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Data Management Plan (DMP)

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ABBREVIATIONS

CA: Consortium Agreement	H2020: Horizon 2020
DM: Data Management	IPR: Intellectual Property Rights
DMP: Data Management Plan	PC: Project Coordinator
EC: European Commission	SI units: The International System of Units
GA: General Assembly	TL: Task Leader
GDPR: General Data Protection Regulation	WPC: Work-Package Coordinator

PARTNERS SHORT NAMES

APTL: Aerosol and Particle Technology Laboratory
DLR: German Aerospace Center, Deutsches Zentrum fuer Luft – und Raumfahrt EV
CIEMAT: Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas
HyGear: HyGear B.V.

EngiCer: ENGICER SA
SUPSI: Scuola Universitaria Professionale della Svizzera Italiana
CEA: France's Alternative Energies and Atomic Energy Commission
Abengoa: Abengoa Innovacion Sociedad Anonima

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PUBLISHABLE SUMMARY

The HYDROSOL-Beyond Data Management Plan (DMP) describes the procedures used in the project for the handling of project's data during and after the end of the project, discusses what kind of data will be collected, processed, and synthesized, which methodology and standards will be applied during data collection and handling, elaborates procedures for sharing and open access to the HYDROSOL-Beyond data and for curation and preservation of the data. Furthermore, procedures in relation to the General Data Protection Regulation (GDPR) are defined and how HYDROSOL-Beyond ensures the protection of the involved companies' data, information and privacy rights.

As part of Horizon 2020, the HYDROSOL-Beyond project participates in a pilot action on open research data. The aim is to provide indications as to what kind of data the project will collect, how the data will be preserved and which sharing policies will be adopted towards making these data readily available to the research community. The project's efforts in the area of open research data are outlined giving particular attention to the following issues:

- The types of open and non-open data that will be generated or collected by the consortium, via experimental campaigns and research, during the project's lifespan;
- The technologies and infrastructures that will be used to securely preserve the data long-term;
- The standards used to encode the data;
- The data exploitation plans;
- The sharing/access policies applied to each data-set.

The plan can be considered as a checklist for the future and as a reference for the resources allocation related to data management.

The content of this document was facilitated by the OpenAIRE proposed web tool “DMPonline” (<https://dmponline.dcc.ac.uk>) and was built upon the input of all project partners. A short questionnaire, outlining the DMP's objectives and stating the required information in a structured manner, has been edited by HYDROSOL-Beyond Coordinator and disseminated for consideration to the partners. The compiled answers were integrated into a coherent plan.

The present DMP will evolve as the project progresses in accord with the project's efforts in this area. At any time, the DMP will reflect the current state of the consortium agreement (CA) regarding data management, exploitation and protection of rights and results.

HYDROSOL-BEYOND DMP

- Project Name:** Thermochemical HYDROgen production in a SOLar structured reactor: facing the challenges and beyond
- Description:** A scientific endeavor aiming at the utilization of concentrated solar thermal power for the production of Hydrogen from the dissociation of water via the redox-pair-based thermochemical cycles
- Funder:** Fuel Cells and Hydrogen 2 Joint Undertaking with support of the EU H2020

INTRODUCTION

Collaborative research projects such as HYDROSOL-Beyond usually produce large and diverse sets of data, e.g. data deriving from laboratory testing, field studies and observations, designs, simulation etc. The purpose of the current Data Management Plan (DMP) is to provide an analysis of the main elements of the Data Management (DM) policy that will be followed by the consortium during and after the HYDROSOL-Beyond with regard to the project's research data.

The DMP covers the complete research data life cycle. It describes the types of research data that will be generated or collected during the project, the standards that will be used, how the research data will be preserved and what parts of the datasets will be shared for verification or reuse.

The DMP will be constantly updated in order to keep up with the changes taking place during the project, such as dataset updates or changes in Consortium policies. The current deliverable is the 1st version of the DMP, delivered in Month 7 of the project. It includes an overview of the datasets to be produced by the project, and the specific conditions that are attached to them.

The following section of the DMP provides an overview of what data will be collected and how this will be accomplished; information over documentation and metadata; information regarding policies over ethical and Intellectual Property Rights (IPR) issues management; details about the measures taken to ensure safe storage of data and backup; the criteria for selection of data a) to be preserved for long-term and b) to be shared along with a data sharing plan, while at the end of the report there is an allocation of resources and responsibilities concerning DM.

DATA COLLECTION

Management of ethical issues

During the HYDROSOL-Beyond project four main types of raw data will be generated mainly through design and theoretical calculations/simulations, observation, experimental measurements and campaigns on the solar platform:

- Visual Data:** Images and videos generated from relevant optical instrumentation such as microscopy, as well as from cameras in order to record e.g. macroscopic characteristics of samples, experimental setups, testing field before, during and after operation, etc.
- Numerical Data:** Spreadsheets and databases with data collected within the project e.g. during samples development, samples evaluation, or data generated via theoretical calculations
- Designs:** Computer Aided Designs (CAD) with information of the components developed/used during the project

Text Data: Documents with laboratory notes, correspondence etc.

In addition to the raw data, the consortium will produce files with processed data (additional numerical data files) as well as other secondary text data outputs, such as technical reports, scientific articles, presentations, etc. The type of data expected to be collected for the scopes of the HYDROSOL-Beyond project, are summarized per partner in Table 1 below.

In all cases, the consortium will pay attention so that chosen file formats and the employed software will be in line with the expertise of the consortium staff, i.e. standardized and interchangeable file formats will be preferred, in order to enable both data sharing and long-term access of data. Actually, part of the HYDROSOL-Beyond consortium, is well aware of how important the latter two aspects are, since the HYDROSOL-Beyond project is the latest version of the so-called HYDROSOL-technology – *a technology developed through a series of collaborative research projects* – dating back to 2002. From the latter, it becomes obvious that the consortium will have access to past collected and processed data that will be used as reference. In such cases, the consortium will ensure that any past data employed does not contradict with copyright nor IPR issues. Besides the consortium related data, each HYDROSOL-Beyond partner will create its own database with relevant scientific articles and data from third parties reporting on the current state-of-the-art and relevant to this project scientific findings.

The HYDROSOL-Beyond consortium expects that the total volume of the data generated over the course of the project will be between 100GB and 1TB, with the majority of the volume occupied by experimental results (both raw and processed data), and about a fourth to a third of the total volume occupied by secondary data outputs (reports, deliverables, dissemination activities, etc.).

Table 1. Type of data and the respective file formats expected to be collected and generated during the HYDROSOL-Beyond project, per Partner.

Type of data and respective file format	APTL	DLR	CIEMAT	HyGear	EngiCer	SUPSI	CEA	Abengoa
Tabular data with extensive metadata; variable labels, code labels, and defined missing values (SPSS portable format (.por), delimited text and command ('setup') file (SPSS, Stata, SAS, etc.), structured text or mark-up file of metadata information, e.g. DDI XML file, proprietary formats of statistical packages: SPSS (.sav), Stata (.dta), MS Access (.mdb/.accdb), data from process interface (.vi/.vit)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tabular data with minimal metadata; column headings, variable names comma-separated values (.csv), tab-delimited file (.tab), delimited text with SQL data definition statements , delimited text (.txt) with characters not present in data used as delimiters, MS Excel (.xls/.xlsx) , MS Access (.mdb/.accdb), dBase (.dbf), OpenDocument Spreadsheet (.ods)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Geospatial data; vector and raster data ESRI Shapefile (.shp, .shx, .dbf, .prj, .sbx, .sbn optional), geo-referenced TIFF (.tif, .tiff), CAD data (.dwg), tabular GIS attribute data, Geography Markup Language (.gml), ESRI Geodatabase format (.mdb), MapInfo Interchange Format (.mif) for vector data,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Type of data and respective file format	APTL	DLR	CIEMAT	HyGear	EngiCer	SUPSI	CEA	Abengoa
Keyhole Mark-up Language (.kml), Adobe Illustrator (.ai), CAD data (.dxf or .svg), binary formats of GIS and CAD packages								
Textual data Rich Text Format (.rtf), plain text, ASCII (.txt), eXtensible Mark-up Language (.xml) text according to an appropriate Document Type Definition (DTD) or schema, Hypertext Mark-up Language (.html), MS Word (.doc/.docx) , NUD*IST, NVivo and ATLAS.ti	☒	☒	☒	☒	☒	☒	☒	☒
Image data TIFF 6.0 uncompressed (.tif) , JPEG (.jpeg, .jpg, .jp2) , GIF (.gif) , TIFF other versions (.tif, .tiff) , RAW image format (.raw), Photoshop files (.psd), BMP (.bmp) , PNG (.png) , Adobe Portable Document Format (PDF/A, PDF) (.pdf)	☒	☒	☒	☒	☒	☒	☐	☒
Audio data Free Lossless Audio Codec (FLAC) (.flac), MPEG-1 Audio Layer 3 (.mp3), Audio Interchange File Format (.aif), Waveform Audio Format (.wav)	☐	☐	☐	☐	☐	☐	☐	☐
Video data MPEG-4 (.mp4) , OGG video (.ogv, .ogg), motion JPEG 2000 (.mj2), AVCHD video (.avchd)	☒	☐	☒	☐	☐	☐	☐	☐
Documentation and scripts Rich Text Format (.rtf), PDF/UA, PDF/A or PDF (.pdf) , XHTML or HTML (.xhtml, .htm), OpenDocument Text (.odt), plain text (.txt), MS Word (.doc/.docx) , MS Excel (.xls/.xlsx) , XML marked-up text (.xml) according to an appropriate DTD or schema, e.g. XHTML 1.0	☐	☒	☒	☒	☒	☒	☒	☒
Experimental data Acquisition Data (.tdms)	☐	☒	☐	☐	☐	☐	☐	☐
Life cycle assessment (Simapro files)	☐	☐	☐	☐	☐	☐	☒	☐
Simulations input/output data; mesh data simulation text data (.cas, .dat, .txt), mesh data (.msh).	☒	☐	☐	☐	☐	☒	☐	☐

As described in Table 1, diverse types of data are expected to occur during the project. A vast number of those, will be instrument-generated data and will be the result of experimental campaigns, carefully designed either from the partner directly involved, or by more than one partners as a result of technical meetings or written communication, in order to increase the quality of the information produced.

In all cases, it will be assured that the foreseen experimental protocols are followed in order to render the procedures repeatable and produce valid results. Experimental protocols, will also predict/assure that the preventive maintenance plans of the instrumentation are followed. In the preventive maintenance processes such as instruments calibration, repeat samples or measurements, standardized data capture or recording, data entry validation, etc. will be included. A proper experimental protocol will also define what should be logged per case (e.g. logging of date, sample details, operator, applied conditions, etc.), the format of the filename of the generated data as well as its storage location.

In general, irrespectively of the instrumentation employed or the file format of the saved data, the following rules are generally accepted and irrevocably followed:

- The filenames of the raw data are consistent, descriptive and follow certain naming conventions
- Copies of the raw data are saved to central servers with sufficient provision of backup
- The raw data under no circumstances are modified
- The reported parameters in the raw data are explicitly stated preferably in SI units
- Both the raw data as well as the occurring processed data are properly managed in properly named folders/folder structures, accompanied by self-explanatory “readme” files. This way any involved user may easily identify quickly the data, understand and reuse/process it. Well-ordered data prevent inconsistencies and data loss and minimize process timing that may occur from poor version control or from duplicate files.

DOCUMENTATION AND METADATA

The experimental results that will occur during the project, will be recorded in spreadsheets stored in central servers (within the institution/company generating the data). For the aforementioned metadata, control fields and standard terminology will be used in order to facilitate data preservation and enable fast retrieving and data indexing. In general, the following metadata elements will be recorded: Project Title, Date, Short description with keywords or subjects describing the content of the data, a unique number or alphanumeric string used to identify the data, etc.

ETHICS AND LEGAL COMPLIANCE

Management of ethical issues

Research in HYDROSOL-Beyond does not involve research on human participants that could arise ethical or privacy issues.

Management of Copyright and IPR issues

The HYDROSOL-Beyond consortium has already prepared a commonly accepted Consortium Agreement (CA) where the management of issues such as possession of copyright and IPR of the data pre-existing the Project as well as the ones that will be collected/created, along with the license(s) for their use and reuse, is already regulated.

DATA STORAGE AND BACKUP

Data Security Measures

The majority of the partners involved in HYDROSOL-Beyond project – *and in particular the partners responsible for conducting the predicted experimental campaigns* – have within their institutions/organizations dedicated IT services/teams that are responsible for the security and storage of data at the local servers and in all cases, the following conditions are ensured:

- The physical security, network security and security of computer systems and files to prevent unauthorized access or unwanted changes to data, disclosure or destruction of data.
- Regular backups to protect against accidental or malicious data loss

In Table 2, measures employed by each HYDROSOL-Beyond partner in order to avoid data loss and ensure safe and secure storage are briefly presented.

Table 2. Data security measures employed by each HYDROSOL-Beyond Partner to ensure safe storage and avoid data loss.

Data Security Measures	APTL	DLR	CIEMAT	HyGear	EngiCer	SUPSI	CEA	Abengoa
Physical security								
Controlling access to buildings, rooms, cabinets where data, computers, media or hardcopy materials are held	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Logging the removal of, and access to, media or hardcopy material in store rooms	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Network security								
Data stored on servers that host internet services (not connected to an external network)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Firewall protection and security-related upgrades and patches to operating systems to avoid viruses and malicious code	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Security of computer systems and files								
Locking computer systems with a password	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ensuring computer software is up-to-date	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Protecting servers by power surge protection systems through line-interactive uninterruptible power supply (UPS) systems	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Implementing password protection and controlled access to data files, for example 'no access', 'read only', 'read and write' or 'administrator-only' permission	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Controlling access to files, folders or entire hard drives encryption	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Not sending personal or confidential data via email or other file transfer means without first encrypting them	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Destroying data in a consistent manner when needed: deleting files and reformatting a hard drive will not prevent the possible recovery of data; consult our guidance on data disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Imposing non-disclosure agreements for managers or users of confidential data	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Security of computer systems and files								
Use of a generic (free or not) cloud-based storage system (e.g. Google Drive, Dropbox, OneDrive, iCloud, YouSendIt) for permanent storage of data.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Use of an individual contact/SLA cloud-based secure storage system for permanent storage.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Data backups								
Available System for backups	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Backups are done manually e.g. after every change to data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Backups are done automatically at regular intervals.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Backups are kept on networked hard drives	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Data Security Measures	APTL	DLR	CIEMAT	HyGear	EngiCer	SUPSI	CEA	Abengoa
Backups are kept on offline storage systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Backups are stored to another location	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Backups are checked for completeness and integrity	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

In addition to the local storage area of each HYDROSOL-beyond Partner, the Partners are also given the opportunity to use a dedicated area created in the project's website (<http://www.hydrosol-beyond.certh.gr>) for:

- Temporary storage of commonly used research data collected during the HYDROSOL-Beyond project,
- Safe exchange of research data,
- Safe storage and exchange of final data files such as reports, technical presentations, minutes, etc.

The website – including the data uploaded by the partners – is hosted at the Coordinator's (APTL/CPERI/CERTH) data server. Access to the restricted area is given only by the Website Administrator, i.e. the Coordinator, upon creation of a new Member/User and is intended only for the project consortium. For security purpose, a detailed record of the modifications performed throughout the website (e.g. modification date and user info) is kept.

Access and security

The HYDROSOL-Beyond Consortium regards the flexibility of digital information as a great strength but at the same time extremely vulnerable to unauthorized access. Although the Project's research does not involve personal data of human participants that could arise confidentiality issues, each partner takes appropriate security measures to the entire data along with more sensitive info considered copyright or/and IPR. The security measures have already been described in Table 2 above.

Since HYDROSOL-Beyond is a collaborative research project that at certain point the collaborators will require secure access to common data, the consortium has already foreseen the creation of password protected "Members Area" through the project's dedicated website (already described in the previous paragraph, Figure 1).

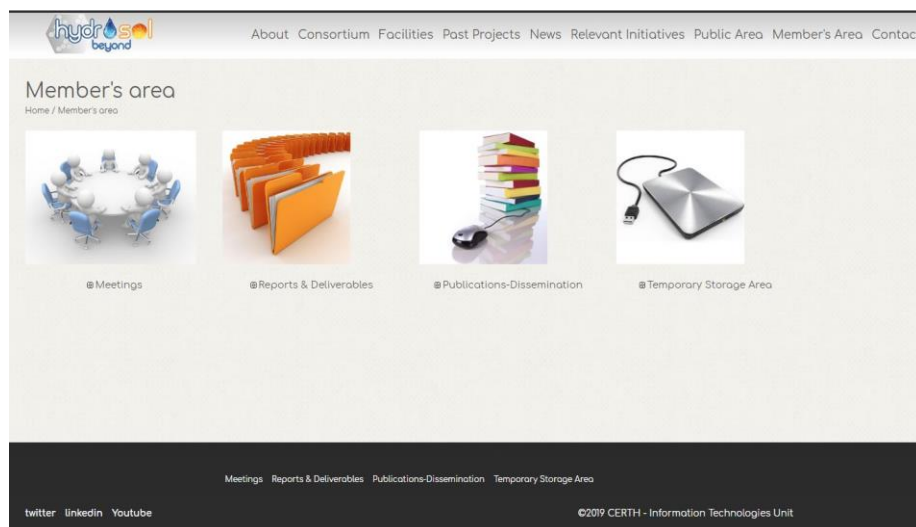


Figure 1. Private HYDROSOL-Beyond "Members Area" accessed via password through the project's website.

SELECTION AND PRESERVATION OF DATA

Data of long-term value

The majority of the data that will occur during the HYDROSOL-Beyond project, will be the result of a scientific research that involves experiments that are not easily recreated and are rather costly to reproduce. These data are initially classified as **observational**, **experimental** and **simulation** findings while during their processing the 4th category of data will also occur: the **deriving** data.

Although the HYDROSOL-Beyond consortium recognizes that preserving all data is neither practical nor economically feasible, it strongly believes that the aforementioned experimental findings are for long-term preservation.

The HYDROSOL-Beyond consortium will do everything possible to keep the volume of the produced digital data to the minimum and through good management practices, the Partners intend to discard on a regular basis, the data files that are no longer relevant to the Project scopes or any past versions of finalized data.

Long-term preservation plan

The HYDROSOL-Beyond data provisioned for long-term storage, will be held on archives of the local servers of each Partner at least for the period described in the project Grant Agreement (five years), while certain findings of the Project – *approved by the General Assembly (GA) committee and authorized by the Partners involved that do not fall on any copyright or/and IPR issues, e.g. Open Access Deliverables and Reports, Scientific Articles, Presentations etc.* – will be also deposited on appropriate repositories such as the EC commissioned Zenodo and OpenAIRE.

DATA SHARING

Data sharing activities

The HYDROSOL-Beyond consortium has already proposed a Data sharing Plan (a “Dissemination Plan”) in order to widely communicate the Project's findings to both relevant audiences and the general public. This plan briefly includes the following actions:

- **Data sharing on the scientific level:** The Consortium will ensure sufficient communication of the Project findings through Scientific Publications, to which they will ensure open access – *along with the related GA approved bibliographic metadata* - through appropriate online repositories.
- **Data sharing in education:** Master and doctoral students are expected to be involved directly in the R&D work of the HYDROSOL-Beyond project, while the consortium aims to promote the HYDROSOL-technology to pre-university students and school-teachers during open days presentations and other training and educational actions such as short courses and dedicated seminars.
- **Data sharing and integration of know-how into other projects:** The Partners will apply and communicate the developed knowledge in related projects and in this way they will contribute to an extension and application of the developed knowledge. The partners will also disseminate their knowledge within their respective scientific and industrial networks and so they will further improve and develop the knowledge in related technologies.
- **Data sharing towards industry:** HYDROSOL-Beyond results will be presented within the industry communities where possible applications have been identified (e.g. hydrogen consumers, chemical industries, energy intensive industries, the transport sector, etc.) in order to ensure a

future easier transfer of the knowledge generated towards industrial applications. Exhibitions and science fairs will be important tools for data sharing activities towards a broader professional audience. The feedback obtained from them should also be communicated within the Consortium.

- **Data sharing towards policy makers:** HYDROSOL-Beyond results will be presented to European regulations authorities, policy-making bodies, related associations/initiatives (e.g. SOLARPACES, IEA, JP CSP in EERA, IPHE, European Green Vehicles Initiative; EGV, European Automotive Research Partners Association; EARPA) as well as to the FCH2-JU public events in order to contribute to the exploitation of the knowledge gained in the project.
- **Data sharing via networks:** The Project findings will be directly shared through the dedicated Project website, and will be projected in parallel own partner's website or intranet and to modern social networking tools (e.g. LinkedIn, ResearchGate, Academia.edu, Twitter, YouTube, Facebook) acknowledged by the Consortium as a powerful means for communicating the project to the rest of the scientific community and the general public.
- **Other data sharing activities outside the Consortium:** Publication of white papers on websites or intranet of (a) the RTD performers and (b) the industrial partners will ensure that the wider scientific community will have access to the publishable project's results. Newsletter and brochures (support for conferences): this type of material might consist of a small set of technical pages to be used as printed support on exhibitions, demonstrations and mailings. Specific, targeted publications and announcements will be agreed and promoted by the partnership to disseminate information and stimulate the interest of other industrial partners currently not participating in the Consortium. Researcher's Night, Open Days activities will be also used for disseminating the projects achievements to the greater public. Strong links and interactions are already established with the most relevant technical journals in the respective fields, whereas Consortium members have already a successful track record as regular organizers of International Conferences as well as participants in International Trade Fairs.

Data sharing restrictions

The HYDROSOL-Beyond partners, will be actively encouraged to disseminate the project results to the public the soonest possible by any appropriate means, unless this is against their legitimate interests. To avoid confidentiality and classification for the protection of knowledge, the data sharing activities that will occur during the Project Duration will be subjected to review/screening from the HYDROSOL-Beyond GA committee. In each case, the GA will decide if the action is eligible to receive a written permission to immediately go public, or if it should be withheld for an agreed time period – *of reasonable duration* – to allow appropriate protection of the IP to be sought. Every decision making will be in accordance to the definitions included in the approved CA by the project partners.

To further ensure open-access to the project's results both Green and Gold Model of Open Access Publishing will be used. The Gold model will be used by submitting manuscripts to open-access journals and by requesting and ordering open access from conventional publishers e.g. Elsevier. Selection per individual publication will be decided on a case-by-case basis. The former model is straightforward to apply by adding the publication to one of the partner's publication portals e.g. DLR's ELIB (Electronic Library System) or to online scientific social networking websites/databases such as ResearchGate and Academia.edu enabling to grant access to publications to a general public – on demand and after the embargo period set by the publisher.

RESPONSIBILITIES AND RESOURCES

Allocation of Responsibilities

In order to ensure good quality data, protect them and facilitate data sharing, every member of the HYDROSOL-Beyond consortium should be responsible of proper good management:

- The **Project Coordinator** (PC) and every assigned **Work-Package Coordinator** (WPC) and **Task Leader** (TL); The good DM is going to be among the main priorities of the HYDROSOL-Beyond Scientific Managers. In particular, every TL will be responsible for the DM of their supervised Task and for providing the relevant information to the respective WPC. In turn, every WPC, holds the responsibility of the DM at the work-package level and for providing the relevant information to the rest of WPCs and the PC. Finally, the PC will be responsible for the supervision of the DM at the Project Level and the handling of the online repositories on behalf of the HYDROSOL-Beyond consortium.
- **Every research member**, including laboratory and technical staff; The staff participating in the research design, units operation, data collection, processing, analysis, generation of metadata and documentation will also share responsibility for proper DM.
- **Support staff**; personnel involved in managing and administering research and research funding, providing ethical review and assessing Intellectual Property rights
- **IT services staff**; personnel involved in providing data storage, security and backup services

Allocation of Resources

In order to produce research results of high quality, certain management activities are already involved in the research effort predicted within the HYDROSOL-Beyond project, since proper data management is an activity that it is not supposed to be a separate process from the integral standard research activities followed.

From this point of view, the required resources to apply proper data management and data sharing practices are already distributed among the respective deliverables and tasks and are spread among the involved partners and throughout the Project.

Consequently, in the HYDROSOL-Beyond Project, all data-related activities and resources (including people, equipment, infrastructure, tools, etc.) for the entire data lifecycle – *spanning from data creation, through processing, analyses and storage, to sharing and long-term preservation* – have been already predicted and included in the submitted budget.

History of Changes		
Version	Publication Date	Change
1.0	25.05.2019	Initial version
1.1	23.04.2021	Correction of the 1 st version based on officer's comments. Update the template with valid funding logos and document structure enhancement.