# RE$^4$ Project

# REuse and REcycling of CDW materials and structures in energy efficient pREfabricated elements for building REfurbishment and construction

| D8.4 | |
|---|---|
| **Data Management Plan** | |
| Author(s)[1]: | FENIX |
| Date: | 28/02/2017 |
| Work package: | WP8 - Training, dissemination and exploitation |
| Distribution[2] | PU |
| Status[3]: | Final |
| Abstract: | Data management for RE$^4$ project in line with Dissemination and communication plan and Exploitation plan. |
| File Name | RE4_D8.4_Data Management Plan_Final_V2.0 |

| Version | Date | Description | Written By | Approved by |
|---|---|---|---|---|
| V0.0 | 15/02/2017 | Document draft | FENIX | |
| V1.0 | 20/02/2017 | Revised version by CETMA | FENIX | |
| V2.0 | 28/02/2017 | Final document | FENIX | CETMA |

---

[1] *Just mention the partner(s) responsible for the Deliverable*

[2] *PU: Public, RE: restricted to a group specified by the consortium, CO: Confidential, only for members of the consortium; Commission services always included.*

[3] *Draft, Revised, Final*

*RE4_RE4_D8.4_Data Management Plan_Final_V2.0.docx*

## TABLE OF CONTENTS

## ACRONYMS & ABBREVIATIONS

| CDW | Construction Demolition Waste |
|---|---|
| EU | European Union |
| EC | European Commission |
| WP | Work Package |
| WPL | Work Package Leader |
| DMP | Data Management Plan |
| R&D | Research and Development |
| HSE | Health and Safety Executive |
| GA | Grant Agreement |
| CA | Consortium Agreement |
| PMC | Project Management Committee |
| PC | Project Coordinator |
| DEM | Dissemination and Exploitation Manager |
| RQM | Risk and Quality Manager |
| STC | Scientific and Technical Committee |
| STM | Scientific and Technical Manager |
| EIG | End User and Interest Group |
| PU | Public |
| CO | Confidential |
| RE | Restricted |
| IPR | Intellectual Property Rights |
| JPEG | Joint Photographic Experts Group |
| JFIF | JPEG File Interchange Format |
| PNG | Portable Network Graphics |
| MPEG | Moving Pictures Expert Group HTML5 |
| MIDI | Musical Instrument Digital Interface |
| WMV | Windows Media Video |
| WMA | Windows Media Audio |
| AVI | Audio Video Interleave |
| ACC | Advanced Audio Coding |
| WAV | Waveform Audio File Format |
| ANSI | American National Standards Institute |
| OEM | Original Equipment Manufacturer |
| UTF | UCS Transformation Format |
| POSIX | Portable Operating System Interface |
| ATE | Automatic Test Equipment |
| STDF | Standard Test Data Format |
| ISSN | International Standard Serial Number |
| OA | Open Access |

# 1. SUMMARY

According to the Guidelines on Open access to Scientific Publications and Research Data for projects funded or co-funded under Horizon 2020, Europe 2020 strategy underlines the central role of knowledge and innovation in growth generation. For these reasons the European Union strives to improve access to scientific information and to boost the benefits of public investment in the research funded under the EU Framework Programme Horizon 2020.

The present document constitutes the first issue of Deliverable D8.4 Data Management Plan in the framework of the $RE^4$ project, dedicated to Task T8.5 under the work package WP8. The Data Management Plan (DMP) identifies the results that should be subject of $RE^4$ dissemination and exploitation and analyses the main data uses, users and explore the restrictions related to IPR according with the Consortium Agreement, defining the data assurance processes that are to be applied during and after the completion of the project. This document is prepared in compliance with the template provided by the Commission in the Annex 1 of the "Guidelines on Data Management in Horizon 2020".

# 2. INTRODUCTION

This document constitutes the first issue of Data Management Plan (DMP) in the EU framework of the $RE^4$ project under Grant Agreement No 723583. The objective of the DMP is to establish the measures for promoting the findings during the project's life and detail what data the Project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The DMP enhances and ensures relevant project´s information transferability and takes into account the restrictions established by the Consortium Agreement. In this framework, the DMP sets the basis for both Dissemination Plan and Exploitation Plan. The first version of the DMP is delivered at M6; later the DMP will be monitored and updated in parallel with the different versions of Dissemination and Exploitation Plans. It is acknowledged that not all data types will be available at the start of the project, thus whenever important, if any changes occur to the $RE^4$ project due to inclusion of new data sets, changes in consortium policies or external factors, the DMP will be updated in order to reflect actual data generated and the user requirements as identified by the $RE^4$ consortium participants.

The overall goal of the $RE^4$ project is to promote new technological solutions for the design and development of structural and non-structural pre-fabricated elements with high degree of recycled materials and reused structures from partial or total demolition of buildings. The developed technology will aim at energy efficient new construction and refurbishment, thus minimizing environmental impacts. The $RE^4$-Project targets the demonstration of suitable design concepts and building elements produced from CDW in an industrial environment, considering perspective issues for the market uptake of the developed solutions. The technical activities will be supported by LCA and LCC analyses, certification and standardization procedures, demonstration activities, professional training, dissemination, commercialisation and exploitation strategy definition, business modelling and business plans.

The overarching purpose is to develop a $RE^4$ prefabricated energy-efficient building concept that can be easily assembled and disassembled for future reuse, containing up to 65% in weight of recycled materials from CDW (ranging from 50% for the medium replacement of the mineral fraction, up to 65% for insulating panels and concrete products with medium mineral replacement coupled with the geopolymer binder). The reusable structures will range from 15-20% for existing buildings to 80-90% for the $RE^4$ prefabricated building concept.

$RE^4$ Project comprises seven technical work packages (WPs) as follows:
- WP1 - Mapping and analysis of CDW reuse and recycling in prefabricated elements
- WP2 - Strategies for innovative sorting of CDW and reuse of structures from dismantled
- WP3 - Innovative concept for modular/easy installation and disassembly of eco-friendly prefabricated elements
- WP4 - Technical characterization of CDW-derived materials for the production of building
- WP5 - Development of precast components and elements from CDW
- WP6 - Pilot level demonstration of CDW based prefabricated elements
- WP7 - Life-cycle and HSE analysis and certification/standardization strategy definition

To facilitate the technical work there are three transversal work packages to coordinate all the work packages, disseminate and communications project results and to ensure compliance with the ethics requirements.
- WP8 - Training, dissemination and exploitation
- WP9 - Project Management
- WP10 - Ethics requirements

This document has been prepared to describe the data management life cycle for all data sets that will be collected, processed or generated by $RE^4$ Project. It is a document outlining how research data will be handled during the project, and after the project is completed. It describes what data will be collected, processed or generated and what methodologies and standards are to be applied. It also defines if and how this data will be shared and/or made open, and how it will be curated and preserved.

## 3.   OPEN ACCESS

Open access can be defined as the practice of providing on-line access to scientific information that is free of charge to the reader and that is reusable. In the context of R&D, open access typically focuses on access to "scientific information", which refers to two main categories:
- Peer-reviewed scientific research articles (published in academic journals).
- Scientific research data (data underlying publications and/or raw data).
It is important to note that:
- Open access publications go through the same peer review process as non-open access publications.

- As an open access requirement comes after a decision to publish, it is not an obligation to publish: it is up to researchers whether they want to publish some results or not.
- As the decision on whether to commercially exploit results (e.g. through patents or otherwise) is made before the decision to publish (open access or not), open access does not interfere with the commercial exploitation of research results. [4]

Benefits of open access:
- Unprecedented possibilities for the dissemination and exchange of information due to the advent of the internet and electronic publishing.
- Wider access to scientific publications and data can help to accelerate innovation, foster collaboration and avoid duplication of effort, build on previous research results, involve citizens and society.
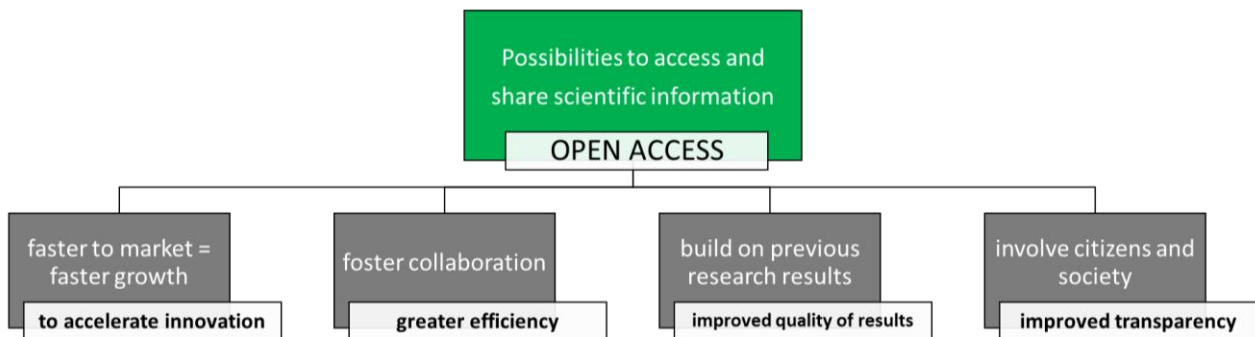


Figure 1. Open Access benefits

The EC capitalizes on open access and open science as it lowers barriers to accessing publicly-funded research. This increases research impact, the free-flow of ideas and facilitates a knowledge-driven society at the same time underpinning the EU Digital Agenda (OpenAIRE Guide for Research Administrators - EC funded projects). Open access policy of European Commission is not a goal in itself, but an element in promotion of affordable and easy accessible scientific information for the scientific community itself, but also for innovative small businesses.

## 3.1   Open Access to peer-reviewed scientific publications

Open access to scientific peer-reviewed publications has been anchored as an underlying principle in the Horizon 2020 Regulation and the Rules of Participation and is consequently implemented through the relevant provisions in the Grant Agreement.
More specifically, Article 29: "Dissemination of results, Open Access, Visibility of EU Funding" of RE[4] Grant Agreement establishes the obligation to ensure open access to all peer-reviewed articles produced by RE[4].

---

[4] *European Commission background note on open access to publications and data in Horizon 2020*

Article 29.2 Open access to scientific publications in RE[4] GA

Each beneficiary must ensure open access (free of charge online access for any user) to all peer reviewed scientific publications relating to its results.

In particular, it must:

(a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

(b) ensure open access to the deposited publication — via the repository — at the latest:
   (i) on publication, if an electronic version is available for free via the publisher, or
   (ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
(c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:
- the terms "European Union (EU)" and "Horizon 2020";
- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable;
- a persistent identifier.

### 3.1.1 Green open access

The green open access is also called self-archiving and means that the published article or the final peer-reviewed manuscript is archived by the researcher in an online repository before, after or alongside its publication. Access to this article is often delayed (embargo period). Publishers recoup their investment by selling subscriptions and charging pay-per-download/view fees during this period during an exclusivity period. This model is promoted alongside the "Gold" route by the open access community of researchers and librarians, and is often preferred.

### 3.1.2 Gold open access

This type of open access is sometimes called open access publishing, or author pays publishing and means that a publication is immediately provided in open access mode by the scientific publisher. Associate costs are shifted from readers to the university or research institute to which the researcher is affiliated, or to the funding agency supporting the research. This model is usually the one promoted by the community of well-established scientific publishers in the business.

### 3.2 Open Access to research data

"Research data" refers to information, in particular facts or numbers, collected to be examined and considered and as a basis for reasoning, discussion, or calculation. In a research context, examples of data include statistics, results of experiments, measurements, observations resulting

from fieldwork, survey results, interview recordings and images. The focus is on research data that is available in digital form.

Article 29.3 Open access to research data in RE$^4$ GA

Regarding the digital research data generated in the action ('data'), the beneficiaries must:

(a) deposit in a research data repository and take measures to make it possible for third parties to access, mine, exploit, reproduce and disseminate — free of charge for any user — the following:

(i) the data, including associated metadata, needed to validate the results presented in scientific publications as soon as possible;

(ii) other data, including associated metadata, as specified and within the deadlines laid down in the 'data management plan' (see Annex 1 of RE$^4$ GA);

(b) provide information — via the repository — about tools and instruments at the disposal of the beneficiaries and necessary for validating the results (and — where possible — provide the tools and instruments themselves).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

The beneficiaries do not have to ensure open access to specific parts of their research data if the achievement of the action's main objective, as described in Annex 1, would be jeopardized by making those specific parts of the research data openly accessible. In this case, the data management plan must contain the reasons for not giving access to third parties.

## 3.3 Dissemination & Communication and Open Access

For the implementation of RE$^4$ Project, there is a complete dissemination and communication set of activities scheduled, with the objectives of raising awareness in the research community, industry and wide public (e-newsletters, e-brochures, poster or events, are foreseen for the dissemination of RE$^4$ to key groups potentially related to the project results' exploitation). Likewise, RE$^4$ website, webinars, press releases or videos, for instance, will be developed for a communication to a wider audience. Details about all those dissemination and communication elements are provided in the deliverable D8.2 Communication and Dissemination Plan. The Data Management Plan and the actions derived are part of the overall RE$^4$ dissemination and communication strategy, which is included in the above mentioned D8.2.

## 4. OBJECTIVES OF DATA MANAGEMNET PLAN

The purpose of RE$^4$ Data Management Plan (DMP) is to provide a management assurance framework and processes that fulfil the data management policy that will be used by the RE$^4$ project partners with regard to all the dataset types that will be generated by the RE$^4$ project. The aim of the DMP is to control and ensure quality of project activities, and to effectively/efficiently manage the material/data generated within the RE$^4$ project. It also describes how data will be

collected, processed, stored and managed holistically from the perspective of external accessibility and long term archiving.

The content of the DMP is complementary to other official documents that define obligations under the Grant Agreement (GA) and associated annexes, and shall be considered a living document and as such will be the subject of periodic updating as necessary throughout the lifespan of the project.
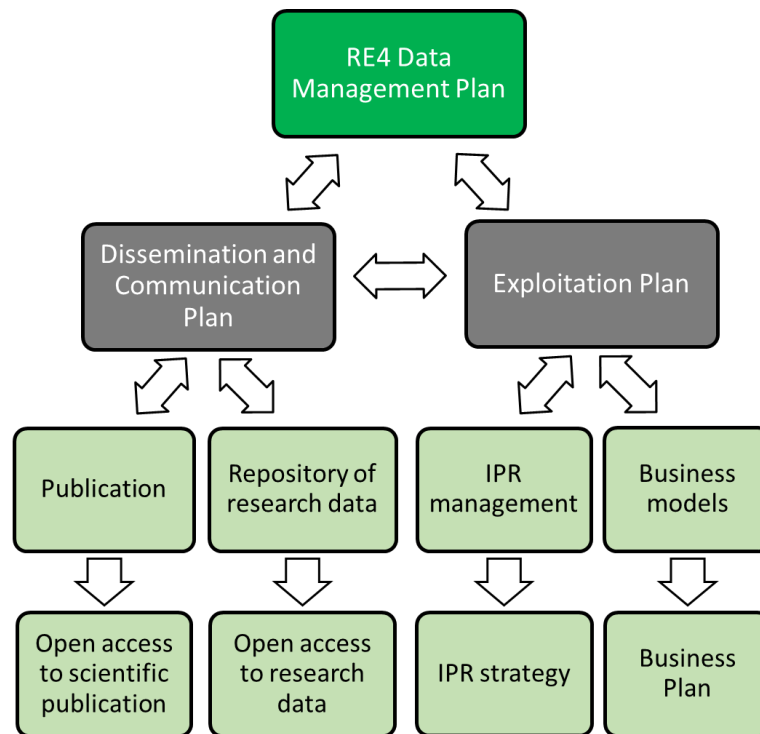


Figure 2. RE[4] Data Management Plan overview

# 5.   RE[4] PROJECT WEBSITE, STORAGE AND ACCESS

RE[4] project website will be used for storing both public and private documents related to project and dissemination, and is meant to be live for the whole project duration and minimum 2 years after the project end. Public section of the website will contain mainly public deliverables, brochure, (roll up) poster, presentations, scientific papers, magazine article, videos, etc. Private section of the project website will include confidential deliverables, work packages related documentation, and will be used as the main exchange of information among the Project partners.

The website www.re4.eu was launched on 1st December 2016, its design is done by dissemination leader FENIX that will be also in charge of website maintenance and regular update. It will be dynamic and interactive tool in order to ensure a clear communication and wide dissemination of project news, activities and results. The website is of primary importance due to the expected

impact on the target audiences. It was designed to give quick, simple and neat information. The website will be regularly updated with news and events related to $RE^4$ Project, press releases, magazine articles, scientific papers, etc. The website is available in English, but translation to partners´ languages is considered as well in order to break the language barrier and enable wide and effective communication of project results at national level.

To ensure the safety of the data, the involved participants will use their available local file servers to periodically create backups of the relevant materials.
In addition to the $RE^4$ Project website, the Project Coordinator established a temporary ftp access for the first period of the Project to all project partners. Dropbox was created for the $RE^4$ Project to manage living documents (e.g. contact list).

The Project Coordinator of the $RE^4$ along with the Dissemination and Exploitation Manager will be in charge for data management and all the relevant issues.
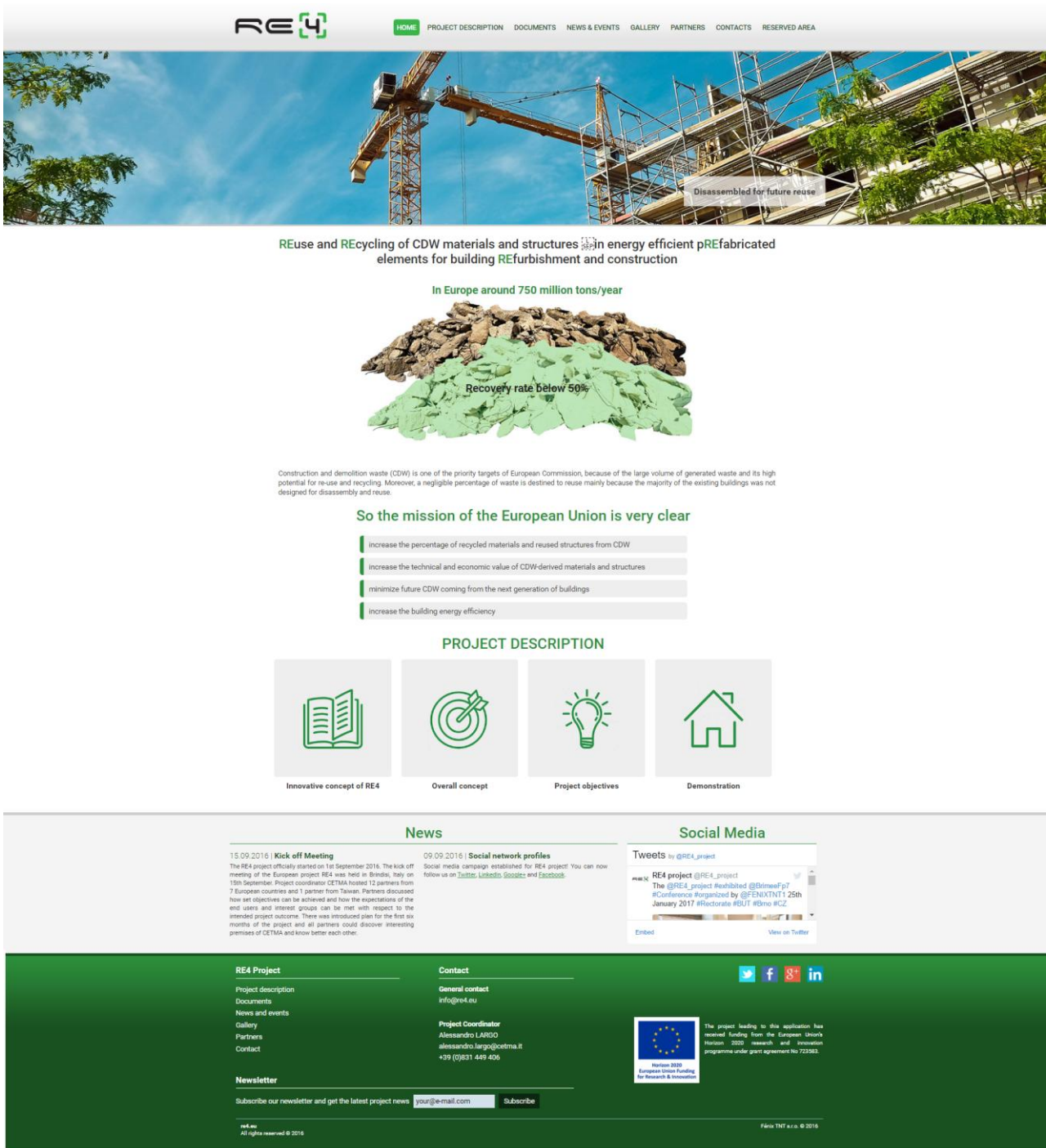
Figure 3. RE[4] Project website

## 6. DATA MANAGEMENT PLAN IMPLEMENTATION

Partners of the RE$^4$ Project demonstrate relevant management capabilities necessary to support and provide major contribution to all the activities envisaged in the Project work. The general and technical Project management is handled by the Coordinator of the Project, CETMA.

The main roles and instruments comprising the Project management structure include:

- <u>Project Management Committee</u> (PMC): representatives of each partner, the highest decision board and its main task will be the Project governance, the overall responsibility of all technical, financial, legal, administrative, ethical, and dissemination issues of the Project. It will encompass the following main roles:
  - Project Coordinator (PC): PMC chairman, responsible for the overall management, communication, and coordination of the entire Project (supervision and approval of reports and technical deliverables, first liaison and communication with the EU Institutions, monitoring of the progress of the Project according to the work-plan, ensuring that the technical objectives of the Project as a whole are met, budget controlling, reporting of the major changes from the agreed work-plan to the PMC).
  - Dissemination and Exploitation Manager (DEM): responsible for dissemination and communication (website, press releases, newsletters, etc.), for exploitation planning (support and liaising to companies, SMEs and industrials), continuous assessment of the market potential of the developed know-how in the Project.
  - Risk Manager and Quality (RQM): assessment, and – along with the support of the PC – the management of administrative and technical risks and the development of the Quality Plan.
- <u>Scientific and Technical Committee</u> (STC): under the control of and in compliance with the decision of PMC responsible for the planning, execution and controlling of the Project, as regards issues of both scientific and technical nature. From a technical point of view, the Project is broken down into a number of work packages, each of them addressing a specific area of work. The STC will encompass the following roles:
  - Scientific and Technical Manager (STM): ensuring that the S&T objectives of the Project are met with quality and time. STM is expected to lead the S&T activities undertaken within the Project and will be responsible for resolving any issues of S&T nature that might occur.
  - Work Packages Leaders (WPL): responsible for managing their work package as a self-contained entity. Their tasks include among others coordinating, monitoring, and assessing the progress of the WP to ensure that output performance, costs, and timelines are met.
  - Each WP is further subdivided into its large components tasks, which are allocated a Task Leader responsible for coordination.

The Project management will also encompass an experienced Financial Responsible (FR) who will be in charge for the financial and administrative Project management and supervision. Finally, an <u>End User and Interest Group</u> (EIG) has been already named to provide inputs for products requirements and to evaluate the Project results and achievements. It will include external experts

already identified and will be chaired by Prof Hebel from Swiss Federal Institute of Technology Zurich, that is currently holding also the position of Assistant Professor of Architecture and Construction at the Future Cities Laboratory in Singapore. The main role of the EIG will be to observe the work tackled in RE$^4$ and envisage possible inconsistencies between the market expectations and the technical work to assure a high level of innovation and to find a suitable balance between the waste managers, architects and end-users requirements and the developed technical solutions.
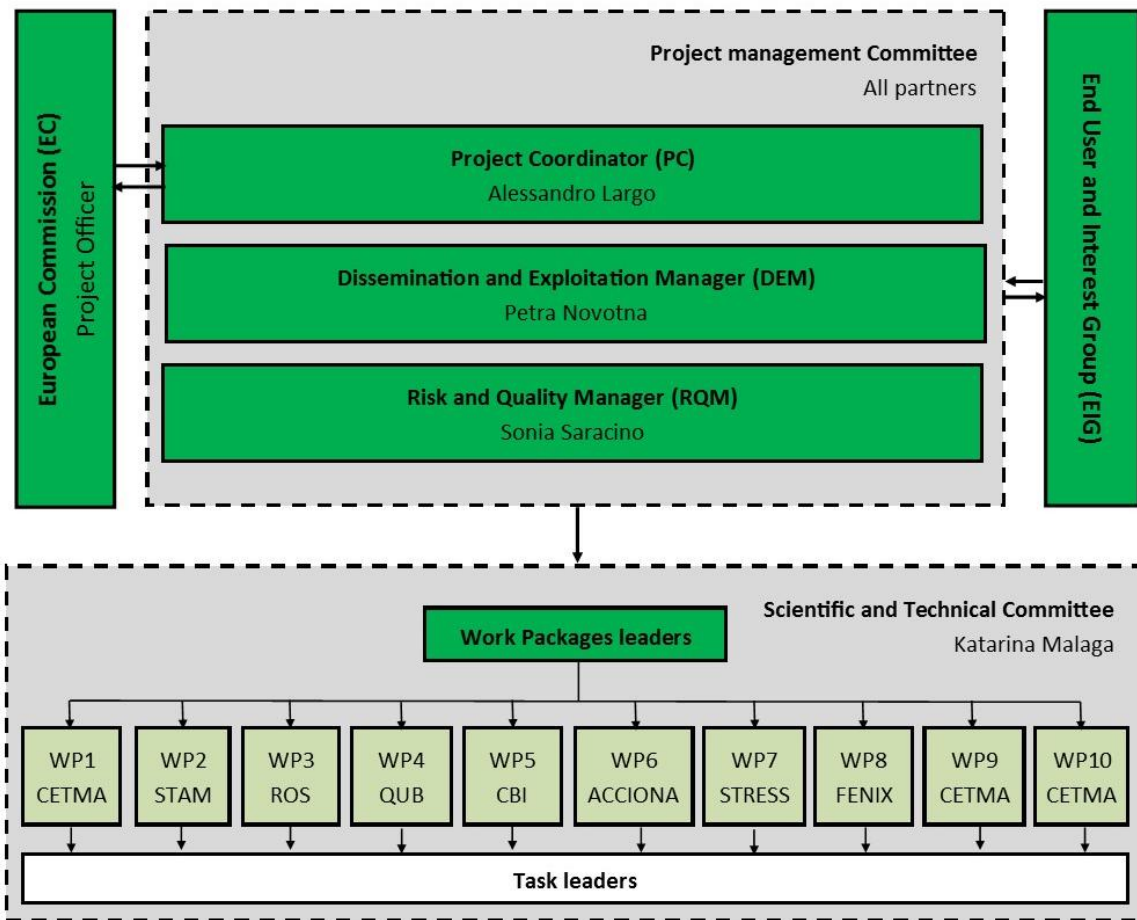


Figure 4. Management structure on RE$^4$ Project

Table 1. RE$^4$ partners and their role in the project

| # | Partner short name | Partner legal name | Partner role in RE$^4$ project |
|---|---|---|---|
| 1. | CETMA | CENTRO DI RICERCHE EUROPEO DI TECNOLOGIE DESIGN E MATERIALI | Project coordinator, mapping the current best practices related to reuse and recycling of CDW in prefabricated elements, diagnosis of CDW management in the EU, current status on policy measures and regulatory frameworks, |

| | | | development of materials incorporating CDW, Portland cement and alkali activated binders. |
|---|---|---|---|
| 2. | **ACCIONA** | ACCIONA INFRAESTRUCTURAS S.A. | Leader of the demonstration activities, in charge of assembling and testing some of the final components in real scale pilot buildings. |
| 3. | **CBI** | CBI Betonginstitutet AB | Scientific leader, development of suitable concrete formulations and concrete component development in particular façade applications, performance and durability testing of the prefabricated elements and of larger precast and timber elements, requirements concerning the quality and properties of materials for concrete and other cement based product, LCA and LCC. |
| 4. | **CDE** | CDE GLOBAL LIMITED | Developing an innovative separating system for CDW, based on weight criteria, and of providing recycled materials for R&D and demo activities, innovative strategies and processes for separating CDW based on weight criteria, collection of representative samples of CDW sorted material. |
| 5. | **CREAGH** | CREAGH CONCRETE PRODUCTS LIMITED | Production of RE$^4$ prefabricated component and their assembly into demo building, manufacturing and testing of the prefabricated elements prototypes, quality control and characterization, HSE analysis. |
| 6. | **FENIX** | FENIX TNT SRO | Dissemination and exploitation leader, development of business modelling and business plans, IPR management, market assessment, data management. |
| 7. | **QUB** | THE QUEEN'S UNIVERSITY OF BELFAST | Technical characterization of recycled material for structural and non-structural elements, characterisation of mineral aggregates, assessment of variability effects and investigation on the alkali activation potential of ceramic waste, development of prefabricated components, refinement and production of pre-fab test elements, certification strategies, technical documentation and standardization. |
| 8. | **ROS** | ROSWAG ARCHITEKTEN GESELLSCHAFT VON ARCHITEKTEN MBH | Design of innovative concept for modular/easy installation and disassembly of eco-friendly prefabricated elements, current status of construction of prefabricated elements with reused/recycled material, definition of sustainable strategies for the disassembly and reuse of structures and components from dismantled buildings. |

| 9. | | | |
|----|-----------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10. | STRESS | SVILUPPO TECNOLOGIE E RICERCA PER L'EDILIZIA SISMICAMENTE SICURA ED ECOSOSTENIBILE SCARL | Life-cycle and HSE analysis and certification /standardization strategy definition, scaled-up processes, inputs related to S-LCA, support for the definition of data to be collected, development of the BIM-compatible DSS and platform for CDW estimation and management, refurbishment of residential and/or commercial building: installation of the panels/blocks on an existing façade. |
| 11. | NTUST | National Taiwan University of Science and Technology | Demonstration of RE$^4$ technologies outside EU. |
| 12. | VORTEX | VORTEX HYDRA S.R.L. | Extruded products (roof tiles, floor tiles and façade products) obtained using CDW materials, to supply a demo line to the consortium capable to produce extruded products using the CDW material, to assist the testing phase of the obtained products following the Standards and to use its experience in this field to achieve the final target, design and adapt the prefabricated elements production line. |
| 13. | ACR+ | ASSOCIATION DES CITES ET DES REGIONS POUR LE RECYCLAGE ET LA GESTION DURABLE DES RESSOURCES | Assessment of economic instruments of CDW management for European representative countries, dissemination and communication activities. |
| 14. | STAM | STAM Srl | Study of innovative sorting solutions for the recycling of CDW and strategies for the reuse of structures from dismantled buildings, main features of materials resulting from total or partial demolition of buildings, innovative strategies and processes for sorting CDW based on advanced robotic system. |

## 7. RESEARCH DATA

"Research data" refers to information, in particular facts or numbers, collected to be examined and considered as a basis for reasoning, discussion, or calculation. In a research context, examples of data include statistics, results of experiments, measurements, observations resulting from fieldwork, survey results, interview recordings and images. The focus is on research data that is available in digital form.

As indicated in the Guidelines on Data Management in Horizon 2020 (European Commission, Research & Innovation, October 2015), scientific research data should be easily:

1. DISCOVERABLE
The data and associated software produced and/or used in the project should be discoverable (and readily located), identifiable by means of a standard identification mechanism (e.g. Digital Object Identifier).

2. ACCESSIBLE
Information about the modalities, scope, licenses (e.g. licencing framework for research and education, embargo periods, commercial exploitation, etc.) in which the data and associated software produced and/or used in the project is accessible should be provided.

3. ASSESSABLE and INTELLIGIBLE
The data and associated software produced and/or used in the project should be easily assessable for and intelligible to third parties in contexts such as scientific scrutiny and peer review (e.g. the minimal datasets are handled together with scientific papers for the purpose of peer review, data is provided in a way that judgments can be made about their reliability and the competence of those who created them).

4. USEABLE beyond the original purpose for which it was collected The data and associated software produced and/or used in the project should be useable by third parties even long time after the collection of the data (e.g. the data is safely stored in certified repositories for long term preservation and curation; it is stored together with the minimum software, metadata and documentation to make it useful; the data is useful for the wider public needs and usable for the likely purposes of non-specialists).

5. INTEROPERABLE to specific quality standards
The data and associated software(s) produced and/or used in the Project should be interoperable allowing data exchange between researchers, institutions, organisations, countries, etc.

Some examples of research data include:
- Documents (text, Word), spreadsheets
- Questionnaires, transcripts, codebooks
- Laboratory notebooks, field notebooks, diaries
- Audiotapes, videotapes
- Photographs, films
- Test responses, slides, artifacts, specimens, samples
- Collection of digital objects acquired and generated during the process of research
- Database contents (video, audio, text, images)
- Models, algorithms, scripts
- Contents of an application (input, output, logfiles for analysis software, simulation software, schemas)
- Methodologies and workflows

– Standard operating procedures and protocols.

In addition to the other records to manage, some kinds of data may not be sharable due to the nature of the records themselves, or to ethical and privacy concerns.

# 8. RE⁴ DATA SETS

Projects are required to deposit the research data - the data, including associated metadata, needed to validate the results presented in scientific publications as soon as possible; and other data, including associated metadata, as specified and within the deadlines laid down in a data management plan (DMP).

At the same time, projects should provide information (via the chosen repository) about tools and instruments at the disposal of the beneficiaries and necessary for validating the results, for instance specialised software(s) or software code(s), algorithms, analysis protocols, etc. Where possible, they should provide the tools and instruments themselves.

The types of data to be included within the scope of the RE⁴ Data Management Plan shall as a minimum cover the types of data that is considered complementary to material already contained within declared project deliverables. In order to collect the information generated during the project, the template for data collection will be circulated periodically every 6 months. The scope of this table is to detail the research results that will be developed during the RE⁴ Project detailing the kind of results and how it will be managed.

The responsibility to define and describe all non-generic data sets specific to an individual work package shall be with the WP leader.

Data set reference and name
Identifier for the data set to be produced. All data sets within this DMP have been given a unique field identifier and are listed in the table contained in Appendix 1.

Data Set Description
A data set is defined as a structured collection of data in a declared format. Most commonly a data set corresponds to the contents of a single database table, or a single statistical data matrix, where every column of the table represents a particular variable, and each row corresponds to a given member of the data set in question. The data set may comprise data for one or more fields. For the purposes of this DMP data sets have been defined by generic data types that are considered applicable to the RE⁴ project.

For each data set, the characteristics of the data set have been captured in a tabular format as enclosed in Appendix 1.

Standards & Metadata
Metadata is defined as "data about data". It is "structured information that describes, explains, locates, and facilitates the means to make it easier to retrieve, use or manage an information

resource". This is especially relevant in the distributed data network environment that exists within RE$^4$. Metadata shall be considered as the formal means by which data is defined and by which the meaning of information is established. All data-sets generated within the project shall be defined such that "data about data" is specified.

Metadata can be categorised in three types:
- Descriptive metadata describes an information resource for identification and retrieval through elements such as title, author, and abstract.
- Structural metadata documents relationships within and among objects through elements such as links to other components (e.g., how pages are put together to form chapters).
- Administrative metadata manages information resources through elements such as version number, archiving date, and other technical information for the purposes of file management, rights management and preservation.

There are a large number of metadata standards which address the needs of particular user communities.

Data Sharing
During the period, when the Project is live, the sharing of data shall be defined by the configuration rules defined in the access profiles for the project participants. Each individual project data set item shall be allocated a 3 character "dissemination classification" for the purposes of defining the data sharing restrictions. The classification shall be an expansion of the system of confidentiality applied to deliverables reports provided under the RE$^4$ Grant Agreement.
PU: Public
RE: restricted to a group specified by the consortium
CO: Confidential, only for members of the consortium; Commission services always included.

The three above levels are linked to the "Dissemination Level" specified for all RE$^4$ deliverables.
All material designated with a PU dissemination level shall be deemed uncontrolled. In case the dataset cannot be shared, the reasons for this should be mentioned (e.g. ethical, rules of personal data, intellectual property, commercial, privacy-related, or security-related).

Data will be shared when the related deliverable or paper has been made available at an open access repository. The normal expectation is that data related to a publication will be openly shared. However, to allow the exploitation of any opportunities arising from the raw data and tools, data sharing will proceed only if all co-authors of the related publication agree. The Lead author is responsible for getting approvals and then sharing the data and metadata on Zenodo (www.zenodo.org), a popular repository for research data. The Lead Author will also create an entry on OpenAIRE (www.openaire.eu) in order to link the publication to the data.
OpenAIRE is a service that implements the Horizon 2020 Open Access mandate for publications and its Open Research Data Pilot and may be used to reference both the publication and the data.
A link to the OpenAIRE entry will then be submitted to the RE$^4$ Website Administrator (FENIX) by the Lead Author.

Data archiving and preservation

Both Zenodo and OpenAIRE are purpose-built services that aim to provide archiving and preservation of long-tail research data. In addition, the $RE^4$ website, linking back to OpenAIRE, is expected to be available for at least 2 years after the end of the Project. At the formal project closure all the data material that has been collated or generated within the Project and classified for archiving shall be copied and transferred to a digital archive.

The document structure and type definition will be preserved as defined in the document breakdown structure and work package groupings specified. At the time of document creation the document will be designated as a candidate data item for future archiving. This process is performed by the use of codification within the file naming convention (see Section 10). The process of archiving will be based on a data extract performed within 12 weeks of the formal closure of the $RE^4$ Project.

The archiving process shall create unique file identifiers by the concatenation of "metadata" parameters for each data type. The metadata index structure shall be formatted in the metadata order as listed in Appendix 2. This index file shall be used as an inventory record of the extracted files, and shall be validated by the associated WP leader.
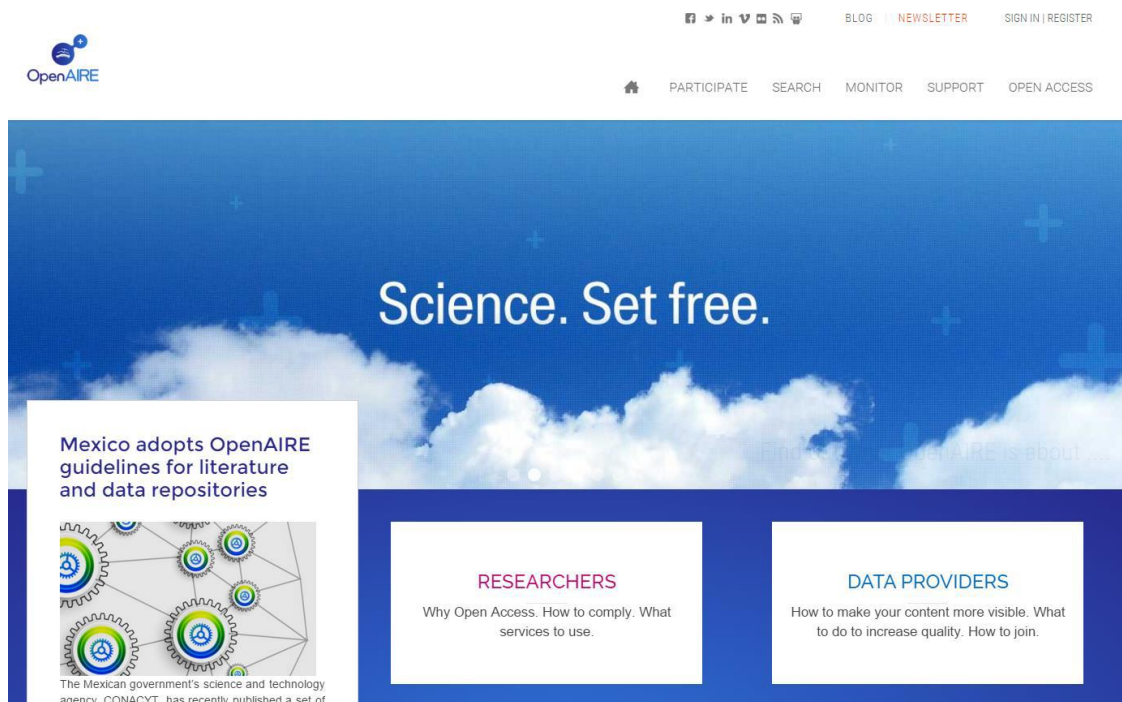


Figure 5. OpenAIRE website

Figure 6. ZENODO repository

## 9. DATA SETS TECHNICAL REQUIREMENTS

The applicable data sets are restricted to the following data types for the purposes of archiving. The technical characteristics of each data set are described in the following sections. The copy rights with respect to all data types shall be subject to IPR clauses in the GA, but shall be considered to be royalty free. The use of file compression utilities, such as "WinZip" is prohibited. No data files shall be encrypted.

### 9.1 Engineering CAD drawings

The .dwg file format is one of the most commonly used design data formats, found in nearly every design environment. It signifies compatibility with AutoCAD technology. Autodesk created .dwg in 1982 with the launch of its first version of AutoCAD software. It contains all the pieces of information a user enters, such as: Designs, Geometric data, Maps, Photos.

### 9.2 Static graphical images

Graphical images shall be defined as any digital image irrespective of the capture source or subject matter. Images should be composed such to contain only objects that are directly related to RE[4] activity and do not breach IPR of any third parties.

Image files are composed of digital data and can be of two primary formats of "raster" or "vector". It is necessary to represent data in the rastered state for use on a computer displays or for printing. Once rasterized, an image becomes a grid of pixels, each of which has a number of bits to designate its colour equal to the colour depth of the device displaying it. The RE[4] project shall only use raster based image files. The allowable static image file formats are JPEG and PNG.

There is normally a direct positive correlation between image file size and the number of pixels in an image, the colour depth, or bits per pixel used in the image. Compression algorithms can create an approximate representation of the original image in a smaller number of bytes that can be expanded back to its uncompressed form with a corresponding decompression algorithm. The use of compression tools shall not be used unless absolutely necessary.

## 9.3   Animated graphical images

Graphic animation is a variation of stop motion and possibly more conceptually associated with traditional flat cell animation and paper drawing animation, but still technically qualifying as stop motion consisting of the animation of photographs (in whole or in parts) and other non-drawn flat visual graphic material. The allowable animated graphical image file formats are AVI, MPEG, MP4, and MOV. The WP leader shall determine the most suitable choice of format based on equipment availability and any other factors. This is mainly valid for the RE[4] project promo video, which is expected to contain animated graphical images, infographics and on site interviews.

Table 2. Video formats

| Format | File | Description |
|---|---|---|
| MPEG | .mpg .mpeg | MPEG. Developed by the Moving Pictures Expert Group. The first popular video format on the web. Used to be supported by all browsers, but it is not supported in HTML5 (See MP4). |
| AVI | .avi | AVI (Audio Video Interleave). Developed by Microsoft. Commonly used in video cameras and TV hardware. Plays well on Windows computers, but not in web browsers. |
| WMV | .wmv | WMV (Windows Media Video). Developed by Microsoft. Commonly used in video cameras and TV hardware. Plays well on Windows computers, but not in web browsers. |
| QuickTime | .mov | QuickTime. Developed by Apple. Commonly used in video cameras and TV hardware. Plays well on Apple computers, but not in web browsers. (See MP4) |
| RealVideo | .rm .ram | RealVideo. Developed by Real Media to allow video streaming with low bandwidths. It is still used for online video and Internet TV, but does not play in web browsers. |
| Flash | .swf .flv | Flash. Developed by Macromedia. Often requires an extra component (plug-in) to play in web browsers. |
| Ogg | .ogg | Theora Ogg. Developed by the Xiph.Org Foundation. Supported by HTML5. |
| WebM | .webm | WebM. Developed by the web giants, Mozilla, Opera, Adobe, and Google. Supported by HTML5. |
| MPEG-4 or | .mp4 | MP4. Developed by the Moving Pictures Expert Group. Based on QuickTime. |

| MP4 | | Commonly used in newer video cameras and TV hardware. Supported by all HTML5 browsers. Recommended by YouTube. |
|---|---|---|

## 9.4 Audio data

An audio file format is a file format for storing digital audio data on a computer system. The bit layout of the audio data (excluding metadata) is called the audio coding format and can be uncompressed, or compressed to reduce the file size, often using lossy compression. The data can be a raw bitstream in an audio coding format, but it is usually embedded in a container format or an audio data format with defined storage layer. The allowable animated audio file formats is MP3 or MP4. This is mainly valid for the RE$^4$ Project promo video, which is expected to contain interviews with key partners, voice over and music.

Table 3. Audio formats

| Format | File | Description |
|---|---|---|
| MIDI | .midi .mid | MIDI (Musical Instrument Digital Interface). Main format for all electronic music devices like synthesizers and PC sound cards. MIDI files do not contain sound, but digital notes that can be played by electronics. Plays well on all computers and music hardware, but not in web browsers. |
| RealAudio | .rm .ram | RealAudio. Developed by Real Media to allow streaming of audio with low bandwidths. Does not play in web browsers. |
| WMA | .wma | WMA (Windows Media Audio). Developed by Microsoft. Commonly used in music players. Plays well on Windows computers, but not in web browsers. |
| AAC | .aac | AAC (Advanced Audio Coding). Developed by Apple as the default format for iTunes. Plays well on Apple computers, but not in web browsers. |
| WAV | .wav | WAV. Developed by IBM and Microsoft. Plays well on Windows, Macintosh, and Linux operating systems. Supported by HTML5. |
| Ogg | .ogg | Theora Ogg. Developed by the Xiph.Org Foundation. Supported by HTML5. |
| MP3 | .mp3 | MP3 files are actually the sound part of MPEG files. MP3 is the most popular format for music players. Combines good compression (small files) with high quality. Supported by all browsers. |
| MPEG-4 or MP4 | .mp4 | MP4. Developed by the Moving Pictures Expert Group. Based on QuickTime. Commonly used in newer video cameras and TV hardware. Supported by all HTML5 browsers. Recommended by YouTube. |

## 9.5 Textual data

A text file is structured as a sequence of lines of electronic text. These text files shall not contain any control characters including end-of-file marker. In principle the least complicated form of textual file format shall be used as the first choice.
On Microsoft Windows operating systems, a file is regarded as a text file if the suffix of the name of the file is "txt". However, many other suffixes are used for text files with specific purposes. For example, source code for computer programs is usually kept in text files that have file name

suffixes indicating the programming language in which the source is written. Most Windows text files use "ANSI", "OEM", "Unicode" or "UTF-8" encoding.

Prior to the advent of Mac OS X, the classic Mac OS system regarded the content of a file to be a text file when its resource fork indicated that the type of the file was "TEXT". Lines of Macintosh text files are terminated with CR characters.

Being certified Unix, macOS uses POSIX format for text files. Uniform Type Identifier (UTI) used for text files in macOS is "public.plain-text".

## 9.6    Numeric data

Numerical Data is information that often represents a measured physical parameter. It shall always be captured in number form. Other types of data can appear to be in number form i.e. telephone number, however this should not be confused with true numerical data that can be processed using mathematical operators.

## 9.7    Process and test data

Standard Test Data Format (STDF) is a proprietary file format originating within the semiconductor industry for test information, but it is now a Standard widely used throughout many industries. It is a commonly used format produced for/by automatic test equipment (ATE). STDF is a binary format, but can be converted either to an ASCII format known as ATDF or to a tab delimited text file. Software tools exist for processing STDF generated files and performing statistical analysis on a population of tested devices. RE[4] innovation development shall make use of this file type for system testing.

## 9.8    Microsoft Office Application Suite

RE[4] Project partners shall use the currently MS supported operating system and convert from any previous obsolete releases.

The types of specific applications available within the current Microsoft Windows operating system shall be used to support all project activities in preference to any other software solutions. The data file types associated with these applications shall be saved in the default format and be in accordance with the file naming convention as specified in Section 10.

At the Microsoft Office Application level the "file properties" shall be configured using the "document properties" feature. This is accessed via "Info" dropdown within the "File" menu. The "properties" and "advanced properties" present a data entry box under the "Summary" as shown in the figure below.

Figure 7. Data Entry Box – Summary

Title: Duplication of the name used for the data file name

Subject: Identifier for $RE^4$ work package discrimination and shall be of the following format RE4_WPxx.

Author: Name of the person creating the document and be formatted to have the surname stated first as follows: surname_firstname_secondname

Manager: Name of the author's immediate line manager and be formatted to have the surname stated first as follows: surname_firstname_secondname

Company: Company name of the author to be stated as follows: companyname_RE4 participant number

Keywords: Free format text and should contain key words that would be relevant and useful to future data searches. The keywords should all be in lower case and separated with commas

Comments: Description of file contents in free format text

Hyperlink base: Blank

The tickbox indicating "Save Thumbnails for All Word Documents" shall be untagged.

## 9.9   Adobe Systems

Portable Document Format (PDF) is a file format developed by Adobe Systems for representing documents in a manner that is independent of the original application software, hardware, and operating system used to create those documents. A PDF file can describe documents containing

any combination of text, graphics, and images in a device independent and resolution independent format. These documents can be one page or thousands of pages, very simple or extremely complex with a rich use of fonts, graphics, colour, and images. PDF is an open standard, and anyone may write applications that can read or write PDFs royalty-free. PDF files are especially useful for documents such as magazine articles, product brochures, or flyers in which you want to preserve the original graphic appearance online.

## 10. NAMING CONVENTION

All files irrespective of the data type shall be named in accordance with the following document file naming convention:

[PROJECT]_[WORKPACKAGE]_[TASK]_[TITLE]_[VERSION]_[DISSEMINATIONCLASS]_[ARCHIVE]
Where:
• [PROJECT] is RE$^4$ for all document types
• [WORKPACKAGE] is the RE$^4$ project work package number, with WP as a prefix
• [TASK] is the RE$^4$ project task number, with T as a prefix
• [TITLE] represents the description of the data item contents excluding capitalisation and punctuation characters
• [VERSION] is the version number consisting of integer numbers only without leading zeros, prefixed with V
• [DISSEMINATIONCLASS] is the dissemination classification allocated to a document type that define the data access post archiving, consists of the characters CO and a suffix of a single number in the range 1 to 3;
• [ARCHIVE] this is a single character defining the allocation of the data item for future archiving and is represented by a Y or N;

## 11. EXPECTED PROJECT RESULTS AND RESEARCH DATA

Expected RE$^4$ Project results described by tasks are listed in the table below. The table template will be circulated periodically in order to monitor the results and set the strategy for their sharing.

Table 4. Collection of project results and sharing strategy

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| WP1 Mapping and analysis of CDW reuse and recycling in prefabricated elements | CETMA | Task 1.1 Diagnosis of CDW management in the EU | M1-M6 | CETMA | Data collection on CDW | pdf | public |
| | | Task 1.2 Current status of construction of prefabricated elements with reused/recycled material | M1-M6 | ROS | Data collection on prefab construction with and without CDW | pdf | public |
| | | Task 1.3 Current status on policy measures and regulatory frameworks | M1-M9 | CETMA | Current status on policy measures and regulatory framework | pdf | public |
| | | | | | Certification framework | xls | public |
| WP2 Strategies for innovative sorting of CDW and reuse of structures from dismantled buildings | STAM | Task 2.1 CDW material specifications | M1-M4 | STAM | CDW average composition among EU | pdf | public |
| | | | | | CDE's separating system performance requirements | pdf | public |
| | | | | | STAM's sorting system input material definition | pdf | public |
| | | | | | STAM's sorting system performance requirements | pdf | public |
| | | Task 2.2 Definition of sustainable strategies for the disassembly and reuse of structures and components from dismantled buildings | M4-M15 | ROS | Building Typology Identification | pdf | confidential* |
| | | | | | Summary of requirements and standards with regards to building demolition in Italy, Spain, UK, Sweden and Germany | pdf | confidential* |
| | | | | | Sustainable Dismantling Strategy with focus on high reusability | pdf | confidential* |
| | | Task 2.3 Innovative strategies and | M4-M15 | CDE | Process flow diagram | pdf | confidential* |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| | | processes for separating CDW based on weight criteria | | | Component size and selection | pdf | confidential* |
| | | | | | Throughput | pdf | confidential* |
| | | | | | Power usage | pdf | confidential* |
| | | | | | Output material definition | pdf | confidential* |
| | | Task 2.4 Innovative strategies and processes for sorting CDW based on advanced robotic system | M4-M20 | STAM | Technical requirements for STAM's sorting system components | pdf | confidential* |
| | | | | | Sorting system design | stp/dwg | confidential* |
| | | | | | CDW classification algorithm compiled file | TBD (dll or other) | confidential* |
| | | | | | CDW NIR data | TBD (csv, xls, etc.) | confidential* |
| | | | | | Performance calculation and results | xls, MATLAB | confidential* |
| | | | | | Evaluation and final considerations | pdf | confidential* |
| | | Task 2.5 BIM-compatible DSS and platform for CDW estimation and management | M4-M24 | STRESS | Output: Platform development. Support for owners and construction/demolition companies providing an estimation of the types and quantities of CDW that will be generated during construction/demolition, with possible utilization options and related logistic references. | ICT tool; pdf document for the tool guideline | confidential* |
| WP3 Innovative concept for modular/easy installation and disassembly of eco-friendly | ROS | Task 3.1 Definition of indicators for easy installation, disassembly, recycling and reuse for newly developed prefabricated elements | M1-M12 | ROS | European design scenario - loads and material properties | pdf, xls | public |
| | | | | | List and rating of indicators for easy installation | pdf | public |
| | | | | | Concept design of dismountable building system | dwg, pdf, xls | public |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| prefabricated elements | | | | | Concept design of dismountable connections | dwg, pdf, xls | public |
| | | Task 3.2 Design concept for prefabricated elements for the refurbishment of residential or commercial build | M3-M30 | ROS | Strategy for the thermal optimisation of existing façade elements | dwg, pdf, xls | public |
| | | | | | Design of façade/roof element for extensions | dwg, pdf, xls | public |
| | | Task 3.3 Design concept for the development of components for the new construction of residential or commercial buildings | M3-M30 | ROS | Design of structural system | dwg, pdf, xls | public |
| | | | | | Concept design of foundations | dwg, pdf, xls | public |
| | | | | | Concept design of slab elements | dwg, pdf, xls | public |
| | | | | | Concept design of bearing / non-bearing walls | dwg, pdf, xls | public |
| | | | | | Concept design of facade elements | dwg, pdf, xls | public |
| | | Task 3.4: Numerical modelling to support the prototypes design and to predict the prototypes performance | M7-M33 | STRESS | Output: FE models and results of numerical simulations (structural, thermal and fire resistance data) | Pdf Documents about the modelling of the developed prefabricated elements | public |
| WP4 Technical characterisation of | QUB | Task 4.1 Collection of representative samples of CDW sorted material | M3-M6 | CDE | Collection of North & South samples - mixed source | N/A | N/A |

| RE4 logo | This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723583 | EU flag |
|---|---|---|

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| CDW-derived materials for the production of building elements | | | | | Delivery of samples to partners        n/a | N/A | N/A |
| | | | | | Physical assessment of CDW samples | MS word | confidential* |
| | | | | | Assessment methods | MS word | confidential* |
| | | | | | Results and discussion | MS word | confidential* |
| | | Task 4.2 Characterisation of CDW-derived materials | M5-M11 | QUB | Chemical and durability characterisation of mineral fraction | pdf | public |
| | | | | | Geometrical and physical characterisation of mineral fraction | pdf/xls | public |
| | | | | | Lightweight fraction characterisation | pdf | public |
| | | | | | Fine fraction characterisation | pdf | public |
| | | | | | Physical assessment of timber from CDW | pdf | public |
| | | Task 4.3 Variability of the chemical-physical features of CDW-derived materials and effect on technological properties of developed products | M9-M18 | QUB | Variability of the chemical-physical features of CDW aggregate and effect on compressive strength development assessment | pdf | public |
| | | | | | Variability of the chemical-physical features and effect on the insulation assessment | pdf | public |
| | | Task 4.4 Definition of quality classes for utilisation in different applications | M16-M20 | CBI | Quality classes | pdf | public |
| | | | | | Potential applications for recovered CDW-derived materials | pdf | public |
| | | Task 4.5 Development of alkali activated binders from sorted brick and tiles waste | M11-M20 | QUB | Investigate the potential for alkali activation of ceramic (bricks and tiles) fraction | pdf | confidential* |
| WP5 Development of precast components and elements from CDW | CBI | Task 5.1: Development of materials incorporating CDW, Portland cement and alkali activated binders | M2-M18 | CETMA | Formulations of concrete with CDW+OPC | xls | confidential* |
| | | | | | Formulations of concrete with CDW+AAB | xls | confidential* |
| | | | | | Formulations of lightweight concrete with CDW+OPC and CDW+AAB | xls | confidential* |
| | | | | | Formulations of earth plaster and adhesive | xls | confidential* |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| | | | | | from CDW | | |
| | | Task 5.2: Development of prefabricated components | M6-M24 | QUB | Development of building blocks | pdf | confidential* |
| | | | | | Development of reconstituted tiles | pdf | confidential* |
| | | | | | Development of timber beams and columns (structural support system) and weatherboarding | pdf | confidential* |
| | | | | | Development of insulation panels | pdf | confidential* |
| | | Task 5.3: Development of prefabricated elements | M6-M31 | CBI | Cladding panel for ventilated façade applications | Blueprint/ Prototype | confidential* |
| | | | | | Sandwich element with integrated insulation | Blueprint/ Prototype | confidential* |
| | | | | | Load bearing concrete element | Blueprint/ Prototype | confidential* |
| | | | | | Non-load bearing internal partition wall | Blueprint/ Prototype | confidential* |
| | | | | | Please fill in data description | Blueprint/ Prototype | confidential* |
| | | Task 5.4: Refinement and production of pre-fab test elements | M18-M31 | QUB | Development of mix designs suitable for a range of applications | pdf | confidential |
| | | | | | Development of formulations for building blocks with a reduced carbon footprint | pdf | confidential* |
| | | Task 5.5: Performance and durability testing of larger precast and timber elements | M20-M31 | CBI | Test results on sandwich elements | xls | confidential* |
| | | | | | Test results on load bearing elements | xls | confidential* |
| | | | | | Test results on cladding panels | xls | confidential* |
| WP6 Pilot level demonstration of CDW based | ACCIONA | Task6.1 Design and adapt the prefabricated elements production line | M23-M28 | VORTEX | Technical and technological information and data related to the line adjustment for the extrusion of concrete with CDW inside for | pdf, dwg, jpeg | confidential* |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| prefabricated elements | | | | | roof tiles/floor tiles/facade | | |
| | | Task6.2 Manufacture and testing of the prefabricated elements prototypes, quality control and characterization | M26-M32 | CREAGH | Production of the prefabricated elements to build the RE$^4$ demonstrator | samples; pdf; jpg (pictures) | confidential* |
| | | | | | Tests results on the prefabricated elements | Xls | confidential* |
| | | Task6.3 New residential and/or commercial buildings made of a high ratio of waste: design and construction of the demonstrator | M18-M36 | ACCIONA | Design of the RE$^4$ demonstrator | pdf | confidential* |
| | | | | | Construction of the RE$^4$ demonstrator | pdf (report), jpg (pictures) | public |
| | | Task6.4 Refurbishment of residential and/or commercial building: installation of the panels/blocks on an existing façade | M31-M36 | STRESS | Output: Results of tests. Testing a and validation of the RE$^4$ elements for refurbishment at STREES facility. | Pdf document for the description of the set-up of the installation of the façade panels. | public |
| | | Task6.5 Disassembly demonstration of conventional building vs. 6.3 and 6.4 demonstrators | M18-M40 | ACCIONA | Disassembly demonstration of RE$^4$ demonstrator VS conventional building | pdf (report), jpg (pictures) | public |
| | | | | | Disassembly demonstration of Task 6.3 | pdf | public |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| | | | | | demonstrator | (report), jpg (pictures) | |
| | | | | | Evaluation and quantification of the disassembly demonstration | pdf | public |
| | | Task6.6 Monitoring and techno-economic analysis of the performance. Validation | M36-M40 | ACCIONA | Monitoring strategy | pdf | confidential* |
| | | | | | Results of the monitoring. Validation performance. | pdf | confidential* |
| | | | | | Techno-economic analysis | pdf | confidential* |
| WP7 Life-cycle and HSE analysis and certification/standardization strategy definition | STRESS | Task7.1 Inputs related to scaled-up processes | M28-M30 | STRESS | Output: Data collection on state of art products, to be utilized as a benchmark and development of the conceptual design of the $RE^4$ processes scaled-up at industrial scale. | pdf | public |
| | | Task7.2 Goal & Scope definition | M13-M24 | STRESS | Output: Development of common assessment framework for LCA, LCCA an S-LCA, in order to compare, in an integrated and consistent way, environment, economic and social impacts of the $RE^4$ technologies/products versus standard solutions. | pdf (LCA, LCCA and S-LCA); jpeg (graphic representation) | public |
| | | Task7.3 Inventory | M18-M32 | CBI | Meta data for all data: reference, year of inventory, data valid to year, regional validity, technical specification, modules included. | xlsx | General life cycle data are public. We don't know any confidential data yet. |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
|---|---|---|---|---|---|---|---|
| | | | | | If good quality on data, material impact data for modules A1-A5, B1-B6, C1-C4 according EN15804. | xlsx | General life cycle data are public. We don't know any confidential data yet. |
| | | | | | Material LCI data from ecoinvent (material flowchart, emissions, recourses, waste, energy use, water used, recycled content, etc. | xlsx | |
| | | | | | Other material data: chemical composition if the components have to be calculated. | xlsx | General life cycle data are public. We don't know any confidential data yet. |
| | | | | | Building element data: type, weight, dimensions, service life, including materials, etc. | xlsx | |
| | | | | | Processes environmental data: for Waste management, transport, construction, deconstruction, upgrading material etc | xlsx | General life cycle data are public. We don't know any confidential data yet. |
| | | Task7.4 Assessment and interpretation | M21-M40 | CBI | LCA Result in tables and figures Impact categories and module according EN 15 804 for all scenarios and sensitivity analysis | xlsx | |
| | | Task7.5 HSE issues analysis | M21-M42 | CREAGH | Products HSE analysis | pdf | confidential* |
| | | | | | Processes HSE analysis | pdf | confidential* |
| | | Task7.6 Certification strategies, technical documentation and contribution to standardization | M31-M42 | QUB | Development of technical documentation in the form of technical data sheets TDS/DoP | pdf | public |
| | | | | | Drafting of preliminary EPD documentation based on the existing product categories for | pdf | public |

| WP number and name | WP lead | Task number and name | Duration | Task lead | Data Description | Format | Level |
| --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | | the EPD (EN 15804) and complying with the ISO 14025-Type III | | |
| | | | | | Analysis of the most convenient certification strategy for each expected RE$^4$ project | pdf | public |

*To be kept confidential at least till the end of the RE$^4$ project.

## 12. PUBLICATIONS

The RE$^4$ Consortium is willing to submit papers for scientific/industrial publication during the course of the RE$^4$ Project. In the framework of the Dissemination and Communication Plan agreed by the GA, R&D partners are responsible for the preparation of the scientific publications, while the Scientific and Technical Committee (Scientific and Technical Manager and WP leaders) is responsible for review and final approval. As a general approach, the R&D partners are responsible for the scientific publications as well as for the selection of the publisher considered as more relevant for the subject of matter. Each publisher has its own policies on self-archiving (green open access: researchers can deposit a version of their published work into a subject-based repository or an institutional repository, gold open Access: alternatively researcher can publish in an open access journal, where the publisher of a scholarly journal provides free online access). After the paper is published and license for open access in obtained, R&D partner will contact Dissemination and Exploitation Manager (FENIX), who is responsible for RE$^4$ data management, and he will upload the publication into project website and deposit in the OpenAIRE repository ZENODO indicating the project it belongs to in the metadata. Dedicated pages per project are visible on the OpenAIRE portal.

For adequate identification of accessible data, all the following metadata information will be included:
- Information about the grant number, name and acronym of the action: European Union (UE), Horizon 2020 (H2020), Innovation Action (IA), RE$^4$ acronym, GA N° 637138
- Information about the publication date and embargo period if applicable: Publication date, Length of embargo period
- Information about the persistent identifier (for example a Digital Object Identifier, DOI): Persistent identifier, if any, provided by the publisher (for example an ISSN number)

For more detailed rules and processes about OpenAIRE, ZENODO, it is possible to find within FAQ on the link https://www.openaire.eu/support/faq.

## 13. CONCLUSION

This report contains the first release of the Data Management Plan and represents the status of the mandatory quality requirements at the time of deliverable D8.4. This report should be read in association with all the referenced documents, appendices and including the EC Grant and Consortium Agreement, annexes and guidelines. The report will be subject to revisions as required to meet the needs of the RE$^4$ project and will be formally reviewed at month 18 and 36 to ensure ongoing fitness for purpose.

## 14. REFERENCES

[1]     Guidelines on Data Management in Horizon 2020:
        https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

## DISCLAIMER

The sole responsibility of this publication lies with the author. The European Union is not responsible for any use that may be made of the information contained therein.

## 15.    APPENDICES

### A1    Data Types Metadata Parameters

| Metadata fields | DWG | JPEG | PNG | AVI | WAV | MPEG | ASCII | .TXT | .PDF |
|---|---|---|---|---|---|---|---|---|---|
| Author | X | X | X | X | X | X | X | X | X |
| Client ID | | | | | | | | | |
| Comments | X | X | X | X | X | X | X | X | X |
| Company | X | X | X | X | X | X | X | X | X |
| Date accessed | X | X | X | X | X | X | X | X | X |
| Date acquired | | | | | | | | | |
| Date archived | X | X | X | X | X | X | X | X | X |
| Date completed | | | | | | | | | |
| Date Created | X | X | X | X | X | X | X | X | X |
| Date last modified | X | X | X | X | X | X | X | X | X |
| Date last saved | | | | | | | | | |
| Description | | | | | | | | | |
| File description | | | | | | | | | |
| File format | X | X | X | X | X | X | X | X | X |
| File format version | X | X | X | X | X | X | X | X | X |
| File name | | | | | | | | | |
| Height | | X | X | | | | | | |
| Horizontal resolution | | | | | | X | | | |
| Keywords | X | X | X | X | X | X | X | X | X |
| Language | | | | | | | | | |
| Length | | | | | | | | | |
| Line manager | | | | | | | | | |
| Name | X | X | X | X | X | X | X | X | X |
| Orientation | | | | | | | | | |
| Owner | X | X | X | X | X | X | X | X | X |
| Recording time | | | | | | X | | | |
| Sensitivity | X | X | X | X | X | X | X | X | X |
| Sharing status | | | | | | | | | |
| Size | X | X | X | X | X | X | X | X | X |
| Source | | | | | | | | | |
| Status | | | | | | | | | |
| Subject | X | X | X | X | X | X | X | X | X |
| Tags | | | | | | | | | |
| Title | X | X | X | X | X | X | X | X | X |
| Type | X | X | X | X | X | X | X | X | X |
| URL | | | | | | | | | |
| Vertical resolution | | | | | | X | | | |
| Width | | X | X | | | | | | |

## A2 Metadata Definition Template

| Metadata Definition Form | | | | | |
|---|---|---|---|---|---|
| Data Set Name | [Name] | Data Set Reference | [DMPxxx] | WP(s) involved | [WPxx] |
| Data Set Description | | | | | |
| Standards & Metadata | | | | | |
| Data Sharing | | | | | |
| Archiving & Preservation | | | | | |