreement No 101084261.

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Revision History

Version	Date	Description	Prepared by (Name, Organisation)	Status (Draft/Final)
01	03/04/23	Initial draft	Rebecca Buckley (UCCAC)	Draft
01	04/04/23	Review and input on initial draft	Ailbe Ó Manacháin (UCC)	Draft
01	05/04/23	Second draft	Rebecca Buckley (UCCAC)	Draft
01	06/04/23	Review and input to second draft based on feedback from Dr Aoife Coffey (UCC)	Ailbe Ó Manacháin (UCC)	Draft
01	27/04/23	Final version with final edits made following review by consortium	Rebecca Buckley (UCCAC)	Final
02	20/02/24	Updates to deliverable including: 1) changes to Table 1 on pg. 6, 2) changes to Table 2 pg. 10 and 3) additional information added to section 5. Data Security on pgs. 17 & 18	Rebecca Buckley (UCCAC)	Draft
02	29/02/24	Reviewed by Coordinator and final version created	Ailbe Ó Manacháin (UCC)	Final

03	21/02/25	Updates to deliverable including: 1) changes to Table 1 on pg. 7, 2) minor corrections of typos, syntax, timelines, etc. throughout text	Anna Power (UCCAC)	Draft
03	25/02/2025	Reviewed by Coordinator and final version created	Ailbe Ó Manacháin (UCC) Anna Power (UCCAC)	Final

Contents

Executive Summary

This Data Management Plan (DMP) version III led by UCC is a *FreeHydroCells* deliverable of Work Package 5 (Project Management and Impact Activities) and falls under Task 5.5 Data Management. The DMP has been developed following the Horizon Europe DMP template with the aim of guiding and supporting *FreeHydroCells* partners in their handling of research data, both during and after the lifetime of the project. It adheres to the European Commission Guidelines on FAIR (**F**indable, **A**ccessible, **I**nteroperable and **R**eusable) data management. The DMP is a living document designed to evolve throughout the lifetime of the project. The next version of this deliverable will be submitted by Month 40 (D5.7).

About *FreeHydroCells*

FreeHydroCells (project ID: 101084261) is a multi-partner, European consortium, led by University College Cork (UCC). The inspiration for the novel concept driving the *FreeHydroCells* project comes from the combined need to absorb as much solar energy as possible in a materials system while at the same time making sure the clean solar energy can be used productively by humans with minimal loss, in this case to make hydrogen fuel. This idea has functional connotations to a leaf during photosynthesis, since it also absorbs solar energy and water (hydrogen, oxygen) to produce organic growth for plant life, while releasing some of the oxygen as a benign gas by-product. While these processes are very different, the use of solar energy and water to convert the solar energy into another productive form for the user, is alike.

To achieve this, some of *FreeHydroCells'* core project objectives include:

- Developing disruptive methods to overcome the problems and limitations of the present state-of-the-art in photoelectrochemical (PEC) energy harvesting and molecular hydrogen generation.
- Identifying novel, abundant, sustainable and emerging alternative semiconductor material combinations to use in new manufacturing-compatible and low-cost processes, coupled with new scientific engineering methods to maximise energy absorption and minimise conversion loss. These are project cornerstones to move beyond the current state-of-the-art solar-to-hydrogen (STH) efficiency levels.
- Driving the energy harvesting and hydrogen generation by employing built-in electric fields, with an ultimate goal of removing the need for an external power source.

FreeHydroCells is a high-risk/high reward project. If fully successful, *FreeHydroCells* could provide a low-cost, efficient, modular solar-to-chemical energy cell in a novel buried many-junction photoelectrochemical system design that has the potential to significantly impact the global energy supply market and assist in urgently needed climate action.

The consortium includes four teams from UCC, collaborating with organisations from across Europe, including the *Commissariat à l'Energie Atomique et aux Energies Alternatives* (CEA), France*; Rheinisch-Westfaelische Technische Hochschule Aachen* (RWTH), Germany*; Consiglio Nazionale delle Ricerche* (CNR), Italy*; Gesellschaft fur Angewandte Mikro und Optoelektronik mit Beschrankterhaftung GmbH* (AMO), Germany*;* and *BARDS Acoustic Science Labs* (BARDS), Ireland*.* UCC Academy (UCCAC) supports the project as the consortium's research project management and communications partner.

1. Data Summary

Note: This section was developed and will be reviewed by answering the following questions from the Horizon Europe Data Management Plan Template:

- *Will you re-use any existing data and what will you re-use it for? State the reasons if re-use of any existing data has been considered but discarded.*
- *What types and formats of data will the project generate or re-use?*
- *What is the purpose of the data generation or re-use and its relation to the objectives of the project?*
- *What is the expected size of the data that you intend to generate or re-use?*
- *What is the origin/provenance of the data, either generated or re-used?*
- *To whom might your data be useful ('data utility'), outside your project?*

Data in the *FreeHydroCells* project will be generated as part of the consortium's research in the following sequence:

1. Measuring, coding and assessing materials bulk and interfacial chemical, structural and physical properties.
2. Measuring, coding and assessing materials electrical, optoelectronic and photoelectrochemical properties.
3. Data formats transcend from raw measurement data, with coding for assessing responses to measurement for assessing data, to then developing analysis data to further higher level analysis, recording and reporting.

Given the high risk, high reward nature of the project as set out in the Grant Agreement and Consortium Agreement, it contains a strong commitment to intellectual property rights (IPR) and confidentiality. The aim of this commitment is to protect the commercialisation strategy of the project and the beneficiaries' interests in this regard, as well as the EU's commercial competitiveness, given the potential game-changing impact should the project be fully successful. The project relies heavily on exploratory science and is multifaceted in its exploration. The technological relevance of data will only become apparent as the project progresses in both its timeline and in its scientific influence on the technology development. Therefore, by default, all data is initially confidential to protect potential IPR obligations in the project, and at certain decision-points in the timeline – including the end of the project – data will be made non-confidential and open at such times and in such a context that such a decision can be made in full protection of IPR.

This sequencing of data acquisition advances the project towards the following objectives:

- Developing disruptive methods to overcome the problems and limitations of the present state-of-the-art in photoelectrochemical (PEC) energy harvesting and molecular hydrogen generation.
- Identifying novel, abundant, sustainable and emerging alternative semiconductor material combinations to use in new manufacturing-compatible

and low-cost processes, coupled with new scientific engineering methods to maximise energy absorption and minimise conversion loss. These are project cornerstones to move beyond the current state-of-the-art solar-to-hydrogen (STH) efficiency levels.

- Driving the energy harvesting and hydrogen generation by employing built-in electric fields, with an ultimate goal of removing the need for an external power source.

As agreed by each consortium partner in the *FreeHydroCells* Consortium Agreement, no background (defined as data, know-how or information) is needed for the implementation of the project, i.e. no existing data will be reused. The types of data produced by *FreeHydroCells* may include but are not limited to the following:

Table 1. Description of data associated with the FreeHydroCells project

Data type	Origin (Work Package)	Format(s)	Expected size
ASCII	WP 1 – WP 4 (measurement, assessment)	.dat; .txt; .csv	kB
Programming	WP 1 – WP 4 (coding, assessment) simulation COMSOL Multiphysics®	.c, .cpp; .h, .step, .iges, .mph, .sldprt	MB
Origin	WP 1 – WP 4 (analysis)	.ogs; .opg	MB
Image	WP 1 – WP 5 (analysis)	.png; .bmp; .tif; .jpg; .gif	MB
Video	WP 1 – WP 5 (analysis)	.mp4; .mov; .wmv	kMB
Sound	WP 1 – WP 5 (analysis)	.wav; .mp3	kMB
Processing	WP 1 – WP 5 (analysis, recording and reporting)	.doc(x); .xls(x); .ppt(x); .pdf; .zip; .7zip; .odc; .rtf; .ods; .html	MB
EndNote	WP 1 – WP 5 (analysis, recording and reporting)	.enl(x); .lib; .rmd; .pdt	MB
OneNote	WP 1 – WP 5 (analysis, recording and reporting)	.one	MB

It is envisaged that non-confidential data arising from the *FreeHydroCells* project will be useful for a wide range of applications by research groups or SMEs for academic, educational, or industrial research purposes, particularly for hydrogen energy harvesting and storage. The IPR strategy of the project will deem data non-confidential at certain decision-points in the timeline of the project or at the end of the project. The project is scientifically exploratory and multifaceted, and as a result, scientific data generated in the project cannot be immediately interpreted into technological IPR value until other data becomes available during the timeline. For this reason, and to protect the beneficiaries' interests of IPR and commercialisation, the data will be held as confidential until a decision-point is reached in the timeline of the project when the data's technological IPR worth can be evaluated and deemed non-confidential and open access should the data be determined as having no technological IPR value for

the project's commercialisation objectives. This also protects the EU's competitiveness in the commercialisation and exploitation of Horizon Europe research activities.

2. FAIR data

2.1 Making data findable, including provisions for metadata

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *Will data be identified by a persistent identifier?*
- *Will rich metadata be provided to allow discovery? What metadata will be created? What disciplinary or general standards will be followed? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.*
- *Will search keywords be provided in the metadata to optimize the possibility for discovery and then potential re-use?*
- *Will metadata be offered in such a way that it can be harvested and indexed?*

To support the findability of *FreeHydroCells*' research outputs, persistent and unique identifiers will be used for all non-confidential data in line with common practices of materials science for the relevant output type. All non-confidential data from equipment and instrumentation (raw data direct from experiments) will be curated, saved and organised for accessibility in the open access repository Zenodo which assigns DOIs to all data uploads.

Each dataset will be supported with contextual documentation and metadata. The metadata file will contain the research data's PID, creating a unique and persistent link between the two. A *FreeHydroCells* 'readme' file template has been created which will be completed and accompanied with all data as the minimum metadata provided (Appendix 1). Where applicable, the metadata will include persistent identifiers for related publications and other research outputs.

2.2 Making data accessible

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

Repository:

- *Will the data be deposited in a trusted repository?*
- *Have you explored appropriate arrangements with the identified repository where your data will be deposited?*
- *Does the repository ensure that the data is assigned an identifier? Will the repository resolve the identifier to a digital object?*

Data:

- *Will all data be made openly available? If certain datasets cannot be shared (or need to be shared under restricted access conditions), explain why, clearly separating legal and contractual reasons from intentional restrictions. Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if opening*

their data goes against their legitimate interests or other constraints as per the Grant Agreement.

- *If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g. patents), specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.*
- *Will the data be accessible through a free and standardized access protocol?*
- *If there are restrictions on use, how will access be provided to the data, both during and after the end of the project?*
- *How will the identity of the person accessing the data be ascertained?*
- *Is there a need for a data access committee (e.g. to evaluate/approve access requests to personal/sensitive data)?*

Metadata:

- *Will metadata be made openly available and licenced under a public domain dedication CC0, as per the Grant Agreement? If not, please clarify why. Will metadata contain information to enable the user to access the data?*
- *How long will the data remain available and findable? Will metadata be guaranteed to remain available after data is no longer available?*
- *Will documentation or reference about any software be needed to access or read the data be included? Will it be possible to include the relevant software (e.g. in open source code)?*

In line with the FAIR Principles, *FreeHydroCells* will endeavour to make research data and outputs as open as possible but as closed as necessary. Accessibility to some outputs may be restricted in cases where open access would:

- be against the beneficiary's legitimate interests, including regarding commercial exploitation, or
- be contrary to any other constraints, in particular the EU competitive interests or the beneficiary's obligations under the project's Grant Agreement.

All data generated by the consortium and any third-party data used by the project will be recorded in a data register. As part of this register, data that will not be made open access will be recorded separately, the status of which will be reviewed regularly as part of Executive Board meetings. All closed datasets will have clear statements of why access is withheld and, whenever possible, guidelines on when access might be possible. For example, there might be certain conditions for accessing the dataset or an embargo period that lifts once the data is protected by a patent. Data that will not be made open access will be reported in Table 2 (below).

To contextualize the FAIR Principles with the IPR strategy of the project, data will be deemed non-confidential at certain decision-points in the timeline of the project or at the end of the project. The project is scientifically exploratory and multifaceted, and as a result, scientific data generated in the project cannot be immediately interpreted into technological IPR value until other data becomes available during the timeline. For this reason, and to protect the beneficiaries' interests of IPR and commercialisation, the data will be held as confidential until a decision-point is reached in the timeline of the project when the data's technological IPR worth can be evaluated and deemed non-confidential and open access should the data be determined as having no

technological IPR value for the project's commercialisation objectives, as set out in the IPR obligations in the Grant Agreement and Consortium Agreement.

This also protects the EU's competitiveness in the commercialisation and exploitation of Horizon Europe research activities.

Table 2. Description of data, reports or documents that will not be made open access

Consortium member	Type of data	Reason for withholding access	Date
UCC	Novel gas collection and electrolyte flow system	IPR development and protection	21/02/2024

All project data which is not confidential will be made openly available in an accessible format. This will enable the scientific community and others to access the data for educational, industrial or academic research purposes. All research data from the *FreeHydroCells* project will be accessible through the *FreeHydroCells* Zenodo repository community page. Zenodo is a well-established open access repository for scientific data with the option for up to 25 years storage. All metadata is openly available under CC0 license, and all open content is openly accessible through open APIs. Zenodo does not impose any requirements on format, access restrictions or license; all data uploads will have an assigned DOI.

Once data and other resources have been assigned DOIs, the DOIs will be used to create persistent links for all *FreeHydroCells* research outputs. The same process will apply if an alternative repository is chosen. Where datasets are also uploaded to institutional or national repositories, it is important that only one DOI is assigned to this dataset. Datasets can be added to Zenodo with existing DOIs, or else, Zenodo can generate a DOI where one does not already exist for the dataset. Research outputs published on the *FreeHydroCells* Zenodo repository will also be linked to the *FreeHydroCells* OpenAIRE project page, to maximise the visibility of research outputs, and ensure automatic syncing with the European Commission funding portal. A link to the project's Zenodo and OpenAIRE pages is included on the *FreeHydroCells* website under the 'Research' page.

If partners select a repository other than Zenodo for uploading data, it must comply with the minimum criteria outlined in Science Europe – Practical Guide to the International Alignment of Research Data Management.

2.3 Making data interoperable

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *What data and metadata vocabularies, standards, formats or methodologies will you follow to make your data interoperable to allow data exchange and re-use within and across disciplines? Will you follow community-endorsed interoperability best practices? Which ones?*

- *In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? Will you openly publish the generated ontologies or vocabularies to allow reusing, refining or extending them?*
- *Will your data include qualified references[1] to other data (e.g. other data from your project, or datasets from previous research)?*

FreeHydroCells' project data, including raw numerical data and images, will be made interoperable where feasible and to whichever level is possible. The instruments currently in place to conduct the research experimentation in *FreeHydroCells* have the capability to output all data with full metadata on the experimental conditions. This form of data will be saved in carefully designated folders on the hosting server with explanations of measurements and direct links to data in the associated publication. Software, instrument and measurement details for each file will be stored in an associated 'readme' file with the raw tabular text files. As yet, there is no global standard for the many forms of research instrumentation output to enable all numerical data to be identically structured and formatted as a file. In these cases, the *FreeHydroCells* 'readme' file template will be completed and included with the data (Appendix 1). This readme file will include the key information needed to reproduce the data analysis, such as the software packages used, the relationship between key scripts and data files, and overall steps in the analysis process. Every effort will be made to contextualise the data to make it as interoperable and reproduceable as possible, to within the limits of the absence of global standards. All data and metadata will therefore be provided in this context in an accessible language that is commonly used in the field and shared in widely used and open file formats such as .csv, .txt, .docx, and .xlsx.

2.4 Increase data re-use

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *How will you provide documentation needed to validate data analysis and facilitate data re-use (e.g. readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, units of measurement, etc.)?*
- *Will your data be made freely available in the public domain to permit the widest re-use possible? Will your data be licensed using standard reuse licenses, in line with the obligations set out in the Grant Agreement?*
- *Will the data produced in the project be useable by third parties, in particular after the end of the project?*
- *Will the provenance of the data be thoroughly documented using the appropriate standards?*
- *Describe all relevant data quality assurance processes.*

[1] A qualified reference is a cross-reference that explains its intent. For example, X is regulator of Y is a much more qualified reference than X is associated with Y, or X see also Y. The goal therefore is to create as many meaningful links as possible between (meta)data resources to enrich the contextual knowledge about the data. (Source: https://www.go-fair.org/fair-principles/i3-metadata-include-qualified-references-metadata/)

Further to the FAIR principles, DMPs should also address research outputs other than data, and should carefully consider aspects related to the allocation of resources, data security and ethical aspects.

All scientific publications from the *FreeHydroCells* project will include a data availability statement that directs readers to the relevant open access data repository or explains why the data is not available. The data availability statement will take one of the following forms:

1. "The datasets generated during and/or analysed during the current study are available in the *FreeHydroCells* Zenodo repository, https://zenodo.org/communities/freehydrocells."
2. "The datasets generated during and/or analysed during the current study are not publicly available due to [REASON(S) WHY DATA ARE NOT PUBLIC]."
3. "Data sharing not applicable to this article as no datasets were generated or analysed during the current study."

In line with the FAIR Principles, a usage license will be attached to all published datasets detailing the permissions and restrictions associated with each dataset. The choice of license will be at the discretion of the individual researcher, but *FreeHydroCells* recommends open licences with as few restrictions as possible such as Creative Commons Attribution 4.0 International (CC-BY 4.0). A citation will be included in the associated metadata to encourage the correct attribution when data is reused.

In the situation where data associated with a publication is under embargo, the length of the embargo period will be stated as part of the bibliographic metadata associated with the publication in the Zenodo repository. Once the embargo period is finished, it too will be released under an Open License.

It is the intention of *FreeHydroCells* that all FAIR data outputs will remain available for reuse and verification for a minimum of 10 years and subsequently as long as technically possible. This is in accordance with the UCC Code of Research, which requires a 10-year retention of all research data and records. Zenodo commits to a retention period of 'the lifetime of the repository' which is currently a minimum of 20 years.

Results arising from the project remain the property of the beneficiary that has generated it, as is the general rule in Horizon Europe projects. Each Beneficiary may however transfer ownership of its own results following the procedures of the Grant Agreement. Further details on the ownership of results is covered in Section 8 of the *FreeHydroCells* Consortium Agreement.

3. Other research outputs

Note: This section was developed and will be updated by considering the following points from the Horizon Europe Data Management Plan Template:

In addition to the management of data, beneficiaries should also consider and plan for the management of other research outputs that may be generated or re-used throughout their projects. Such outputs can be either digital (e.g. software, workflows, protocols, models, etc.) or physical (e.g. new materials, antibodies, reagents, samples, etc.).

Beneficiaries should consider which of the questions pertaining to FAIR data above, can apply to the management of other research outputs, and should strive to provide sufficient detail on how their research outputs will be managed and shared, or made available for re-use, in line with the FAIR principles.

All other research outputs from the project including software, protocols, conference presentations etc., will be made available on the project's Zenodo page, unless it is to be protected for exploitation purposes. Research outputs will also feature on the project website on the 'Research' page. Snapshots of the project's website are being captured on a regular basis (6-monthly intervals) via the Internet Wayback Machine. This will ensure that a thorough, permanent archive of the website is retained after the project ends.

4. Allocation of resources

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *What will the costs be for making data or other research outputs FAIR in your project (e.g. direct and indirect costs related to storage, archiving, re-use, security, etc.) ?*
- *How will these be covered? Note that costs related to research data/output management are eligible as part of the Horizon Europe grant (if compliant with the Grant Agreement conditions)*
- *Who will be responsible for data management in your project?*
- *How will long term preservation be ensured? Discuss the necessary resources to accomplish this (costs and potential value, who decides and how, what data will be kept and for how long)?*

The **Project Coordinator** will assume overall responsibility for data management and quality assurance in the project but will be assisted in this task by other members of the consortium. The Project Manager, Work Package Leaders and Executive Board will have separate responsibilities around data management on the project, as follows:

The **Project Manager** is responsible for:

- Developing and updating the DMP
- In collaboration with the Work Package Leader and data owner, uploading all data from the project to the Zenodo platform or national/subject specific repositories if applicable
- Ensuring that all relevant project data is logged in OpenAIRE and linked properly to the *FreeHydroCell*s project
- Monitoring data management activities on the project and providing solutions for specific issues
- Maintaining *FreeHydroCells* profile pages on both the Zenodo and OpenAIRE platforms
- Ensuring that the *FreeHydroCells* website is up-to-date with links to all project publications and data repositories

The **Work Package Leaders** are responsible for:

- Monitoring data management activities at Work Package level
- Creating data management plans at the Work Package level as necessary, in order to capture detailed metadata and standard operating procedures that enable data reusability – (recommended to use Science Europe DMP template available here[2])
- Ensuring that the data produced at Work Package level is made available in a timely manner according to the guidelines outlined in this DMP

[2] Science Europe - Practical Guide To The International Alignment Of Research Data Management

In *FreeHydroCells*, the Work Package Leaders are as follows: Prof Salvatore A. Lombardo, CNR (WP1 Leader), Dr Ulrich Plachetka, AMO (WP2 Leader), Ms Estelle Le Baron, CEA (WP3 Leader) and Dr Ailbe Ó Manacháin, UCC (WP4 & WP5 Leader).

The **Executive Board** is responsible for:

- Monitoring all results and project outcomes for publication and/or IP potential
- Delaying or vetoing publication of results that may compromise execution of intellectual property rights claims

Each beneficiary is responsible for their own data management and deciding what needs to be retained. Researchers on the *FreeHydroCells* project should consult with their Work Package leader or Coordinator and ensure that they comply with their own institutional regulations. Curating and preserving data takes time, so criteria such as those outlined below should be considered in the decision-making process:

- Does the data support validation of your findings?
- Do the data outputs have long-term value?
- Can the data be re-used?
- Is it necessary to keep the data as evidence or for legal reasons?

FreeHydroCells data stored locally should be retained for a minimum of 5 years after the final project payment, since a review or audit can be instigated by the European Commission up to 2 years after the final project payment and an impact evaluation up to 5 years after the final project payment. The *FreeHydroCells* Grant Agreement also specifies record keeping for a period of 5 years after the final payment. Beyond 5 years, *FreeHydroCells* data stored locally should be stored in accordance with institution or national requirements. For example, the UCC Code of Research requires a 10-year retention of all research data and records.

Once a decision has been made to destroy the data, it should be done thoroughly and completely removing copies from personal PCs, external hard drives and cloud servers.

5. Data security

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *What provisions are or will be in place for data security (including data recovery as well as secure storage/archiving and transfer of sensitive data)?*
- *Will the data be safely stored in trusted repositories for long term preservation and curation?*

During active research, data security, back-up and recovery plans will be the responsibility of each individual beneficiary. Each Work Package Leader will engage with their local IT team to ensure that adequate back-ups and recovery plans are in place for any data that may be needed for future research or audits.

Each beneficiary is responsible for responding appropriately to any incident of a potential or actual data breach. The beneficiary that receives notification of the breach (potential or actual) or otherwise becomes aware of the breach is responsible for leading the response and managing the breach event. Without undue delay, the beneficiary should:

- Complete a risk assessment in line with their organisation's policy
- Notify their organisation's data protection office (or other as appropriate) to review the risk assessment
- Notify the *FreeHydroCells* Project Coordinator (Dr Ailbe Ó Manacháin, UCC) and Project Manager (Anna Power, UCCAC)
- If appropriate, convene a meeting to be held between affected members of the consortium (including their data protection staff and partner leads), with the Project Coordinator and Project Manager also in attendance. The meeting objectives will be as follows:
    - Review and sign off on the risk assessment.
    - Establish and assign actions relating to the two primary obligations relating to the GDPR:
        (a) Notifying the Data Protection Committee in Ireland and any other relevant bodies of the personal data breach, unless it is possible to demonstrate that the breach is unlikely to result in a risk to data subjects, and
        (b) Communicating the breach occurrence to relevant data subjects, when the breach is likely to result in a high risk to data subjects
- Notify all consortium members of the breach.
- Record and store in line with appropriate retention policies, the following information:
    - The risk assessment
    - A detailed description of:
        - how the breach occurred
        - how and when they became aware of the breach, and
        - the source of the breach

- How many data subjects are affected
- The data categories (types) affected
- The immediate actions that were undertaken upon discovery of the breach
- Any future actions to be undertaken and related timelines
- If all relevant information has been retained
- Data processing records
- Any other relevant documentation, including those on policies and procedures

Without undue delay, the Project Manager will:

- Support the affected beneficiary with the documentation and implementation of agreed project-level immediate and future actions responding to the breach event (potential or actual) arising from the meeting convened with affected members of the consortium. Relevant immediate actions may include the following:
  - Restricting access to the project's digital collaboration spaces such as Teams and SharePoint
  - Removing individuals from the project's correspondence list(s)
- Document the breach event in the FreeHydroCells Risk Register

Without undue delay, each affected member of the consortium will:

- Facilitate the meeting request from the affected beneficiary
- Follow their organisation's protocols, policies and procedures related to breach events (potential or actual)
- Support the affected beneficiary with the implementation of any agreed project-level immediate and future actions responding to the breach event (potential or actual)

As mentioned in previous sections of this DMP, Zenodo is the repository of choice for making data from the *FreeHydroCells* project open access. Zenodo commits to a retention period of 'the lifetime of the repository' which is currently a minimum of 20 years. It is also GDPR-compliant and has an extensive privacy policy. User data may be exported from the platform at any time (on request), and the account deactivated or deleted. Research data on Zenodo can be withdrawn in accordance with Zenodo's withdrawal policies, but some metadata records may have to remain.

6. Ethics

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

- *Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).*
- *Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?*

The objectives, methodology and likely impact of the *FreeHydroCells* project do not raise any ethical concerns, as it does not encroach on any of the following areas of concern: humans, cell/tissues, personal data, animals, non-EU countries, environment, health and security, artificial intelligence, other ethical issues, and crosscutting issues.

The *FreeHydroCells* project will adhere to all ethics and research integrity policies described in the Grant Agreement (Article 14), as well as abide by UCC's Code of Research Conduct. All partners will be proactively encouraged and supported in their own best practices for research integrity.

Any personal data (either from researchers involved in the project or from individuals external to the project) will be processed in compliance with EU and national law on data protection. This personal data is kept to the absolute minimum required and is always processed with informed consent. For communication activities that may process personal data (such as enquiries from the project website), UCC Academy is the data controller and in full compliance with EU data protection guidelines. The *FreeHydroCells* privacy policy is available through the project website.

7. Other issues

Note: This section was developed and will be updated by answering the following questions from the Horizon Europe Data Management Plan Template:

Do you, or will you, make use of other national/funder/sectorial/departmental procedures for data management? If yes, which ones (please list and briefly describe them)?

Any publications authored by *FreeHydroCells* personnel from UCC must be made open access with Cork Open Research Archive (CORA).

8. Further support on Data Management

- *FreeHydroCells* community page on Zenodo
- The Research Data Service in UCC Library will continue to support the on-going development of a tailored DMP for this project and the subsequent FAIR sharing of research outputs post project. Each partner is also encouraged to contact data management support services within their own university or research institution.
- The Research Data Alliance provides a Metadata Standards Directory that can be searched for discipline-specific standards and associated tools.
- The EUDAT B2SHARE tool includes a built-in license wizard that facilitates the selection of an adequate license for research data.
- Other resources include:
    - How to make your data FAIR? (OpenAIRE)
    - How to apply licenses for Research Data (OpenAIRE)
    - Zenodo FAQ

Appendices

Appendix 1: *FreeHydroCells* Readme File Template

This < >.txt file was generated on < > by < >

ABOUT FreeHydroCells

FreeHydroCells (project ID: 101084261) is a multi-partner, European consortium, led by University College Cork (UCC). *FreeHydroCells* aims to provide a low-cost, efficient, modular solar-to-chemical energy cell in a novel buried many-junction photoelectrochemical system design that has the potential to significantly impact the global energy supply market and assist in urgently needed climate action.

The consortium includes four teams from across UCC, collaborating with organisations from across Europe, including the *Commissariat à l'Energie Atomique et aux Energies Alternatives* (CEA), France*; Rheinisch-Westfaelische Technische Hochschule Aachen* (RWTH), Germany*; Consiglio Nazionale delle Ricerche* (CNR), Italy*; Gesellschaft fur Angewandte Mikro und Optoelektronik mit Beschrankterhaftung GmbH* (AMO), Germany*;* and *BARDS Acoustic Science Labs* (BARDS), Ireland. UCC Academy (UCCAC) will support the project as the consortium's research project management and communications partner.

More info: https://cordis.europa.eu/project/id/101084261
Project website: https://freehydrocells.eu/

GENERAL DATASET INFORMATION

1. Title of Dataset:
< >

2. Author Information
    A. Principal Investigator Contact Information
        Name: < >
        Institution: < >
        Address: < >
        Email: < >

    B. Associate or Co-investigator Contact Information
        Name: < >
        Institution: < >
        Address: < >
        Email: < >

3. Date of data collection (single date, range, approximate date):
< >

4. Geographic location of data collection:
< >

DATA & FILE OVERVIEW

1. File List:
< >

2. Relationship between files, if important:
< >

3. Additional related data collected that was not included in the current data package:
< >

4. Are there multiple versions of the dataset?
< >

A. If yes, name of file(s) that was updated:
i. Why was the file updated?
ii. When was the file updated?

METHODOLOGICAL INFORMATION

1. Description of methods used for collection/generation of data:
< >

2. Methods for processing the data:
< >

3. Instrument- or software-specific information needed to interpret the data:
< >

4. Standards and calibration information, if appropriate:
< >

5. Environmental/experimental conditions:
< >

6. Describe any quality-assurance procedures performed on the data:
< >

7. People involved with sample collection, processing, analysis and/or submission:
< >

DATA-SPECIFIC INFORMATION FOR: [FILENAME]

<repeat this section for each dataset, folder or file, as appropriate>

1. Number of variables:
< >

2. Number of cases/rows:
< >

3. Variable List:
<list variable name(s), description(s), unit(s)and value labels as appropriate for each>
< >

4. Missing data codes:
<list code/symbol and definition>
< >

5. Specialized formats or other abbreviations used:
< >