IMPETUS

Turning climate commitments into action

Deliverable Report
Data Management Plan v3

30.09.2024

Deliverable Number: D8.7

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101037084.

Deliverable No.	D8.6
Deliverable nature	R (Report)
Work Package (WP) and Task	WP8- Project Management/ T8.3. Development of the Data Management Plan
Dissemination level	PU
Number of pages	76
Keywords	Data Management, Open Science, Open Data
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Contractual submission date	30.09.2024
Actual submission date	30.09.2024

[1] PU = Public
CO = Confidential, only for members of the consortium (including the Commission Services)
R = Report
ORDP = Open Research Data Pilot

Technical References

Project acronym	IMPETUS
Project full title	Dynamic Information Management Approach for the Implementation of Climate Resilient Adaptation Packages in European Regions
Call	H2020-LC-GD-2020-2
Grant number	101037084
Project website	http://climate-impetus.eu/
Coordinator	EUT

Document history

V	Date	Beneficiary	Author
V1	06.08.2024	EUT	Josep Pijuan
V2	30.09.2024	EUT	Josep Pijuan
FINAL	30.09.20224	EUT	Hannah Arpke

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Disclaimer

Abbreviations

Abbreviation / Acronyms	Description
AI	Artificial Intelligence
CA	Consortium Agreement
DMP	Data Management Plan
DOA	Document of Action
DOI	Digital Object Identifier
EC	European Commission
EEA	European Environment Agency
EOSC	European Open Science Cloud
ERC	European Research Council
EU	European Union
FAIR	Findable, Accessible, Interoperable and Reusable
GA	Grant Agreement
GAN	Generative Adversarial Network
GDPR	General Data Protection Regulation
GRIB	GRIdded Binary or General Regularly-distributed Information in Binary form
IPR	Intellectual Property Rights
JSON (-LD)	Javascript Object Notation (-Linked Data)
KPI	Key Performance Indicator
NRCS	Normalized Radar Cross-Section or Sigma0
OA	Open Access
ODC	Open Data Commons
RKBs	Resilience Knowledge Boosters
SDG	Sustainable Development Goal
URL	Uniform Resource Locator
WAN	Wide Area Network
WEFE	Water, Energy, Food and Environment
WP	Work Package
XML	eXtensible Markup Language

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Executive Summary

This document presents the third version of the Data Management Plan (DMP) on open access data handling (see box 1) defined for the IMPETUS project. The document considers the many aspects of data management, data and metadata generation, data preservation- maintenance- and analysis, whilst ensuring that data is well managed at present and prepared for preservation in the future. This Data Management Plan is compiled according to the Guidelines on FAIR Data Management in H2020 and the Guidelines on Implementation of Open Access to Scientific Publications and Research Data and the Guidelines to the Rules on the Open Access to Scientific Publications and Open Data Access to Research Data in H2020. Complementary to this formal document, we have decided to use the Argos Tool to maintain the DMP online and dynamically for the entire IMPETUS project. Specifically, the corresponding online version of the datasets related to IMPETUS will be available in the following Uniform Resource Locator (URL) corresponding to the public online version of the DMP (see Box 2)

Box.1. Open Access

Open access (OA) refers to the practice of providing online access to scientific information that is free of charge to the end-user and reusable. 'Scientific' refers to all academic disciplines. In the context of research & innovation, 'scientific information' can mean: (1) peer-reviewed scientific research articles (published in scholarly journals) or (2) research data (data underlying publications, curated and raw data).

Box.2. Open Access

Argos Tool is an online tool to create, link and share a data management plan. It is developed by Open Aire and permit to automate the process of cataloguing and sharing data between researchers, communities and funders. Moreover, Argos Tool permit also to share data according to common standards and at the end, make the DMP machine-actionable. For IMPETUS project, we have elaborated a data management in the following URL:

https://argos.openaire.eu/explore-plans/publicOverview/f82edff4-ef57-405e-8f72-6e9f1f32de99

Thus, the sections below present the lifecycle, responsibilities, review processes and management policies of research data, produced during the execution of IMPETUS. The DMP reflects the agreement of the IMPETUS consortium as well as the adopted measures concerning the control, protection, distribution and maintenance of the produced data.

This version of the DMP is updating the sections of the document that have been modified during the last 18 months from the release of D8.6. The sections that remains without updates, are kept to keep the document completeness and identified at the beginning as not updated.

1 Introduction and background

1.1 Scope

(Section not modified from D8.6)

This document presents the second version of the DMP as a part of Task 8.3 “Development of the Data Management Plan”. This task is included under WP8 “Project Management”. According to the Document of Action (DOA), the envisioned data management in IMPETUS will:

Box.3. IMPETUS Data Management

The Data Management Plan which will be based upon the FAIR principles' guidelines of the H2020. The DMP will detail how data that will be collected and generated, how data needs to be handled, classified and stored to comply with data protection regulations and good practice (incl. General Data Protection Regulation -GDPR- requirements), and which data can be shared or need to be protected/restricted and how they can be reused, as well as compatibility with the European Data Strategy. Moreover, the data management plan will cover the project contribution to open-science across Open Research Europe. The DMP will be published as a live document and will make use of the Argos tool, which offers automated processes for creating, managing, sharing and linking DMPs with research artifacts. This work will be supervised by the Data Manager.

Considering Task description, the data management plan envisioned in IMPETUS will cover the H2020 Data Management guidelines at a first stage. Due to the transition to Horizon Europe programme, IMPETUS will also take into consideration the best practices and guidelines provided in the document entitled as "HORIZON EUROPE Programme Guide" and "Practical guide to the international alignment of research data management". These documents highlight the main basis for the elaboration of research data management including:

1. Recommendation to use online tools for data management such as Argos or DMPOnline;
2. Publish the DMP in specialised journals or publishing platforms such as RIO;
3. The methodologies for making data and tools aligned with the Findable, Accessible, Interoperable and Reusable (FAIR) principles;
4. Guidelines and practices for contributing to Open Science with the relevant results of IMPETUS.

Thus, this document follows the template provided by the European Commission on DMP structure and guidelines. This documented DMP is complemented also, by the publication of the datasets under the Argos Tool (see Box 2) published by OpenAIRE. The interrelation of the DMP with OpenAIRE also allows IMPETUS project to take part in the Open Research Data Pilot contributing as well to the European Open Science Cloud (EOSC). All of these aspects materialised in the initial version of the DMP in Month 03.

As stated, the DMP is a living dynamic document of agreements that evolves throughout the project lifetime. In addition to submitting updated versions of this Deliverable, the online version of the datasets will be updated as follows:

- Regular update of the DMP (online and the present document) will be provided at M18, M36, M48.
- The online DMP will add datasets at times when they are ready to be published.
- The DMP will continuously monitor and update the data generated and consumed in the project according to the European Commission (EC) rules.

1.2 Why is a Data Management Plan necessary?

(Section not modified from D8.6)

IMPETUS is willing to participate in the Open Access and the Open Research Data Pilot of the European Research Council (ERC). The DMP specifies the implementation of the pilot for: data generated and collected, standards in use, workflow to make data accessible for use, re-use and verification by the community, and definition of a strategy of curation and preservation of the data. Referring to the Grant Agreement (GA), Article 29.3 on "Open Access to research data" (see Box 4):

Box.4. Open Access to research data

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;

(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).

The data management policy described in this document reflects the current state of the partnership agreements on data management that officially materialise in the Consortium Agreement (CA). The IMPETUS project will collect bio-physical, socio-economic, climate, water, energy and food information. The collection of these heterogeneous datasets can be an expensive and time-consuming process. By making a large part of them available, IMPETUS will make a long-lasting and significant contribution to the research and industrial communities.

All scientific datasets will be released in open formats (e.g. JavaScript Object Notation -JSON-, JSON-LD mainly considering also other formats such as eXtensible Markup Language -XML- in case of need) respecting available standards, with proper documentation supporting their use by other researchers and stakeholders. IMPETUS will engage end-users and stakeholders at all IMPETUS projects levels considering the technological and non-technological solutions to be implemented in the demo sites as an adaption to climate change (Figure 1). Moreover, this engagement strategy also covers the design of the adaptation pathfinder tool and relevant risk assessment tools. Based on this, the IMPETUS project is demo-case driven. In this environment, it is imperative to carefully address data management issues connected to the use of external data regarding the regional resilience knowledge boosters in each of the relevant climatic regions of the European Union (EU). Considering these aspects, data is an imperative in the construction and adoption of the knowledge-driven resilience knowledge booster approach to sharing experiences across the different regions. Indeed, data will sustain the development of the human dimension of the knowledge boosters (Work Package -WP-1 and parts of WP7), adaptation pathfinders (WP2), risk assessment tools (WP3), technologic and non-technologic adaptation solutions (WP4) and the adaptation pathways and innovation packages (WP5). Considering data relevance, we will explicitly deal with security issues from the technical perspective. In the DMP, we will also tackle specifications on security and privacy issues from the management perspective.

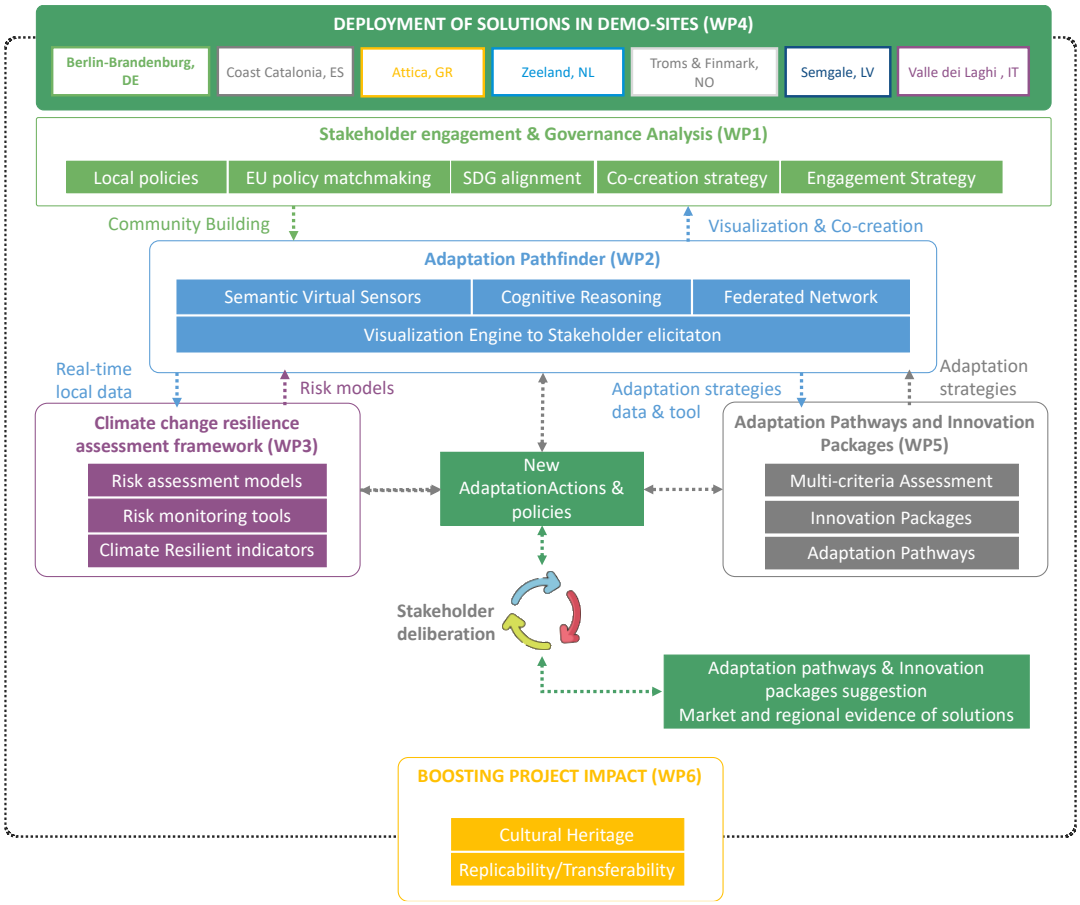

Figure 1. Overall methodology of the IMPETUS project

The following categories of data will be collected in the project:

- Personal data (age, gender, email, name, affiliation, photos, videos, quotes, consent information etc.).
- Socio-economic (city of residence, social status, marital status and income category)
- Social networks (Twitter and LinkedIn account information)
- Regional climate models for impact assessment and monitoring
- Water, freshwater & marine (hydrological maps, flows, water/wastewater directives, fishing stocks, aquaculture, biologic information, water use permits, wells and springs)
- Surface water and reclaimed water data (quantity and quality parameters)
- Agricultural data (irrigation, fertilization, production)
- Snow (historical height data)
- Climate change & impacts (atmospheric conditions, heat & energy information, temperature & precipitation, wind, solar radiation, extreme events data, climate projections)
- Ecosystems & biodiversity (terrestrial, coastal, marine and freshwater)
- Geospatial information (Copernicus, DIAS, European Environment Agency -EEA-, etc.)
- Land use, land cover, Digital Terrain Model
- Personal opinions, values, decision criteria and patterns, decision-making processes, etc.
- Local ecological knowledge, local climate perceptions
- Financial information (market volumes, investments etc.)
- Climate risk indexes
- Information about historic building stock

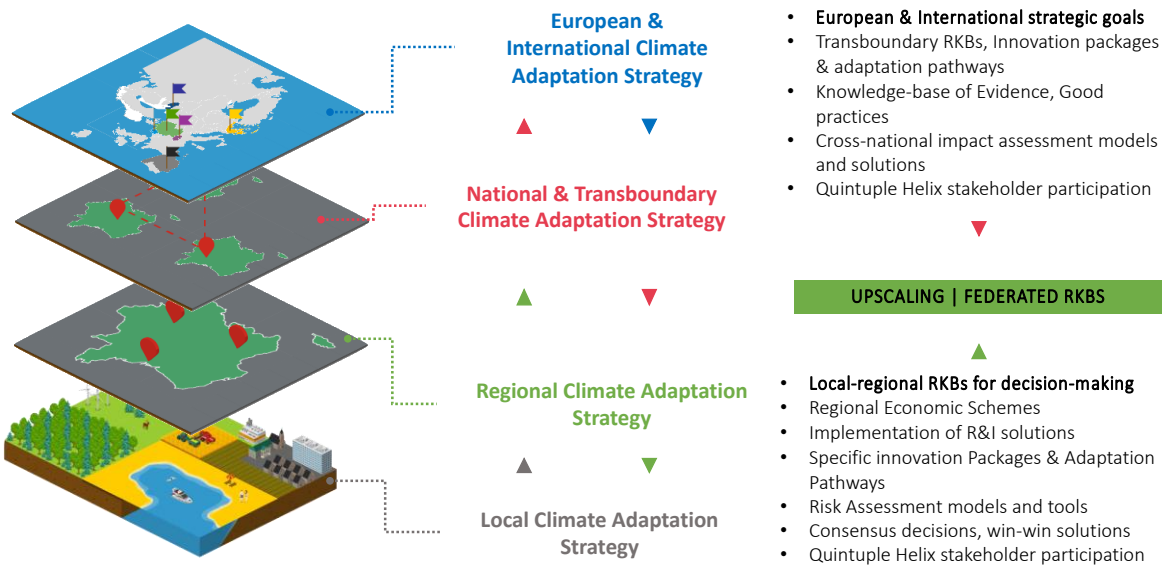

Figure 2. Conceptual framework of IMPETUS

Sensitive data related to the IMPETUS innovations mentioned above within most of the WPs will be stored in the project databases All data and especially personal information will be securely stored in the project server. The ways and strategies to access, manage and secure the personal data information will follow the General Data Protection Regulation (GDPR). Specifically, partners must comply with the GDPR in the following areas (as detailed in the next sections):

- **Transparency and communication** - all data will be securely stored and transmitted to/from the corresponding architectural modules inside IMPETUS. Within the visual modules of the platform, a GDPR advertisement will be added to remind users of the rules and management procedures about personal data.
- **Collection of personal data -** personal data will be collected with clear communication to the users about their data's use, storage, processing, management and their right to view or remove their personal data from the database.
- In cases where consent is needed, appropriately worded information will be provided along with the request for consent. Evidence of consent should be kept by partners. Users may withdraw their consent at any time.

Specifications about the server and other technical aspects will be documented in D2.2: 'Semantic Context Broker tool to facilitate knowledge sharing across regions' and D2.6: 'High and advanced visualisation to facilitate stakeholder engagement and co-creation'. Demo –site teams will be the responsible partners to manage their regional servers, which will be scalable when required in terms of processing power and storage space. Under this environment, EUT will be responsible for deploying the adaptation pathfinder and for configuring it inside these demonstration cases. Moreover, EUT and UiT will define an strategy to connect these regional pathfinders into a federated network to maximise performance (e.g. quick access for the user to the content, quick processing and communication with the corresponding services/modules, etc.). IMPETUS partners will have secure web access to the previously anonymised data, which will have been automatically checked for consistency, homogeneity and completeness, whilst manual audits will be performed as per the standard operational procedures previously defined.

After project completion, and in case of no objection by IMPETUS partners and users, anonymisation will be preserved (i.e., users cannot be identified from their data) and data may be published in an Open Data portal for future research, always consistent with exploitation and Intellectual Property Rights (IPR) requirements.

1.3 Who will be the responsible for the implementation of the DMP?

(Section not modified from D8.6)

The responsible partner will be EUT as leader of Task 8.3 'Development of the Data Management Plan'. The DMP primarily concerns the IMPETUS partners for data collection considering regional climate models, water information systems, urban planning information, agricultural information, fire information, etc. On top of this data, the DMP will also cover risk assessment tools information, adaptation pathfinder recommendation, the representation of information in the visualisation engine, and any personal data collected as a result of stakeholder engagement, communication and dissemination activities or events. Hence, IMPETUS transversal innovations and regional adaptation solutions will comprise 7 demonstration sites (Berlin-Branderburg -DE, Catalonia Coast -ES- Attica -GR, Zeeland -NL, Troms & Finmark -NO, Zemgale –LV, and Valle dei Laghi -IT) through the demo-site work package (WP4) leader, KWB. Moreover, project and scientific coordinators are also central players in the implementation of the DMP and they will track the compliance of the rules agreed.

1.4 What kinds of data will be affected by the DMP?

The main purpose of a DMP is to describe research data with attached metadata to make them discoverable, accessible, assessable, usable beyond their original purpose and exchangeable between researchers.

IMPETUS will focus on the production of knowledge and intelligent processes and tools rather than the production of research or observation data. Considering the intention to take part in the Open Research Data Pilot, three types of data are considered:

- "*The data, including associated metadata, needed to validate the results presented in scientific publications as soon as possible*."
- "*Other data, including associated metadata, as specified and within the deadlines laid down in the data management plan – that is, per the individual judgement by each project*". According to the Guidelines on Data Management in Horizon 2020, the IMPETUS DMP will describe the handling of numerical datasets processed or collected during the project lifetime.
- "*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, input/output of the elaborated/updated models, interview recordings and images. The focus is on research data that is available in digital form.*"

The DMP includes clear descriptions and rationale for the access regimes that are foreseen for collected data sets. Therefore, the DMP explicitly leaves open the handling, use and curation of products like tools, software and written documents. Thus, we restrict the focus of our DMP to numerical data products like produced model data or observation data.

It should be taken into consideration that the collection of personal data per se is not the main purpose of IMPETUS. However, certain aspects of the data may be necessary to build the different operational applications and conduct the research (e.g. information on the Member State / region in which an individual is located, attributing a view to certain organisation or expert, human markers, etc.). Furthermore, research activities may indirectly result in collecting such personal data as part of the wider collection process. This means that:

- Potential personal data collection during IMPETUS does not constitute an output of the research project - which further guarantees data protection and safety.
- Personal data that is not currently publicly available will be completely anonymised for any external communications or publications, unless prior approval has been sought from the

individual concerned. Completely anonymised data is excluded from the data privacy rules (as from the moment it has been completely anonymised).

"Personal data" means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person. (For the full definition, see *REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 - General Data Protection Regulation).*

'Processing' means any operation or set of operations which is performed on personal data or on sets of personal data, whether or not by automated means, such as collection, recording, organisation, structuring, storage, adaptation or alteration, retrieval, consultation, use, disclosure by transmission, dissemination or otherwise making available, alignment or combination, restriction, erasure or destruction.

IMPETUS consortium partners will collect and process personal data only if and in so far as it is really necessary for their research or other project activities such as stakeholder engagement, communications and dissemination. Partners will not use the data for other objectives than those explained to the participants in an appropriately worded information sheet / registration form / consent form / email. Examples of processing of personal data that are relevant to IMPETUS include creating a list of participants or managing a database with personal data (e.g. to send invitations).

The collection of personal data as part of IMPETUS may be undertaken using different methods. The main methods used will be interviews, questionnaires circulated to stakeholders and potentially through the direct online retrieval of publicly available data. Data collection, including personal data collection, is foreseen in particular in the context of the demo sites, their resilience knowledge booster (RKB) and stakeholder engagement activities, and the related communication and dissemination actions. This data collection will be done via (i) face-to-face interviews, (ii) interactive workshops, (iii) specific surveys; (iv) focus group sessions, (v) cookies inside the visual part of the platform, to gather information on individuals' views and experiences on various topics (being compliance with the GDPR). Interactions via email, social media or other means of communication could also generate personal data, as well as registration for events and the seeking of consent to publish photos, quotes and other communications-related content. In this context, WP1 and WP7 are also involved. In addition, WP7 activities may also generate personal data collection needs.

There is no external IMPETUS newsletter, so retention of subscription data for such a purpose will not be an issue. In line with the project strategic communication approach laid out in D7.2 'Framework for communication, collaboration and dissemination', IMPETUS instead collaborates with 'sister projects' to create a joint newsletter ('The Climate Resilience Post') for which REGILIENCE holds responsibility. An internal project newsletter is sent only to individuals participating in IMPETUS.

All IMPETUS partners involved in data collection must follow high quality and common standards ahead of any participatory events, led by the IMPETUS partner leading the event. This detail is being provided in the form of guidelines on what and how data should be collected. Personal data could be also indirectly collected through expense claim forms in cases where reimbursement of expenses is foreseen.

With respect to storage, protection, retention, destruction or re-use of personal data, this takes place at the level of each individual organisation in the IMPETUS consortium. IMPETUS partners are long-established organisations that are involved in numerous research projects. These organisations fully comply with applicable EU and national legislation on the issue of personal data protection; some also have internal procedures in place regarding these aspects.

1.5 Storing and sharing information

(Section not modified from D8.6)

Collection of data from stakeholders is subject to confidentiality rules, and stakeholders will be requested to give written permission (by email or via a consent /registration form) for using, storing, and distributing their data in an anonymised way. Thus, individual data cannot be traced back to individuals. Publications will include the proper level of scale, and quantitative as well qualitative information will be aggregated / discussed at a group level before being published. These precautions will protect privacy in accordance with clear rules of confidentiality within the consortium. Micro data[1] will not be distributed outside the consortium and its use will be limited to IMPETUS purposes.

This being said, the main data generated by demo sites consist of qualitative data such as notes/transcripts of discussions, minutes of meetings, input/outputs of the elaborated models and subsequent data after its elaboration for other purposes (publication, dissemination), or any other qualitative output elaborated by participants. Privacy issues that may emerge from these types of data are covered within the IMPETUS ethics agreement (i.e. collection of personal data, the need of the team to be able to attribute comments to the participants / organisations they represent). Thes topics are addressed along this document as well as in Annex V and will be updated in following versions

It is noted that all information saved and shared on the IMPETUS website and the shared space platform of the project (Microsoft Sharepoint)will be safely stored in the following spaces: (i) on the platform itself, which will be internet-based (i.e. no reliance on one specific computer) and (ii) regularly backed up by the coordinator(EUT) or Dissemination responsible(ESCI) on its local system).

IMPETUS partners are bound to follow these information management (and confidentiality) rules if they download data onto their organisation or personal systems. Within the consortium, some information, notably qualitative information, will be shared using the shared space platform based on Microsoft Teams (Microsoft Sharepoint). Exchanges of information and documents can also take place between more restricted subgroups if necessary.

The degree to which data will be openly accessible will depend on the extent to which confidentiality or IPR rules apply to the data to be shared, as well as the relevance of sharing information with the target audience in the context of the research / activity. Any reference to information about stakeholders stored on maps, clinical information, etc. will be deleted prior to public publication, in order to avoid violating the confidentiality of individual data holdings. Information arising from IMPETUS research will be shared to the wider public and will be made available on the IMPETUS website, with social media and other communication means used to cross reference this data/information.

Data that will be published should be compiled, assessed and analysed (e.g. research papers, short reports), especially for the qualitative data collected during the stakeholder interactions, or in the form of tabular datasets if appropriate. Raw information or datasets will not be published if it is irrelevant to the study and the target audience, unless it is deemed important for research purposes for a particular reason.

As a general rule and especially whenever a personal data conflict is identified, personal data will be anonymised. However, for the purposes of IMPETUS, the partners are likely to be able to attribute a statement to e.g. an individual expert. External participants will be informed of this prior to any IMPETUS events and may withdraw consent or ask for anonymity if they wish to stay anonymous.

By sharing IMPETUS documents on the public domain, the team ensures that data can be effectively disseminated to the target audience groups and the wider public.

In case a dataset cannot be shared, the reasons for this will be mentioned (e.g. ethical, rules of personal data, intellectual property, commercial, privacy-related, security-related).

Data collection, handling and analysis in IMPETUS are essential and all partners of the project conform to the current legislation and regulations regarding secrecy obligations for collected data that conform to EU legislation on:

- The Charter of Fundamental Rights of the EU; and

[1] https://ec.europa.eu/eurostat/web/microdata

- The REGULATION (EU) 2016/679 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 April 2016 - General Data Protection Regulation on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

Open Access to research data is ensured through the IMPETUS website that corresponds to the repository for all public deliverables of IMPETUS. Recognising that the Internet is a primary medium to allow users to access data, project partners committed to keep the website live for at least 5 years after the conclusion of the project, to maintain a preserved access to all resources and project outputs by the public and the scientific community. Data collected in the case studies, and more generally all data made public during the lifetime of the project, will be gradually archived on the project website on an appropriate webpage as well as on specific research data repositories as described in detail in next section.

The management, security and long-term curation of data, including access beyond the project lifetime, is assured by the project coordinator. This ensures that all data are held securely on their own infrastructures and in line with EU rules. Finally, scientific publications are also available on the chosen open access repository.

1.6 Structure of the Document

(Section not modified from D8.6)

The DMP document has been structured according to the following sections:

- *Section 0* Eexecutive summary of the document.
- *Section 1* is the introductory chapter which provides the scope of the deliverable and the main outline of the document.
- *Section 2* contains information about digital datasets generated or collected in IMPETUS for each of the WPs and also sections devoted to the preservation data mechanisms established within the project.
- *Section 3* contains information about the FAIR data for IMPETUS and will be updated as the project evolves.
- *Section 4* focuses on the allocation of resources to maintain the datasets and digital assets elaborated within IMPETUS.
- *Section 5* is devoted to data security aspects.
- *Section 6* addresses issues related to ethical aspects.
- *Section 7* covers other issues related to data management
- *Section 8* focuses on the identification and description of external applications and services to ensure the correct elaboration of a DMP.
- *Section 9* describes main conclusions and future work.

2 Data Summary

The main intention of the DMP is to present the data management plan to the Work Packages. The information listed below reflects the initial conception and thoughts of the individual Work Packages during the proposal stage, corresponding to the datasets and their management flows in order to provide fast results and evidence. For that aim, the main intention is to apply a fast-track application of the resilience knowledge boosters (human dimension and digital dimension of the RKBs) over initial demo sites, to be selected during the initial months of execution (Figure 3). The objective of the fast-track is to:

- Identify difficulties related to key community systems' involvement, datasets collected from different stakeholders and projects to identify climate models and have a comprehensive view of all components in the area.
- Identify obstacles and find solutions to harmonise data at level of scale and spatial distribution.

After the fast-track application, IMPETUS will apply the developments and experiences to the rest of the demo sites iteratively.

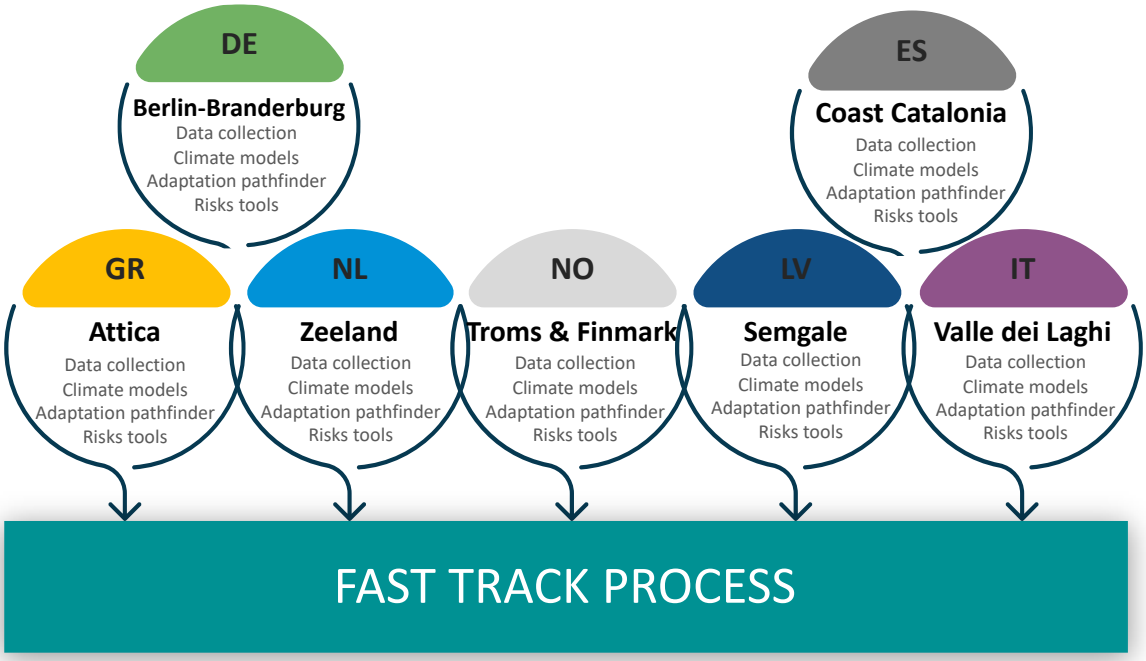

Figure 3. IMPETUS demo sites

Considering this process, EUT will manage all data used for the implementation of IMPETUS. The information flow is depicted in the following figure (Figure 4):

Figure 4. IMPETUS digital dimension of the RKBs

Based on the image, the demo sites will adopt a human dimension for engaging users in a co-creation strategy of innovative technological and non-technological solutions, the integration of regional data and climate modelling tools information, the development and deployment of the adaptation pathfinders, elaboration of risk assessment tools and the subsequent climate resilience indicators. A main outcome of the project will be demonstration of the adoption of the regional knowledge boosters in the different regions, including the co-elaboration of adaptation pathways and innovation packages. This conceptual and demonstration model will cover the entire project span from WP1 to WP5 including specific demonstrations in WP4 and supporting activities in WP7. Hence, the conceptual model will include climate risk assessment modelling and AI-driven tools innovations (cognitive systems, semantic virtual sensors, context brokers, etc). These kinds of IMPETUS assets will be fed with climate, socio-economic, geospatial and other relevant information coming from the demonstration cases (derived from the national authorities, organisations, institutes and programmes like Eurostat, GISCO, GEOSS, Copernicus, INSPIRE, JRC (CORINE, USGS, etc.). Moreover, information and knowledge to be shared under IMPETUS will be published through REST APIs fully compatible with reference architectures (e.g. FIWARE) and NGSI-LD standard to expose cross-domain information. Hence, another outcome of IMPETUS is the creation of a climate resilience open data space.

EUT will be responsible for communicating with the WP leaders, co-leaders, demo site leaders, data experts, climate resilience experts and for the different needs for data collection and information requirements. Assigned people for reporting and updating the above-mentioned datasets are shown in the following tables (Table 1, Table 2 and Table 3):

Table 1. Work Package leaders and responsible partners

Work package	Assigned Institution
WP1	Stefania Munaretto / Lisa Andrews (KWR)
WP2	Iván Cester (EUT)
WP3	Dionysis Nikolopoulos / Christos Makropoulos (NTUA)
WP4	Nasrin Haacke (KWB)
WP5	Sebastiano Carrer (THETIS)
WP6	Laura Armayones (EUT)
WP7	Gustavo Jacomelli (ESCI)
WP8	Hannah Arpke (EUT)

Table 2. IMPETUS demo sites' responsible institutions and partners.

Case Study	Assigned Institution
Berlin-Brandenburg (GE)	Nasrin Haacke(KWB)
Coast Catalonia (ES)	Queralt Plana (EUT)
Attica (GR)	Klio Monokrousou (NTUA)
Zeeland (NL)	Jasper van Lieshout (N&S)
Troms & Finnmark (NO)	Rune Graversen (UIT)
Zemgale (LV)	Ingrida Brēmere (BEF)
Valle dei Laghi (IT)	Valentina D'Alonzo (EURAC)

Table 3. Responsibilities regarding the digital assets in IMPETUS

Digital Asset	WP	Assigned Institution
RKB context-broker for data integration	WP2	EUT
Climatic open data	WP2	UiT, KWR, NTUA, KWB, N&S, LOB, MGIS, MANTIS
Climatic projections & scenarios	WP2	LOB
Prediction tool for physical and socio-ecologic phenomena and trends	WP2	EUT, UiT
Characterisation of environmental and anthropogenic factors	WP2	UiT
Visualisation environment of CA Solutions	WP2	EUT, MANTIS, NTUA, LOB, BEF, THETIS, TFFK
Resilience knowledge boosters	WP2	EUT, MANTIS, NTUA, LOB, BEF, THETIS, TFFK
Risk assessment models	WP3	NTUA, LOB, BEF
Non-climatic data (ASCAT, TRMM, 3B42, MODIS, etc)	WP3	LOB
Extreme events datasets (EFAS, EDO, etc)	WP3	LOB, MGIS, UiT, EUT
KPI indicators for climate adaptation	WP3	KWR, NTUA, WUT, THETIS, UiT
Climate resilience footprint tool	WP3	NTUA, THETIS, IUCN, GCF, UNSDSN, LOB, KWR, EUT
Biodiversity & reforestation tools	WP4	MAICH, EUT, NTUA, GSNEW

Sewer mining technology	WP4	NTUA, EYDAP, MAICH
Water-energy simulation and optimisation tool	WP4	NTUA, EYDAP
Decision support system for integrated water management	WP4	KWB, SENUMVK, BWB, GCF, MGIS, EURAC, BIM, LOB
Online pathogen monitoring	WP4	EUT/KWB
Flood risk model	WP4	N&S, KWR
Heat stress model	WP4	N&S, KWR
Early warning systems (EWS) for civil protection from floods	WP4	BEF, ZPR, JPOIC, LOB
Digital Twin for climate adaptation and green business development	WP4	NTUA, GSNEW, MANTIS, LOB
Satellite-based coastal monitoring system	WP4	LOB, AUEB
EWS for avalanches	WP4	UiT, TFFK
Decision Theatre	WP4	GCF, KWB, SENUMVK, BWB
Marine spatial planning framework	WP4	TFFK, UiT
Digital Twin of Tromsø City	WP4	TFFK, UiT
Decision support tool for industrial clusters' decarbonisation	WP4	WEI
Repository of climate adaptation options	WP5	THETIS, EUT
List of exploitable results	WP6	EUT
TOOL-WP4-DIGITAL-TWIN-WATER-MANAGEMENT	WP4	MGIS
TOOL-WP4-WATER-MANAGEMENT-DATA	WP4	EURAC,MGIS
TOOL-WP4-DSS-WATER-MANAGEMENT	WP4	EURAC

In this version of the DMP we have removed one of the digital assets, the climate ontology as at the end it will not implemented neither used by the ODS developed in Task 2.2. The ODS uses only a data model with the concepts of data catalogue and data entity. A part of that some new assets have been added like, the Digital Twin for Tromsø City(WP4), The repository of climate adaptation options(WP5) and the List of exploitable results(WP6). Finally, the assigned institutions of some assets have been updated.

Considering the different assets and responsibilities in IMPETUS, the main purpose of the section is to provide an executive summary of the different strategies for addressing the following issues:

- Provide an overview of collected and generated datasets and their corresponding preservation procedures;

- State the purpose of the data collected / generated;
- Specify the types and formats of the data generated / collected;
- Specify if existing data will be re-used;
- Specify the origin of the data;
- State the expected size of the data;
- Outline the data utility: to whom will it be useful;
- Define how the data is going to be accessible for internal and public use, when and for how long.

2.1 Data Assets and Preservation Procedures

This part of the document is mainly devoted to specifying the data assets that will be generated in IMPETUS work packages and the corresponding preservation procedures after the project ends. At this stage of the project (Month 18), it must be mentioned that most of the information described corresponds to the consortium intention to publish / generate information. It is also noteworthy that the datasets that are going to be generated during the project will be published in the following places (Table 4):

Table 4. Open repositories used in IMPETUS

Data repository	URL of the repository	Brief description of the dataset to be published
Zenodo	IMPETUS Climate project | Zenodo	A data repository to share datasets and other digital assets in open source
European Open Science	EOSC Portal | Select your identity provider (eosc-portal.eu)	A repository to share datasets and support IMPETUS in the cataloguing of such datasets
Argos	Argos - DMP Overview (openaire.eu)	A tool used as a virtual data management plan. The main advantage is the publication of datasets directly on Zenodo and OpenAIRE.
Github	https://github.com/Applied-Artificial-Intelligence-Eurecat	Github is the preferred open repository for code. The link included here is the repository proposed by Eurecat as Project coordinators for any project need. However, some partners can decide to use their own Github repositories.

Complementing this information, it is envisioned that most of the tools and data generators are openly available for community and scientists' future use (code shared through GitHub). Specifically, the following tools are tentatively openly available through open-source repositories (Table 5. Code repositories used in IMPETUS for each of the digital tools):

Table 5. Code repositories used in IMPETUS for each of the digital tools

Code Repository	Code Repository	Repository URL
RKB context-broker for data integration	Github	https://github.com/Applied-Artificial-Intelligence-Eurecat

Prediction tool for physical and socio-ecologic phenomena and trends	Github	https://github.com/Applied-Artificial-Intelligence-Eurecat
Characterisation of environmental and anthropogenic factors	Github	https://github.com/IMPACTteam
Visualisation environment of CA Solutions	Github	https://github.com/Applied-Artificial-Intelligence-Eurecat
Resilience knowledge boosters	Github	https://github.com/Applied-Artificial-Intelligence-Eurecat
Risk assessment models	Github	TBD
Climate resilience footprint tool	Github	TBD
Biodiversity & reforestation tools	Github	TBD
Sewer mining technology	Github	TBD
Water-energy simulation and optimisation tool	Github	TBD
Decision support system for integrated water management	Github	TBD
Online pathogen monitoring	Github	TBD
Flood risk model	Github	TBD
Heat stress model	Github	TBD
Early warning systems (EWS) for civil protection from floods	Github	TBD
Digital Twin for climate adaptation and green business development	Github	TBD
Satellite-based coastal monitoring system	Github	TBD
EWS for avalanches	Github	TBD
Digital Twin of Tromsø City	Github	TBD
Decision support tool for industrial clusters' decarbonisation	Github	TBD
TOOL-WP4-DSS-WATER-MANAGEMENT	Github	Server on EURAC facilities

As described in the abovementioned tables, IMPETUS contributions to provide open-data information, data catalogues and open-source tools are envisioned and agreed by the consortium. This subsequently

implies the wider community will be able to access sets of data and digital tools to better understand climate trends at different time scales, geographies and also, considering key community systems. Moreover, this also implies this open data will be used to derive climate adaptation and mitigation pathways.

Considering this description, Table 7 presents a summary of all data assets that potentially have been and will be elaborated and delivered through IMPETUS. Considering the relevant datasets shown in Table 7, there is a remarkable intention by the consortium to highly contribute to the scientific community and the piloting of research with potential reliable and curated information. These aspects will sustain future investigations in the selection, implementation and monitoring of innovation packages and subsequently the generation of adaptation pathways. The generation of open data and open catalogues in each of the regions will sustain the regional knowledge boosters and subsequent communities.

It is the intention of the consortium to maintain all digital assets (Table 7) that IMPETUS could produce, after the project is completed. Thus, the quality of data will be ensured for future research and studies. There is also the intention of the consortium to maintain updates to the digital tools for around 2-3 years, according to the tools depicted in Table 6.

Indeed Table 7 has increased the number of digital assets from 26 to 30 in the v2 (M18 revision) with respect the first version published at M3. The set of assets is expected to grow along the project providing also further details in all tables describing them.

Table 6. Maintenance and preservation plans envisioned for the digital tools of IMPETUS

#	Identifier/Name	Responsible Partner	Maintenance and data preservation plan (2-3 years)
1	**RKB context-broker for data integration**	EUT	Maintenance and updates on code will be done as needed
2	**Prediction tool for physical and socio-ecologic phenomena and trends**	EUT/UiT	This information will be available in the future versions of the DMP
3	**Characterisation of environmental and anthropogenic factors**	UiT	Planned to update the version on Github regularly, so that the new versions of the tool can be appropriately maintained
4	**Visualisation environment of CA Solutions**	EUT,MANTIS	This information will be available in the future versions of the DMP
5	**Resilience knowledge boosters**	EUT,MANTIS	This information will be available in the future versions of the DMP
6	**Risk assessment models**	NTUA	This information will be available in the future versions of the DMP
7	**Climate resilience footprint tool**	NTUA	This information will be available in the future versions of the DMP
8	**Biodiversity & reforestation tools**	MAICH	This information will be available in the future versions of the DMP
9	**Sewer mining technology**	NTUA	This information will be available in the future versions of the DMP

10	**Water-energy simulation and optimisation tool**	NTUA	This information will be available in the future versions of the DMP
11	**Decision support system for integrated water management**	KWB	This information will be available in the future versions of the DMP
12	**Online pathogen monitoring**	EUT	This information will be available in the future versions of the DMP
13	**Flood risk model**	N&S	This information will be available in the future versions of the DMP
14	**Heat stress model**	N&S	This information will be available in the future versions of the DMP
15	**Early warning systems (EWS) for civil protection from floods**	NTUA	This information will be available in the future versions of the DMP
16	**Digital Twin for climate adaptation and green business development**	BEF	This information will be available in the future versions of the DMP
17	**Satellite-based coastal monitoring system**	LOB	This information will be available in the future versions of the DMP
18	**EWS for avalanches**	UiT	This information will be available in the future versions of the DMP
19	**Marine spatial planning framework**	TFFK	Agreement with Geodata and UiT on Maintenance and data preservation
20	**Digital Twin of Tromsø City**	TFFK	Agreement with Geodata and UiT on Maintenance and data preservation
21	**Decision support tool for industrial clusters' decarbonisation**	WEI	This information will be available in the future versions of the DMP
22	**TOOL-WP4-DSS-WATER-MANAGEMENT**	EURAC	This information will be available in the future versions of the DMP

To conclude this part of the document, IMPETUS is committed to open-source science through the initiatives of Open Pilot Research, EOSC and also the digitalisation of the data management plan inside the Argos Tool. Under these initiatives, the intention of IMPETUS is to share relevant digital tools developed within the project, models, and also referring to output datasets regarding the AI-driven tools processes (including curation and quality assurance). Moreover, the project is committed to the maintenance of these assets during the project. Also, there is the intention to maintain these assets beyond the project lifespan to ensure future research, raise the awareness of society in facing climate change and, most importantly, to empower the quintuple helix to be an active part of decision-making processes.

Table 7 Open and private datasets and tools generated in IMPETUS

#	Identifier/Name	Brief Description	Open Source	Repository	Additional Comments or justification of not open source
1	**RKB context-broker for data integration**	A NGSI-LD instance to expose the collected information using linked data representation	Open Source	https://github.com/Applied-Artificial-Intelligence-Eurecat	
2	**Climatic open data**	Open data related to climatic variables	Open Source	TBD	
3	**Climatic projections & scenarios**	Data sets that incorporate climatic downscaling, scenarios and projections for the different regions	Open Source	TBD	
4	**Prediction tool for physical and socio-ecologic phenomena and trends**	Pattern recognition techniques at local and global level to extract significant patterns that can be used to reliably understand and predict physical and socio-ecologic phenomena and trends	Open Source	TBD	
5	**Characterisation of environmental and anthropogenic factors**	Geometric deep learning to improve the characterisation of environmental and anthropogenic factors	Open Source	https://github.com/IMPACTteam	
6	**Visualisation environment of CA Solutions**	High visualisation engine to interact with data and run generated models (e.g. digital twin)	Open Source	TBD	

7	**Resilience knowledge boosters**	A full climate platform to be installed inside each region	Open Source	TBD	Pending discussions within consortium
8	TOOL-WP2-SEASONAL-DATA-PROCESSOR	Tool to download and process the seasonal forecast dataset	Proprietary	N/A	TBD
9	TOOL-WP2-CLIMATE-PROJECTION-DATA-PROCESSOR	Tool to download and process the CMIP6 climate projection data	Proprietary	N/A	TBD
10	DATASET-WP2-SEASONAL-FORECAST-DS7	Dataset of the seasonal forecast main variables extracted for the Valle dei Laghi region	Open Source	TBD	
11	DATASET-WP2-CLIMATE-PROJECTION-CMIP6-DS7	Dataset of the climate projection main variables obtained from the CMIP6 models in the Valle dei Laghi region	Open Source	TBD	
12	**Risk assessment models**	Tool to detect hot-spots and vulnerable points in each of the regions	Publicly available (as a service)	N/A	Brough in prior IP (NESSIE)
9	**Non-climatic data (ASCAT, TRMM, 3B42, MODIS, etc)**	Historical records of satellite-derived and non-climate data (ASCAT, TRMM 3B42, MODIS, etc.)	Open Source	TBD	
10	**Extreme events datasets (EFAS, EDO, etc)**	Selection and exposure of extreme events datasets (EFAS, EDO, etc.)	Open Source	TBD	
11	**KPI indicators for climate adaptation**	Selection of climate KPIs to measure the cost-benefit of the	Open Source	TBD	

		technology and other important impacts for the assessment.			
12	**Climate resilience footprint tool**	Tool that uses the selected KPIs to assess cost-benefits and cost-effectiveness	Publicly available (as a service)	N/A	Brough in prior IP (NESSIE)
13	**Biodiversity & reforestation tools**	AI algorithms to monitor biodiversity and reforestation of the forestry areas	Open Source	TBD	
14	**Sewer mining technology**	Regional digital twin that will combine AR/VR for creation of newer climate change adaptation services	Open Source	TBD	Data will be illustrated through the Attica digital twin (T4.10.4)
15	**Water-energy simulation and optimisation tool**	Simulation and optimisation tools for model wastewater systems	Open Source	TBD	UWOT model is deployed
16	**Decision support system for integrated water management**	Combination of water balance model and DSS for water resources	TBD	N/A	Berlin models partially in ownership of BWB (groundwater) and SenUMVK (surface water)
17	**Online pathogen monitoring**	Data-driven algorithms for water quality monitoring and also, detection of water-borne pathogens	TBD	N/A	Open access software/code to be used. However, It is still under decision the model to be implemented. Results and data will be open access.
18	**Flood risk model**	Decision making tool that uses 3Di models for flood monitoring.	TBD	N/A	Models in ownership of N&S. Results / data open access.

19	**Heat stress model**	Decision making tool that interactively derives heat stress for a region	TBD	N/A	Idem Flood Risk Model
20	**Early warning systems (EWS) for civil protection from floods**	Early warning system for protection of citizens about flood events using LIDAR and satellite technology	Open Source	TBD	
21	**Digital Twin for climate adaptation and green business development**	A digital twin to access reliable data, climate adaptation services, and business innovation recommendations	Open Source	TBD	
22	**Satellite-based coastal monitoring system**	Satellite-based coastal monitoring system for the Catalan coast used to identify vulnerability hot-spots and assess economic impact of future extreme events on the coastal infrastructure	Open Source	TBD	
23	**EWS for avalanches**	EWS based on ground-based radar monitoring coupled with real-time observation of weather and climate-related parameters to detect avalanches at their early stage.	Open Source	TBD	
24	**Decision Theatre**	A digital tool to empower discussions with interactive visualisation environments	Proprietary	GCF Server	Danger of misuse
25	**Marine spatial planning framework**	Upgrade of the digital twin in the Arctic for services related to planning processes of marine areas	Open Source	Geodata/TFFK server	

26	**Digital Twin of Tromsø City**	Digital twin of Tromsø city for climate-proofing of the city centre and of its urban water infrastructure against sea level rise	Open Source	Geodata/TFFK server	
27	**Decision support tool for industrial clusters' decarbonisation**	Tool to discover and identify decarbonisation pathways inside industry.	Open Source	TBD	
28	TOOL-WP4-DIGITAL-TWIN-WATER-MANAGEMENT	A Digital Twin that produce information about the main hydrological variables to perform the water management	Proprietary	MGIS	
29	DATASET-WP4-WATER-MANAGEMENT-DATA	Dataset that contains information about variables to perform the water management like inflow in reservoirs.	Open Source	MGIS	
30	TOOL-WP4-DSS-WATER-MANAGEMENT	Platform that can be used as a Decision Support System for the water management optimisation.	TBD	EURAC server	Valle dei Laghi DSS partially in ownership of MGIS (back-end, see Tools 28 and 29) and EURAC (front-end)
31	**Repository of climate adaptation options**	List of adaptation options useful for Adaptation Pathways design	TBD	TBD	
32	**List of exploitable results**	List of all exploitable results of the project with all their characteristics	TBD	TBD	

2.2 Purpose of the data collection / generation and relation to project objectives

IMPETUS will develop and validate the climate adaptation framework at different scales addressing socio-economic and climate change, as well as stakeholder behaviour and transboundary (diplomacy) issues. The core outcome will be the regional resilience knowledge boosters that offer open spaces to co-create and share knowledge regarding climate adaptation measures against different impacts.
Considering this purpose, several models (risk assessment, climate monitoring, socio-economic, biophysical, climate-change) will be integrated at regional scale or even modelled at this same scale. For all these models, IMPETUS considers as input information coming from public and readily available information (e.g. Eurostat, Copernicus, GISCO, MODIS, GEOSS, INSPIRE, meteorological stations, JRC/CORINE and others) for future easy updates and copyright reasons. Also, IMPETUS considers using demo site data repositories (adaptation pathfinder).

All IMPETUS objectives are tightly connected to data collection and generation as (i) existing knowledge about climate adaption measures through adaptation pathways and innovation packages, used to develop new strategic actions; (ii) the use of advanced integration methodologies under a federated network; (iii) a source of better understanding of the drivers of climate impacts as well as of adaptation domains at cross-domain through assessment framework; and (iv) ways to elaborate an adaptation pathfinder to support relevant stakeholders in the elaboration of adaptation pathways.

Considering these objectives, the IMPETUS consortium has identified the following datasets and their potential contributions to the specific described objectives (Table 8):

Table 8. Datasets generated in IMPETUS project

#	Input Dataset	URL	Objective nº
1	**Climatic open data**	N/A	1,2,3,4
2	**Climatic projections & scenarios**	N/A	1,2,3,4
3	DATASET-WP2-SEASONAL-FORECAST_DS7	N/A	1,2,3,4
4	DATASET-WP2-CLIMATE-PROJECTION-CMIP6-DS7	N/A	1,2,3,4
5	**Non-climatic data (ASCAT, TRMM, 3B42, MODIS, etc)**	N/A	1,2,3,4
6	**Extreme events datasets (EFAS, EDO, etc)**	N/A	1,2,3,4
7	**KPI indicators for climate adaptation**	N/A	1,2,3,4
8	DATASET-WP4-WATER-MANAGEMENT-DATA	N/A	1,2,3,4
9	**Repository of climate adaptation options**	N/A	1,2,3,4
10	**List of exploitable results**	N/A	1,4

(*) This table will be updated according to project progress

2.3 Types and formats of data generated / collected

Considering Table 4, the datasets generated in IMPETUS are related to: i) datasets referred to in project publications (deliverables and papers) to be managed by Zenodo; ii) curated and/or raw data collected and produced during the project execution, to be managed by Zenodo or EOSC Portal ; and iii) source code of the tools, to be managed by Code repositories, mainly Github

Inside IMPETUS, datasets collection is mainly linked to WP1 ('*Governance & Stakeholder Co-creation for Transformative Adaptation'*), WP2 ('*Digital and knowledge dimension of the Resilience Knowledge Boosters'*), WP3 ('*Exposure and Vulnerability Assessment'*), WP4 ('*Deployment of Solutions at demo sites'*) and WP5 ('*IMPETUS Adaptation Pathways and Innovation Packages'*). These datasets presented in Table 7, correspond to climatic projections and scenarios needed for the elaboration of the AI-driven tools and other digital services to make consensus about climate adaptation and mitigation pathways. It is also important to notice the in-situ monitoring of the different regions and especially the monitoring of key community systems through the different early warning systems, decision support tools and digital twins to be implemented in WP4. Complementary, climate scenarios and projections combined with non-climatic and extreme events information will be served for the elaboration of downscaling models and also, the elaboration of the risk assessment framework. In the end, the resilience knowledge boosters (RKBs) will offer reliable datasets collected from each of the regions to facilitate understanding of their climatic conditions and vulnerabilities to risks, selection of innovation packages and pathways for climate adaption and mitigation, and to assess cost-efficiency and cost-benefits of the solutions.

Considering these interrelations between work packages in terms of the generation of newer datasets, IMPETUS will deploy in the different demo sites (under the fast-track strategy), the RKBs (human and digital dimensions). This will involve the creation of a robust community to empower them in decision-making regarding innovation packages and pathways. Complementary to this, it will also make available the different digital assets listed in Table 8. Datasets generated in IMPETUS project. Under the conformation of the demo sites and deployment of the digital tools, curated datasets and datasets coming from the application of AI-driven tools will be generated; regions will be monitored and subsequent key community systems and datasets will be generated with uplifting from raw data to linked data. IMPETUS will make its generated datasets publicly available if they do not pose a risk or raise any industrial or personal concerns or compromise privacy rights (e.g. specific information that could compromise the infrastructures). In that case, the IMPETUS consortium will strive to find data synthetisation (e.g. using Generative Adversarial Networks -GANs- models) and anonymisation approaches that enable large parts of the data to be published.

Based on this information, the main features and details about the data collected and generated is presented in the following table (Table 9):

Table 9. Format followed up in the IMPETUS datasets

#	Identifier	Size	Type	Format
1	**Climatic open data**	N/A	Data/Image	NRCS (Normalised Radar Cross-Section or Sigma0)
2	**Climatic projections & scenarios**	N/A	Datasets/Image	GRIB (GRIdded Binary or General Regularly-distributed Information in Binary form)

3	DATASET-WP2-SEASONAL-FORECAST_DS7	N/A	Datasets/Image	GRIB (GRIdded Binary or General Regularly-distributed Information in Binary form)
4	DATASET-WP2-CLIMATE-PROJECTION-CMIP6-DS7	N/A	Datasets/Image	GRIB (GRIdded Binary or General Regularly-distributed Information in Binary form)
5	**Non-climatic data (ASCAT, TRMM, 3B42, MODIS, etc)**	still updating, currently at 4GB with (4)	Datasets/Image	NetCDF, SHP, JSON, CSV, TIFF etc
6	**Extreme events datasets (EFAS, EDO, etc)**	still updating, currently at 4GB with (3)	Datasets/Image	NetCDF, SHP, JSON, CSV, TIFF etc
7	**KPI indicators for climate adaptation**	N/A	Text	PDF
8	DATASET-WP4-WATER-MANAGEMENT-DATA	N/A	N/A	N/A
9	**Repository of climate adaptation options**	N/A	Text	text
5	**List of exploitable results**	still updating, currently at 266KB	Tabular data	xlsx

(*) This table will be updated according to project progress

2.4 Re-use of existing data

The main motivation and vision of IMPETUS is to "*develop and validate a coherent, cross-sectoral climate-change adaptation framework to accelerate the transition towards a climate-neutral and sustainable economy, empowering citizens and societal actors in the co-design of adaptation packages and related implementation pathways*". IMPETUS will promote a conceptual framework that is rooted in the consideration that decisions about adaptation and resilience solutions have to be: 1) strongly anchored in knowledge; 2) co-designed and co-created with quintuple helix stakeholders, at multiple governance levels; 3) 'low-regret' and scalable, depending on the evolution of climate change and other drivers; and 4) cost-effective and environmentally, economic and socially sustainable. This conceptual framework will be materialised in the RKBs, which are intended as a space where all relevant stakeholders gather to co-create, demonstrate, monitor and assess climate adaptation pathways for sustainable adaptation and resilience. RKBs also have a virtual dimension, where relevant climate-change related data, knowledge and experiences are integrated to help fuel ideas, share research experiences and promote data / knowledge exchange between stakeholders and regions during the co-creation process.

To ensure the sustainability of the RKBs, IMPETUS needs to demonstrate their viability in different EU biogeographical regions and key community systems. To empower the relevant stakeholders in climatic and political decision making, IMPETUS will put into their hands relevant data, digital services and Artificial Intelligence (AI) -driven tools to facilitate understanding of each region and the climate state as a whole.

To achieve these aspects, the following datasets, digital tools and semantic models will be re-used from other consortium initiatives (Table 10):

Table 10. Re-used tools and data models in IMPETUS

#	Digital Asset	Responsible Partner	Previous EU Initiatives	Contribution to IMPETUS
1	TOOL-WP2-RKB-CONTEXT-BROKER	EUT	AquaSpice, ULTIMATE, SIM4NEXUS, FIWARE4WATER	Improvement of the NGSI-LD context broker through the combination of graph databases with time series databases.
2	TOOL-WP2-PREDICTION-PHYSICAL-SOCIOECOLOGIC	EUT/NTUA	SIM4NEXUS NEXOGENESIS	Uplift existing models elaborated for Water Energy Food and Environment-Nexus (WEFE) to use regarding climate change
3	TOOL-WP2-ANTHRO-ENV-CHARACTERIZATION	UiT	ExtremeEarth	Geometric deep learning algorithms for multimodal data analysis will be applied to heterogeneous datasets collected in the RKBs, to enhance understanding of the relationships between human activities and ecosystems (e.g. anomaly detection, quantification of causal effects) at intra- and inter-regional level.

4	TOOL-WP2-HIGH-VISUALIZATION-ENGINE	UiT	N/A	Improvement of visualisation of data, models and AI tools' outputs to provide users with a complete overview of climate change factors.
5	TOOL-WP2-RKB	EACH REGION	TBD	TBD
6	TOOL-WP3-RISK-ASSESSMENT-MODELS	NTUA	STOP-IT	Uplift stress-testing platforms to apply to climate change and large-scale areas
7	TOOL-WP3-CLIMATE RESILIENCE-FOOTPRINT-TOOL	NTUA	SIM4NEXUS NEXOGENESIS ULTIMATE	Combine WEFE indicators with industrial and cost indicators. Indicators will be complemented with climatic indicators and Climate-ADAPT metrics.
8	TOOL-WP4-BIODIVERSITY & REFORESTATION TOOL	MAICH	N/A	A Deep Learning algorithm (convolutional neural networks) will be trained and applied to images from the ecosystem to recognise different species ,to inform restoration efforts. Part of the offering of the Attica digital twin, it will also act as a tool for relevant working groups within the RKB.
9	TOOL-WP4-SEWER MINING TECHNOLOGY	NTUA, EYDAP, MAICH	NEXTGEN DESSIN	Expand the use of augment reality/virtual reality for climate adaptation services
10	TOOL-WP4-WATER-ENERGY-SIMULATION	NTUA, EYDAP	N/A	N/A
11	TOOL-WP4-DSS-IWM	KWB	N/A	N/A
12	TOOL-WP4-ONLINE-PATHOGEN MONITORING	EUT	iBATHWATER PATHOCERT	The tool will be extended with risk models for water quality
13	TOOL-WP4-FLOOD RISK MODEL	N&S	N/A	decision support tool for spatial planners improved with high-resolution hydrodynamic models in a digital twin environment
14	TOOL-WP4-HEAT STRESS MODEL	N&S	N/A	Interactive decision support tool for heat stress under different climate projections and adaptation measures using cloud computations

15	TOOL-WP4-DIGITAL-TWIN-CLIMATE ADAPTATION	NTUA,	NEXTGEN DESSIN SUBSOL	Complement with newer databases, climate adaptation services and initiatives as well as business data-driven tools
16	TOOL-WP4-EWS-FLOODS	BEF	N/A	N/A
17	TOOL-WP4-SATELLITE-COASTAL-MONITORING-SYSTEM	LOB	N/A	N/A
18	TOOL-WP4-EWS-AVALANCHES	UiT	N/A	Improved early warning systems for evacuations, and resiliency planning for unstoppable events, to protect the community and reduce the impact of disasters. Part of the Arctic demo site
19	TOOL-WP4-MARINE SPATIAL FRAMEWORK	TFFK	ATLAS ClimeFish	Co-design a Marine Spatial Planning (MSP) Framework in the Arctic demo site, focusing on increasing the resilience and sustainability of fisheries and aquaculture while facilitating the stakeholder dialogue and co-creation processes.
20	TOOL-WP4-DIGITAL TWIN OF TROMSØ CITY	TFFK, UIT	N/A	A Digital Twin is developed as a technical planning tool of Tromsø city, to help reduce climate risks related to sea level rise, storm surges and flooding.
21	TOOL-WP4-DST-INDUSTRI-DECARBONIZATION	WEI	N/A	N/A

2.5 Origin of the data

Considering the main digital assets to be elaborated within IMPETUS, the following table represents the origin of data needed to build and deploy the different tools. It is worth mentioning that we also included re-usable semantic models to ensure semantic interoperability between the digital assets, (Table 11).

Table 11. Data origins by each digital asset in IMPETUS

#	Digital Asset	Responsible Partner	Data Origin
1	TOOL-WP2-RKB-CONTEXT-BROKER	EUT	NGSI-LD
2	TOOL-WP2-PREDICTION-PHYSICAL-SOCIOECOLOGIC	EUT/NTUA	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX
3	TOOL-WP2-ANTHRO-ENV-CHARACTERIZATION	UiT	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX, NVE
4	TOOL-WP2-HIGH-VISUALIZATION-ENGINE	UiT	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX
5	TOOL-WP2-RKB	EACH REGIONALITY	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX
6	TOOL-WP3-RISK-ASSESSMENT-MODELS	NTUA	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX
7	TOOL-WP3-CLIMATE RESILIENCE-FOOTPRINT-TOOL	NTUA	NOOA, NASA, EFAS-Copernicus, JRC-EDO, EURO-CORDEX
8	TOOL-WP4-BIODIVERSITY & REFORESTATION TOOL	MAICH	TBD in future versions
9	TOOL-WP4- SEWER MINING TECHNOLOGY	NTUA, EYDAP, MAICH	TBD in future versions
10	TOOL-WP4-WATER-ENERGY-SIMULATION	NTUA, EYDAP	TBD in future versions
11	TOOL-WP4-DSS-IWM	KWB	TBD in future versions
12	TOOL-WP4-ONLINE-PATHOGEN MONITORING	EUT	TBD in future versions
13	TOOL-WP4-FLOOD RISK MODEL	N&S	TBD in future versions
14	TOOl-WP4-HEAT STRESS MODEL	N&S	TBD in future versions

15	TOOL-WP4-DIGITAL-TWIN-CLIMATE ADAPTATION	NTUA, GSNEW, MANTIS, LOB	TBD in future versions
16	TOOL-WP4-EWS-FLOODS	BEF	TBD in future versions
17	TOOL-WP4-SATELLITE-COASTAL-MONITORING-SYSTEM	LOB	TBD in future versions
18	TOOL-WP4-EWS-AVALANCHES	UiT	TBD in future versions
19	TOOL-WP4-MARINE SPATIAL FRAMEWORK	TFFK	GEONORGE, Kartverket, NGU, NVE, HI, Copernicus Geodata As.
20	TOOL-WP4-DITAL TWIN OF TROMSØ CITY	TFFK, UiT	GEONORGE, Kartverket, NGU, NVE, HI, Geodata As.
21	TOOL-WP4-DST-INDUSTRI-DECARBONIZATION	WEI	TBD in future versions
22	TOOL-WP4-DSS-WATER-MANAGEMENT	EURAC	TBD in future versions

2.6 Expected size of the data

As considered in the abovementioned sections, IMPETUS will consider the publication and use of raw data, processed data and output data coming from modelling and the application of artificial intelligence inside the RKBs. Indeed, data like that needed for geospatial maps is likely to require more storage capacity than other kinds of data. Based on the types of data detailed in Table 7 and Table 9, the potential aggregated data size is indicated in the following table (Table 12):

Table 12. Data size of the IMPETUS digital assets

#	Digital Asset	Responsible Partner	Data Size
1	TOOL-WP2-RKB-CONTEXT-BROKER	EUT	TBD in future versions
2	TOOL-WP2-PREDICTION-PHYSICAL-SOCIOECOLOGIC	EUT/NTUA	TBD in future versions
3	TOOL-WP2-ANTHRO-ENV-CHARACTERIZATION	UiT	TBD in future versions
4	TOOL-WP2-HIGH-VISUALIZATION-ENGINE	UiT	TBD in future versions
5	TOOL-WP2-RKB	EACH REGIONALITY	TBD in future versions
6	TOOL-WP3-RISK-ASSESSMENT-MODELS	NTUA	(still under development, 1.6 GB currently, Forecast to be over 2 GB)

7	TOOL-WP3-CLIMATE RESILIENCE-FOOTPRINT-TOOL	NTUA	(under active development)
8	TOOL-WP4-BIODIVERSITY & REFORESTATION TOOL	MAICH	TBD in future versions
9	TOOL-WP4-SEWER MINING TECHNOLOGY	NTUA, EYDAP, MAICH	TBD in future versions
10	TOOL-WP4-WATER-ENERGY-SIMULATION	NTUA, EYDAP	TBD in future versions
11	TOOL-WP4-DSS-IWM	KWB	TBD in future versions
12	TOOL-WP4-ONLINE-PATHOGEN MONITORING	EUT	TBD in future versions
13	TOOL-WP4-FLOOD RISK MODEL	N&S	TBD in future versions
14	TOOL-WP4-HEAT STRESS MODEL	N&S	TBD in future versions
15	TOOL-WP4-DIGITAL-TWIN-CLIMATE ADAPTATION	NTUA, GSNEW, MANTIS, LOB	TBD in future versions
16	TOOL-WP4-EWS-FLOODS	BEF	TBD in future versions
17	TOOL-WP4-SATELLITE-COASTAL-MONITORING-SYSTEM	LOB	TBD in future versions
18	TOOL-WP4-EWS-AVALANCHES	UiT	TBD in future versions
19	TOOL-WP4-MARINE SPATIAL FRAMEWORK	TFFK	TBD in future versions
20	TOOL-WP4-DIGITAL TWIN OF TROMSØ CITY	TFFK, UIT	TBD in future versions
21	TOOL-WP4-DST-INDUSTRI-DECARBONIZATION	WEI	TBD in future versions
22	TOOL-WP4-DSS-WATER-MANAGEMENT	EURAC	TBD in future versions

2.7 Outline the data: to whom will it be useful?

(Section not modified from D8.6)

The data generated in IMPETUS is the main basis for the elaboration of the RKBs in each of the demo site regions and for upscaling climate knowledge at pan-European level. Most of the generated data and digital assets will be for public and societal use and correspond to data that will be publicly released in Zenodo to be used by scientists, industries, public authorities and other interested parties in relation to each region. At the time of writing this document, Zenodo has been opened and the next step will be to upload corresponding datasets to make them publicly available. Complementing this information, IT and digital tools development code will be available in different Github/Gitlab repositories. Moreover,

final versions of these digital assets will be made available via the IMPETUS website. Considering these aspects, the following table reflects the main stakeholders who could use the different data assets (Table 13):

Table 13. Relevant stakeholders for IMPETUS data and digital assets

#	Stakeholders	Data utility
1	**Scientists**	Perform specific research and generation of newer data based on the novel application of climate and space domain. In this regard, AI applications combined with newer projections and scenarios will support understanding of predictions and variable interrelations.
2	**Climate modelers**	Generation of downscaling models that will serve to provide newer projections and scenarios for sustain data-driven models but also, understand risk and vulnerabilities of the regions at long term.
3	**Authorities**	Knowledge sharing about climate adaptation and mitigation in the different EU regions. This knowledge will be collected and exposed through the RKBs.
4	**Environmentalists**	Perform research, indicators and impacts in relation with WEFE and climate information.
5	**Key Community Systems**	Knowledge to support them in the elaboration of long-term win-win strategies at cross-sectorial level.
6	**Policy Makers**	Establishment and reinforcement of their knowledge about climate adaptation and mitigation and efficient decision-making at different scales. Generated historical data, AI driven models could be relevant to determine statistics and indicators.
7	**Society at large**	Empower of societal pillars and vulnerable groups into the climate decision-making process. Also, it is relevant for this societal pillar the interaction with intuitive and user-friendly visualization environment to support future envisions on co-creation of climate adaptation and mitigation solutions.

2.8 Data Accessibility for internal and public use

(Section not modified from D8.6)

Data collection aims to serve both internal and public use:

- ***Internal Project use***: It will allow partners to run models to create and use advanced integration methodologies based on instance-based learning, novel artificial intelligence and machine learning techniques, context-brokers, semantic interoperability approaches to recommend and support the relevant stakeholders in the elaboration of the adaptation pathways and innovation packages.

- ***Public Use***: Data that will be publicly released in Zenodo (www.zenodo.org) to be used by scientists, authorities and other interested parties involved in the Nexus. Already, most of the collected and produced climatic data are already uploaded and available in Zenodo. Moreover, it will also consider contributing to the EOSC platform with reliable dataset of information in

order to offer the community curated data to advance in nexus and policy generation at long term.

2.8.1 Data Accessibility for private use

(Section not modified from D8.6)

The main objective of making data available for private use is motivated by data sharing across the project to elaborate the different envisioned data assets. In this regard, IMPETUS project consortium has opened a private data sharing space in SharePoint to share project information across partners. The structure of this private data sharing space is as follows (Figure 5):

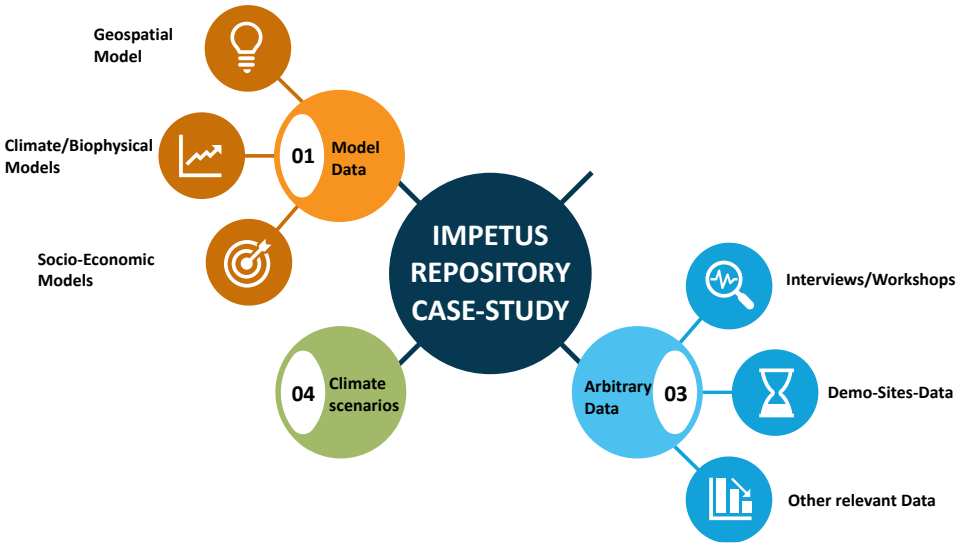

Figure 5. Structure of the IMPETUS repository

2.8.2 Data Accessibility for public use

(Section not modified from D8.6)

Some of these datasets are already open to the public, while others are proprietary and have high commercial sensitivity. In the cases where private data are processed and aggregated (e.g. as part of a model, or functionality of a component) permission will be requested by the provider prior to making the altered data publicly available. In case of not obtaining such permission, IMPETUS consortium with the involved data owners will manage also the possibility to generate synthetic and anonymised data based on the private dataset.

In reference to the nature of the user data involved, some of the results that will be generated by each project phase will be restricted to authorised users, while other results will be publicly available. As per our Ethics commitment during the negotiation phase of the project, data access and sharing activities will be rigorously implemented in compliance with the privacy and data collection rules and regulations, as they are applied nationally and in the EU.

Focusing on the public use of data and data assets, the table and accessibility of open data has been defined and established in the Table 7. Considering the datasets for public use, it mainly involves specific case-studies historic information, climatic information, non-climatic information, sensor information and extreme events information. All this information about the regionalities will be exposed under a RKBs. At the current stage of the DMP, the entire consortium is working on creating a baseline information from the case-studies to advance with project development and also, to create reliable data of the interest of the scientific community.

Considering all of this information put publicly available, the following table provides a link to the access to the different datasets and tools generated under IMPETUS project (Table 14):

Table 14. URL and accessibility of the IMPETUS data and digital assets

#	Digital Asset	Responsible Partner	URL
1	TOOL-WP2-RKB-CONTEXT-BROKER	EUT	TBD in future versions
2	TOOL-WP2-PREDICTION-PHYSICAL-SOCIOECOLOGIC	EUT/NTUA	TBD in future versions
3	TOOL-WP2-ANTHRO-ENV-CHARACTERIZATION	UiT	https://github.com/IMPACTteam
4	TOOL-WP2-HIGH-VISUALIZATION-ENGINE	UiT	TBD in future versions
5	TOOL-WP2-RKB	EACH REGIONALITY	TBD in future versions
6	TOOL-WP3-RISK-ASSESSMENT-MODELS	NTUA	TBD in future versions
7	TOOL-WP3-CLIMATE RESILIENCE-FOOTPRINT-TOOL	NTUA	TBD in future versions
8	TOOL-WP4-BIODIVERSITY & REFORESTATION TOOL	MAICH	TBD in future versions
9	TOOL-WP4- SEWER MINING TECHNOLOGY	NTUA, EYDAP, MAICH	TBD in future versions
10	TOOL-WP4-WATER-ENERGY-SIMULATION	NTUA, EYDAP	TBD in future versions
11	TOOL-WP4-DSS-IWM	KWB	TBD in future versions
12	TOOL-WP4-ONLINE-PATHOGEN MONITORING	EUT	TBD in future versions
13	TOOL-WP4-FLOOD RISK MODEL	N&S	TBD in future versions
14	TOOl-WP4-HEAT STRESS MODEL	N&S	TBD in future versions
	TOOL-WP4-DIGITAL-TWIN-CLIMATE ADAPTATION	NTUA, GSNEW, MANTIS, LOB	TBD in future versions
15	TOOL-WP4-EWS-FLOODS	BEF	TBD in future versions
16	TOOL-WP4-SATELLITE-COASTAL-MONITORING-SYSTEM	LOB	TBD in future versions
17	TOOL-WP4-EWS-AVALANCHES	UiT	TBD in future versions

18	TOOL-WP4-MARINE SPATIAL FRAMEWORK	TFFK	TBD in future versions
19	TOOL-WP4-DIGITAL TWIN OF TROMSØ CITY	TFFK, UiT	TBD in future versions
20	TOOL-WP4-DST-INDUSTRI-DECARBONIZATION	WEI	TBD in future versions
21	TOOL-WP4-DSS-WATER-MANAGEMENT	EURAC	TBD in future versions

3 FAIR Data

IPR management in IMPETUS project is a substantial part of its data management plan. Usually, data content and their system are treated as one parameter, but when the matter comes to IPR, a distinction between the databases and data content is of outmost importance. It is imperative for other users to know how they can reuse both the data collected, assembled, or generated and the databases where these are included.

The Open Data Commons group (ODC) developed the following tools to govern the use of data sets. The three ODC licenses are:

- ***Public Domain Dedication and License (PDDL)***: This makes the use of the database and its content free to the public domain.
- ***Attribution License (ODC-By)***: Users can make use of the database and its content in new and different ways, but they need to provide an attribution to the source of the data and/or the database.
- ***Open Database License (ODC-ODbL)***: ODbL stipulates that any use of the database must provide attribution, and any new outcomes must use the same terms of licensing (also an unrestricted version of the new product must always be accessible).

Considering aspects related with the ownership of data combined with Open Research Data in IMPETUS, the following license are prone to be applied to the digital assets to ensure maintenance of the provenance and background parties involved (Table 15):

Table 15. License of the IMPETUS data and digital assets

#	Digital Asset	Responsible Partner	License
1	TOOL-WP2-RKB-CONTEXT-BROKER	EUT	TBD in future versions
2	TOOL-WP2-PREDICTION-PHYSICAL-SOCIOECOLOGIC	EUT/NTUA	TBD in future versions
3	TOOL-WP2-ANTHRO-ENV-CHARACTERIZATION	UiT	ODC-By
4	TOOL-WP2-HIGH-VISUALIZATION-ENGINE	UiT	TBD in future versions
5	TOOL-WP2-RKB	EACH REGIONALITY	TBD in future versions
6	TOOL-WP3-RISK-ASSESSMENT-MODELS	NTUA	TBD in future versions
7	TOOL-WP3-CLIMATE RESILIENCE-FOOTPRINT-TOOL	NTUA	TBD in future versions
8	TOOL-WP4-BIODIVERSITY & REFORESTATION TOOL	MAICH	TBD in future versions
9	TOOL-WP4- SEWER MINING TECHNOLOGY	NTUA, EYDAP, MAICH	TBD in future versions

10	TOOL-WP4-WATER-ENERGY-SIMULATION	NTUA, EYDAP	TBD in future versions
11	TOOL-WP4-DSS-IWM	KWB	TBD in future versions
12	TOOL-WP4-ONLINE-PATHOGEN MONITORING	EUT	TBD in future versions
13	TOOL-WP4-FLOOD RISK MODEL	N&S	TBD in future versions
14	TOOl-WP4-HEAT STRESS MODEL	N&S	TBD in future versions
15	TOOL-WP4-DIGITAL-TWIN-CLIMATE ADAPTATION	NTUA, GSNEW, MANTIS, LOB	TBD in future versions
16	TOOL-WP4-EWS-FLOODS	BEF	TBD in future versions
17	TOOL-WP4-SATELLITE-COASTAL-MONITORING-SYSTEM	LOB	TBD in future versions
18	TOOL-WP4-EWS-AVALANCHES	UiT	TBD in future versions
19	TOOL-WP4-MARINE SPATIAL FRAMEWORK	TFFK	TBD in future versions
20	TOOL-WP4-DIGITAL TWIN OF TROMSØ CITY	TFFK, UiT	TBD in future versions
21	TOOL-WP4-DST-INDUSTRI-DECARBONIZATION	WEI	TBD in future versions
22	TOOL-WP4-DSS-WATER-MANAGEMENT	EURAC	TBD in future versions

3.1 Making data findable, including provisions for metadata

(Section and subsections not modified from D8.6)

As depicted in the previous sections, IMPETUS will publish open data coming from the scientific results and outcomes in Zenodo. Moreover, IMPETUS will also publish the datasets in the Argos Tool (digital version of the DMP) initially created during this initial phase of the project. Taking advantage of these initiatives, the IMPETUS consortium could ensure the research data findable in agreement with the H2020 Open Access Mandate and the guidelines of the Horizon Europe in terms of research data management and open science.

Hence, all uploads in Zenodo will be enriched with standard Zenodo metadata, including the following information:

- Publication Date
- DOI
- Grants
- License
- Versions

By means of publishing information in Zenodo and inside the Argos Tool, IMPETUS also ensure the information is indexed in Open Aire and then contribute to the open research at European level.

This section will be updated on next iterations to provide detailed information on how data will be made discoverable, and more specifically:

- Discoverability of data (metadata provision)
- Identifiability of data and refer to standard identification mechanism
- Use of persistent and unique identifiers such as Digital Object Identifiers
- Naming and conventions used
- Approach towards search keyword
- Approach for clear versioning
- Specify standards for metadata creation
- Type of metadata created and how

3.1.1 Making Data Openly Accessible

All data, information, and knowledge considered relevant for the scientific community will be made accessible under Open Access. In this regard, data will be shared in relation to (i) publications (deliverables and papers) and (ii) curated and/or raw data. For the data linked to scientific publication, the publication will serve as the main piece of metadata documentation for the shared data. When this is not seen as being adequate for the comprehension of the raw data, a report will be shared along with the data explaining their meaning and methods of acquisition. However, for both data categories the metadata standard structure of the data repository (tentative an FTP server) will be used.

3.1.2 Making Data identifiable

All the available datasets will be uploaded in Zenodo, Argos Tool and EOSC. In this regard, Data set reference and naming will be implemented to employ a standard identification mechanism for each data set according to the metadata standard implemented. Zenodo (a popular repository for research data, will be extensively exploited throughout the project) assigns all publicly available uploads a Digital Object Identifier (DOI) to make the upload easily and uniquely citable. Zenodo supports harvesting of all content via the OAI-PMH protocol.

Similar aspects are present inside the Argos Tool (digital version of the DMP). Inside Argus Tool, the general aspects of the DMP are linked with specific contributions using ORCID. The general information of the DMP is complemented with information about the datasets prone to be published. The information related to these datasets corresponds to the main FAIR principles. The corresponding datasets published are simultaneously shared with Zenodo and Open Research Data Cloud. Therefore, the main metadata adhered to the datasets are the same as exposed for the Zenodo case.

At least but not least, the information tentative to be published will be partially stored inside the Real-Time Monitoring and Control Tool and the corresponding data stores for historical information. Some of this data will be findable and accessible using Linked Data principles. In this regard, IMPETUS will ensure information exchange between all digital modules using JSON-LD format following the principles established in the IMPETUS ontology (TOOL-WP2-CLIMATE-ENV-ONTOLOGY).

3.1.3 Naming and Conventions used

At this stage of the DMP, there is no defined naming convention for the files due it will depend on the data available in the case-studies. Nevertheless, the following general naming convention will be discussed in the beginning of the project (Figure 6):

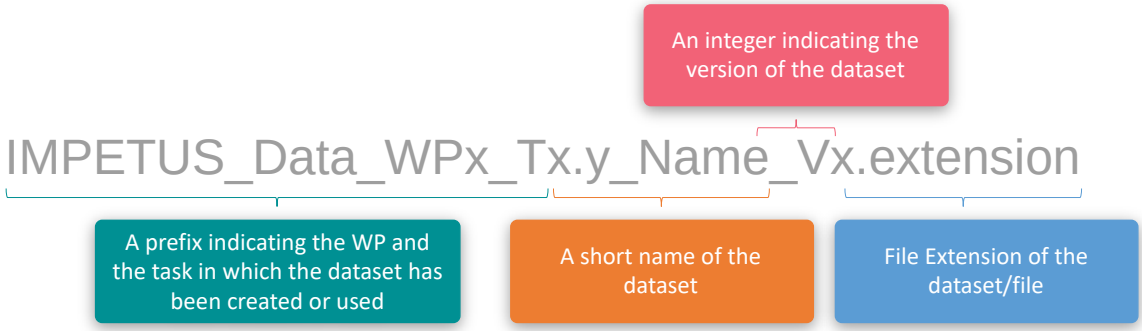

Figure 6. IMPETUS naming convention for files

3.1.4 Approach towards search and keywords

In case of data will being collected and/or produced by IMPETUS to be optimally re-used, search keywords will be used, in correspondence with the specific field that data concerns. In this regards, Microsoft Sharepoint (see Figure 7) contains a search tool to find corresponding document, folder related to the project.

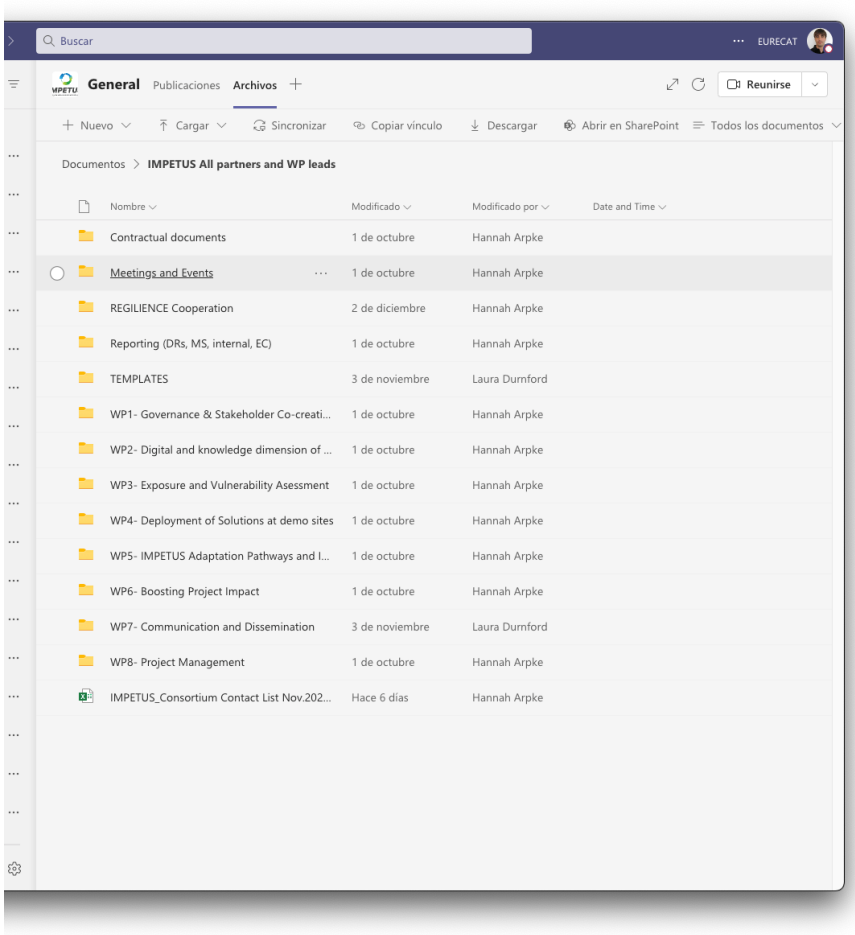

Figure 7. IMPETUS file structure inside Teams/Sharepoint

In relation to the search tools and relevant keywords inside the IMPETUS RKBs, the configuration of the environment could potentially have a search engine to select relevant data sources. Moreover, the visualization and exploration engine could potentially also have search engine to query data and

information. These both aspects will be confirmed at time as the tools were more mature inside the project.

3.1.5 Approach to clear versioning

Zenodo repository and Argus (digital DMP) standardization ensures that data is stored under specific structure to be easily identified in a historical basis.

3.1.6 Specify standards for metadata creation

Metadata standards are required to (i) establish a common understanding of the meaning of the data, and (ii) ensure correct and proper use and interpretation of the data by its owners and users. To achieve this, a number of characteristics, or attributes of the datasets have been defined and are described in the following section.

3.1.7 Type of metadata created and how

Along with the metadata described in Section 3.1.3 for the content of the datasets, metadata are also created for each dataset to describe the size of the file, its format, the data provider (owner), last update (date), time of update. In addition, a very short description of all the datasets is also provided:

Table 16. Metadata considered for IMPETUS according to OpenAire/Zenodo

Metadata	Brief Description
Size (k)	Corresponds to the size of the file.
Format	Indicates the format of the represented information. It could be JSON, CSV, etc.
Short Description	A brief explanation of the dataset.
Data Provider	Name of the company and/or person who provides the information.
Last update (data)	Date of the last update performed over the dataset.
Time of Update	Hour in which update has been performed.

3.2 Making Data Openly Accessible

(Section and subsections not modified from D8.6)

IMPETUS will generate public datasets available over (Open Access-OA). Specifically, IMPETUS will release OA datasets in reference for socio-economic, biophysical, climatic and geospatial information. All of these mentioned datasets will be uploaded into Zenodo, Argos and EOSC. Moreover, the output of the AI driven tools applied to the case-studies information will also published (OA) before the end of IMPETUS. Corresponding permissions will be requested to the specific case-study partners and data providers.

This section will be updated on next iterations to provide detailed information on how data will be made accessible, assessable and intelligible more specifically:

- Specifics on which data will be made openly available
- Which data is kept closed and provide the rationale?

- How the data will be made available
- What methods and software tools are used to access the data
- Documentation of software needed to access the data included
- Inclusion of relevant software
- Data and associated metadata, documentation and code deposit
- Provision of access provided in case of restrictions

As detailed in Section 2, all data, information, and knowledge considered relevant for the scientific community will be made accessible under OA. When a dataset is made publicly accessible, the corresponding information in the DMP will be fulfilled and updated accordingly.

3.2.1 Specifics on which data will be made openly accessible

Considering the data published as an open access, a detailed description is provided in Section 2. Considering this information, an indicative time schedule for all data publications will be provided in open access (Table 17):

Table 17. Planning for the data and digital assets publication inside IMPETUS planning

Month	Description
Month 1-18	Data Management Plan, initial datasets and publications-
Month 18-36	Datasets used on the implementation of models, initial version of open-source tools, project publications
Month 36-48	Final datsets used on models, datasets generated by project models, final versions of open-source tools, project publications.

3.2.2 Which data is kept closed and provide the rationale?

For the time being and according to the initial exchanges with the IMPETUS demonstration-sites, there is a concern about the publication of fine-grain data about the specific infrastructures (as stated in the CA). There is the possibility that fine-grain information about the industrial processes inside the demo-cases could be closed. In that case, the IMPETUS consortium will try to generate datasets and anonymised data based on real information (generation of synthetic data).

A part of this, as mentioned in previous sections there is a requirement in IMPETUS to request for permission from the data owners (especially industries) about the publication of the information.

3.2.3 How the data will be made available

Data will be made available through Zenodo Repository, which is compliant with the H2020 regulations. In general, for Public Availability of Data, data will be shared when the related deliverable, paper or data set has been made available at an OA repository from the responsible partner/owner of the data. It is expected 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. The Lead Author will also create an entry on OpenAIRE to link the publication to the data. OpenAIRE is a service built to offer this functionality and may be used to reference both the publication and the data. A link to the OpenAIRE entry will then be submitted to the IMPETUS Website Administrator by the Lead Author. As already described above, pertinent approvals have been received from the data owners.

In view of the precautions for protection of personal data, it is explicitly confirmed that the data collected will be publicly available, after care is taken with regards to rules of confidentiality, anonymity, and protection. Anonymized final data sets will be open access and procedures are set as to how data will be preserved and archived in the repository. We are aware of post-publication risks to local researchers and end-users in our research sites and will mitigate all reasonable risk before publication according to the ethical and IPR requirements set.

However, “Opting Out” remains a choice for data owners, as it is possible that even though comprehensive measures are taken to ensure the safety of participants, researchers and their environment, it is only after an IMPETUS report or peer reviewed article is published and generation of date sets is realized, that the question of open access arises. Open access does not entail an absolute obligation to publish all data, and it is up to researchers and associated organization to decide whether data is suitable and ethical to be published or not.

To ensure archiving and preservation of long-tail research data during the project, a repository of data will be established in IMPETUS. This data repository will be established inside the IMPETUS digital platform and will be maintained after the project completion. Thus, the IMPETUS platform will provide smarter and common interfaces to access the information. Moreover, the application of semantic interoperability will guarantee to expose the information using a common vocabulary and also, common exploration mechanisms (SPARQL, JSON-LD, etc).

3.2.4 What methods and software needed to access the data included?

IMPETUS (see Figure 1 and Figure 2) involves the RKBs as a main implementation (human and digital dimension) that can be exploited and adopted to perform its function. Focusing on the digital assets, the main building blocks are:

Context-Broker and Semantic Interoperability. This building block will be focused on the data collection and exposition in each of the RKBs. This will include (i) Data collection from heterogeneous datasets involving climatic and non-climatic data; (ii) In-situ and real time monitoring of different key community systems in each of the selected biogeographical regions; (iii) context-broker as a tool to integrate the information and uplift the information into linked data. In relation to the methods, the Context-Broker will be through HTTP (REST APIs using JSON). The resultant platform will expose the information using JSON-LD under REST-API.

AI data-driven models for climate adaptation and mitigation. The main building blocks can be summarised as: (i) algorithms and methods for making data realisable and trustworthy; (ii) data-driven models to t local and global level to extract the significant patterns that can be used to reliably understand and predict physical and socio-ecologic phenomena and trends occurring in the considered regions; (iii) geometric deep learning techniques will be used to improve the characterization of the environmental and anthropogenic factors in the region and lead to an accurate and efficient understanding of the interaction between human and ecosystem in the context of climate resilience.

Risk Assessment and KPIs. This building block will cover the elaboration of (i) climatic projections and scenarios based on the collected information; (ii) elaboration of risks models and stress testing platforms to detect vulnerable points in each of the regions; (iii) elaboration of robust KPI methodology and calculation for the cost-efficiency and cost-benefit of the innovation packages.

Specific Digital tools inside the case-studies. Based on previous experiences and EU initiatives, each of the case-studies will elaborate decision support tools, deliberation platforms, digital twins, early warning systems and specific models to nurture the RKBs.

High visualization and RKB federation. This building block will correspond with (i) the elaboration of the IMPETUS platform; and (ii) the elaboration of human interfaces and dashboarding (high visualizations). Moreover, this building block of IMPETUS also includes the study about the federation of the architecture to connect each of the regions under a reliable network.

These tools developed within IMPETUS can store a multitude of resource descriptions that conform to any standard internet media type. The considered data types are:

- JSON/JSON-LD data schemas to share information between modules.
- Stylesheets for generating web resources and geospatial maps.

Furthermore, arbitrary relationships among the different information items can be expressed by creating links between any two resource descriptions (semantic/ontology linkage of the information). For example, a service offer may be associated with descriptions of the data sets that can be acquired using digital services.

Hence, these tools profile provides a flexible, general-purpose that can be adapted to meet the needs of the different regions through the connection of the RKBs within certain geospatial domain. In the IMPETUS framework, the following rules are respected:

- Communicate information adopting standard protocols (e.g. JSON/JSON-LD, NGSI-LD as a standard to share real-time data, etc.).
- Try to adopt a solution that allows for the maximum interoperability among actors who will process the data stored.
- State of the art technologies that will be used in the context of the REST API include:
    - Context Brokers and data-driven tools for understanding climate projections and predictions.
    - Risk Assessment models
    - Novel digital asset tools at regional level.
    - Visualization, navigation and exploration tool.
- Zenodo, Argos/Open Aire repository for research data.

3.2.5 Documentation of software needed to access the data included

The following tools and data repositories provide a sound documentation for accessing the data:

3.2.5.1 Zenodo Repository

Zenodo is built and developed by researchers, in the context of the OpenAIRE project. Zenodo main motivation is to raise open access and open data movements in Europe. Subsequently, this tool is commissioned by the EC to support their new Open Data policy. Thus, it provides a universal repository for EC funded research. One of its mayor advantages is that it works closely with GitHub, enabling users to make the work they share on GitHub citable by archiving one of your GitHub repositories and assigning a DOI with the data archiving tool Zenodo.

3.2.5.2 Argos Tool (Virtual Data Management Plan)

Argos tool is built and developed by the Open Aire community. According to their website "*ARGOS is the joint effort of OpenAIRE and EUDAT to deliver an open platform for Data Management Planning that addresses FAIR and Open best practices and assumes no barriers for its use and adoption.*". The tool permits to create a digital version of the data management plan to create actionable DMPs. Argos services are directly connected to Open Aire Service Catalogue and also EOSC catalogue. Therefore, the uses or Argos will facilitate to publish open datasets and make it accessible to the research community openly across well-known communities and following FAIR principles.

3.2.5.3 Semantic Context Broker Tool

This tool is a semantic enriched context broker to represent the different industrial data sources. Also, this tool is capable of interrelating industrial and water information as same time as provided a common

representation of the data. This aspect will facilitate data sharing following the principles of NGSI-LD specification and then, make the IMPETUS FIWARE compatible. The documentation about the context broker and their functionalities will be provided under D2.2.

3.2.6 Inclusion of relevant software (e.g. Open-Source Code)?

Considering the IMPETUS reference platform and the subsequent building blocks, the following table represents the open-source code included in the digital developments (Table 18):

Table 18. Open-Source Libraries used in IMPETUS

Open Source Libraries	Brief Description
Jena (triple store)	This triple-store will be used in the context broker to add metadata to the information.
StarDog	
InfluxDB	A database to store time series efficiently.
NestJS Framework	Node.js based framework to develop and program the context-broker.
Angular Framework	Visual framework to develop visual configuration of the context-broker.
Bootstrap	Front-end development framework for the creation of websites and web apps
Leaflet	Open-source JavaScript library used to create interactive web maps
Gunicorn	Python Web Server (receives and processes http requests)
jQuery	JavaScript framework designed to simplify HTML DOM tree traversal and manipulation, as well as event handling, CSS animation, and Ajax
OpenStreetMaps	Free, editable map of the whole world
Flot/Chart.js	Ploting library
Geopandas/pandas	Data and geospatial data analysis
Rasterio/Xarray/rasterstats	Spatial raster data analysis
Django	Web framework

3.2.7 Data and associated metadata, documentation and code deposit

As stated in previous sections, the following tools are associated with metadata, documentation and code repository (Table 19):

Table 19. Tools used in IMPETUS to expose data and metadata

Open-Source Libraries	Brief Description
Semantic Context Broker	The context broker will represent IMPETUS industrial information following up the IMPETUS ontology.
Zenodo	Zenodo metadata will serve to represent and link open research datasets
Argos	A digital DMP and subsequent metadata will serve to link datasets and also, sustain open research in EU through Open Aire and EOSC.
GitHub	Code repository for Optimization

3.2.8 Provision of access provided in case of restriction

The IMPETUS RKBs, digital tools, risk assessment models and Zenodo ensure that an authorization scheme can be applied for accessing the data, depending on the scope of the usage. It is upon the partners to decide what is the most appropriate authorization scheme.

As an example, inside the WP2 "*Digital and knowledge dimension of the Resilience Knowledge Boosters*" there will be needed algorithms and models to ensure data integrity and also, trustworthy in the collected information from the different biogeographical regions selected as demo-cases in IMPETUS.

3.3 Making Data Interoperable

(Section and subsections not modified from D8.6)

This section will be updated on next iterations to provide detailed information on how data will be made interoperable to specific quality standards and more in detail:

- Assess the interoperability of project data.
- Specifics on data/metadata vocabularies, standards and methodologies followed.
- Use of standard vocabulary and mechanism for all data types present to allow cross-domain interoperability.
- Provision of mapping to more commonly used ontologies.

To ensure data interoperability, IMPETUS will follow state of the art on ontologies and standards at two levels: European and International standards. In this regard, IMPETUS will support the elaboration of an ontology to represent demo-cases information and link cross-domain information (water, agriculture, industry, etc.) across regionalities. The ontology will be delivered at same time as the semantic context broker (M14 in the D2.2-"*Semantic Context Broker tool*"). This ontology will cover standards like NGSI-LD and Web of Things (WoT) to represent and facilitate information interlink between key community systems and regions. Complementing this aspect, the semantic context broker will be based on implementation of NGSI-LD to be FIWARE compatible at informational and data model level. This tool will provide a REST-API to access the information and consume it using common mechanism and methodologies (JSON-LD data serialization). Finally, the data driven tools and Risk assessment framework will also collect and store information exposing it through web services (outputs resulting from the analytics).

3.3.1 Assess the interoperability of project data

All data collected and/or produced in the project will be interoperable (even if close or open access). In this regard, data representation will follow documented EU and international standards like the ones presented in the following table (Table 20):

Table 20. Interoperability mechanism and models used in IMPETUS

Standard	SDO	Brief Description
OGC-GEOSPARQL	OGC	Standard to represent geographical information across digital systems.
NGSI-LD	ETSI	Standard to provide an Open REST API to access IoT information from industrial demo-cases.
SAREF	ETSI	Standard ontology to represent water information.

Moreover, IMPETUS will follow common data representations and serializations like XML, JSON, JSON-LD. The combination between the adoption of EU and International standards and data formats will ensure data exchange and reuse between researchers, institutions, organizations and countries.

3.3.2 Specifics on data/metadata vocabularies, standards and methodologies followed

Initial description is provided within the Section 3.1 and specifically, Table 14, Table 16 and Table 18.

3.3.3 Use of standard vocabulary for all data types present to allow interdisciplinary interoperability

Initial description is provided within the Section 3.1 and specifically, Table 14, Table 16 and Table 18.

3.3.4 Provision of mapping to more commonly used ontologies

IMPETUS knowledge repositories and data modelling will be achieved through an ontology that combines industry process information with water domain. Based on this ontology, the IMPETUS ontology will generate mapping with the following ontologies (Table 21):

Table 21. Re-use of existing ontologies inside IMPETUS

Ontology	Brief Description
SAREF4WATR	Water reference and standard ontology to represent observations and measurements
SAREF4ENVI	SAREF4ENVI has two main aims: on the one hand, to be the basis for enabling the use of SAREF in the environment domain and, on the other hand, to exemplify how to enable interoperability between environmental devices in cooperation.

SAREF	A reference ontology to represent devices and measurements
W3C Time Ontology	Standard ontology to represent timestamps and temporal information
GEOSPARQL	Standard ontology to represent geographic information compliant with the Open Geospatial Consortium (OGC) data exchange information.
W3C QUDT	Reference ontology to represent unit of measures of the corresponding variables
SIM4NEXUS	Ontology to represent Nexus variables interrelation
ULTIMATE	Ontology to represent Industrial Symbiosis variables interrelation
PATHOCERT	Ontology to represent water quality and risk assessment variables interrelation

3.4 Increased data re-use

(Section and subsections not modified from D8.6)

This section will be updated on next iterations to provide detailed information on how data will be made usable beyond the original purpose for which it was collected, and more in detail:

- Data licensing to permit the widest reuse possible
- Data availability for re-use
- Why and for what period a data embargo is induced
- Data useable by third parties after the end of the project
- Restriction of re-use of some data
- Data quality assurance processes
- Length of time for which the data will remain re-usable

As detailed in Section 3, all data, information, and knowledge considered relevant for the scientific community will be made accessible under Open Access when possible. When a dataset is set to be accessible publicly, this information will be fulfilled and the DMP updated accordingly.

3.4.1 Data Licensing to permit the widest reuse possible

It is initially proposed to use Creative Commons Attribution Share-Alike 4.0 License, which allows sharing, remixing, transforming and building upon the material for any purpose. Products should be redistributed under the same license. It is not yet decided at this stage of the Proposal.

Despite this guideline, the authors of the tools and datasets have the freedom to select the most suitable open source license they consider interesting.

3.4.2 Data availability for reuse

At the time this deliverable is written, there are some datasets identified to be reused. However, none of them is already published. Despite of this, all representative data for scientific usage will be published in Zenodo and Argos. Software tools (AI driven and/or Simulation models) will be made available through RKBs. Complementary to this, digital assets with open-source code will be available mainly under Github repositories.

3.4.3 Why and for what period a data embargo is induced?

It is decided that all publications will be published by month 48 of the Project and the data will be published OA.

3.4.4 Data usable by third parties after the end of the project

Open Data used by third parties should be cited accordingly with the rules established by Zenodo/Argos in case of datasets and model outputs. This rule includes the name of the authors, the project, the DOI, the nature of the document and the year of publication:

AuthorSurname1, AuthorName1; AuthorSurname2, AuthorName2; …; AuthorSurnameN, AuthorNameN (year). Title_of_dataset [dataset]. Zenodo. Doi

3.4.5 Restriction of reuse of some data

There will be no restriction of use for the dataset published in open access.

3.4.6 Data quality assurance process

Data used in IMPETUS will be derived from trustworthy open data repositories from climate and non-climate platforms. This information will be integrated into the “Semantic Context Broker” in which data quality and assurance process will be performed. Moreover, under this platform, there will be also ensured data privacy, integrity and accessibility.

All of IMPETUS databases will provide data with identified quality and provenance.

3.4.7 Length of the time for which the data will remains reusable

According to the 2.2, the data made openly accessible will be updated continuously during the 2-3 years following the end of IMPETUS. After this period, the data will be maintained in Zenodo without any updates. In case of the digital tools, it will be available within the same period. However, the services will be suspended for public use after that period if no budget is acquired to maintain it according to the final exploitation plan.

4 Allocation of Resources

(Section and subsections not modified from D8.6)

This section is mainly devoted to the description of the associated costs of the FAIR data. Under this section, the following questions will be answered:

- What are the costs for making data FAIR in your project?
- How will these be covered? Note that costs related to open access to research data are eligible as part of the Horizon 2020 grant (if compliant with the Grant Agreement conditions).
- Who will be responsible for data management in your project?
- Are the resources for long term preservation discussed (costs and potential value, who decides and how what data will be kept and for how long)?

4.1 Costs for making data FAIR in IMPETUS

The cost is estimated at 1-person month per case study to making data FAIR and maintainable. Thus, the total cost is estimated at 30.100€ including travel, other costs (7 person/months @4.300/PM). This amount is already covered by project budget.

4.2 How will these be covered?

During the project life, costs are covered by the IMPETUS budget. Following project closure, this cost will be covered by the pilots or new applications (impact analysis) partners.

4.3 Who will be responsible for data management in your project?

EUT is the responsible partner for the data management. From March 2023 Josep Pijuan (EUT) is taking over Aitor Corchero as a data manager and he will be the responsible of the data strategy of IMPETUS.

4.4 Resources for long term preservation

The envisioned long term preservations resources are (Table 22):

Table 22. Description of the costs for long-term preservation of the data and digital assets

Item	Brief Description
Costs	30.100€ including travel, other costs (7 person/months @4.300/PM). These are the costs per year of maintaining datasets and the online digital assets
Potential Value	Updated for 2 years after the project's completion. After this timeframe, the value of the preserved database will be questionable. It is a matter of the Project's exploitation
Who decides and how	IMPETUS Consortium decides on the duration of the long-term preservation of the data.

What data will be kept	All the data used for the IMPETUS RKBs in the case studies, outputs of the corresponding models, AI driven tools and also simulations.
For how long	The data will be preserved for 2 years after project completion. After this period, the data has no value, and unless the project is exploited with additional applications, the database will be obsolete.

5 Data Security

(Section and subsections not modified from D8.6)

This section is devoted to the data security aspects to be implemented and considered within IMPETUS. In this regard, the following questions will be answered:

- What provisions are in place for data security (including data recovery as well as secure storage and transfer of sensitive data)?
- Is the data safely stored in certified repositories for long term preservation and curation?

5.1 Provisions for data security (including data recovery as well as secure storage and transfer sensitive data)?

All provisions for data security will be established by the following data repositories and digital assets (Table 23):

Table 23. Data Security for the main data repositories of IMPETUS

Repository & Dataset	Brief Description
Zenodo	Zenodo, as widely used repository, has its own data securization, backup strategies and also data accessibility and authorship.
Semantic Context Broker	In IMPETUS, the semantic context broker will apply technologies and tools for data accessibility, security and trustworthy (Task 2.3). Moreover, corresponding backups over production databases will be applied to preserve the data at long term.
RKB	The RKBs will include specific security mechanism to access information. Cookies and other aspects will be in compliance with the GDPR.

5.2 Is the data safely stored in certified repositories for long term preservation and curation?

In IMPETUS all production servers with corresponding open access will be located in EU and will also be aligned with the EU legislation on data security and privacy. Inside this service IMPETUS will apply corresponding backup strategies for data assurance at long-term.

For the case of Zenodo and according to their policies on longevity, the following capacities will be adopted for data preservation and curation:

- ***Versions***: Data files will be versioned. The uploaded data will be archived as a Submission Information Package. Derivatives of data files will be generated, but original content is never modified. Records can be retracted from public view; however, the data files and record are preserved.
- ***Replicas***: All data files will be tentatively stored in CERN Data Centres, primarily Geneva, with replicas in Budapest. Data files will be kept in multiple replicas in a distributed file system, which is backed up to tape on a nightly basis.

- ***Retention period***: Items will be retained for the lifetime of the repository. This is currently the lifetime of the host laboratory CERN, which currently has an experimental programme defined for the next 20 years at least.
- ***Functional preservation***: Zenodo makes no promises of usability and understandability of deposited objects over time.
- ***File preservation***: Data files and metadata are backed up nightly and replicated into multiple copies in the online system.
- ***Fixity and authenticity***: All data files will be stored along with a MD5 checksum of the file content. Files are regularly checked against their checksums to assure that file content remains constant.
- ***Succession plans***: In case of closure of the repository, best efforts will be made to integrate all content into suitable alternative institutional and/or subject based repositories.

6 Ethical Aspects

(Section and subsections not modified from D8.6)

This section is mainly devoted to the description of the Ethical Aspects adhered to the IMPETUS project. Under this section will be considered two main aspects, the Intellectual Property Rights and the assessment and protection of personal data and research activities information under the framework of the GDPR and compatible regulations.

6.1 General Information & Assessments

Within the IMPETUS project only general ethical issues are relevant such as informed consent, anonymity and confidentiality associated with the voluntary involvement of human participants in the European Union. Types of such data collected in IMPETUS are various user interviews, opinions and reviews associated with project's components and demo-cases. Non-exhaustive list is as follows:

- Close involvement of industrial operators, managers and regionalities in order to distil efficient practices and demonstrate the IMPETUS reference digital platform.
- The visualization and human interfaces to collect information from users so that the IMPETUS RKB and subsequent modules could support in industrial decision-making to put in practice efficient operational decisions.
- A series of interviews with key stakeholders and decision makers.
- Planned contacts with representative persons of the targeted users. Interviews should be carried out by online meetings (e.g. Teams, Zoom or similar) or face-to-face when convenient. Interviews should help to define the expected functionalities, requirements and services to be offered, test and demonstrate the effectiveness of the IMPETUS RKBs, validate and measure the usability of the platform, test the price that could be acceptable and identify distribution channels to access these clients.
- The relevant stakeholders (end-users, potential developers, and partners, etc.) will be provided the opportunity to test and review the latest products and services offered by IMPETUS.
- Methodology and procedures for sensitive data processing and storing will be specified as a part of the ethics. It is important to emphasize that special efforts will be devoted to ensuring data integrity and privacy (Task 2.2) as well as trustworthy and reliability. Mechanisms to delete personal data will be provided in an easy and usable manner.

To strengthen further commitment of IMPETUS partnership research, a good ethical practices and guidelines will ensure fair and equal power relationships between researchers and participants. In this regard, the consortium agrees to comply with the principles laid down in the European Code of Conduct for Research integrity published by the European Science Foundation. These principles mainly highlight:

- Honesty in communication of the research's goals and intentions, in reporting methods and procedures and in conveying interpretations;
- Reliability in performing research;
- Objectivity, which requires facts capable of proof, and transparency in the handling of information;
- Impartiality and independence;
- Openness and accessibility;
- Duty of care - all researchers have a duty of care for the humans, animals, the environment or the objects that they study;
- Fairness in providing references and giving credit for the work of others;
- Responsibility for the scientists and researchers of the future;
- Care will be taken to minimize the potential collection of personal data, e.g. while taking photos and/or videos during events.

In this regard, IMPETUS will not involve any potentially vulnerable groups or people unable to consent (children, those with a learning disability or cognitive impairment, or individuals in a dependent or unequal relationship). Moreover, it will not involve sensitive topics which might induce psychological stress, anxiety or humiliation, deception or any potential increased danger to participants, or the collection of personal data from participants.

Further, the IMPETUS solutions, processes and methodologies will not involve the collection or processing of the following types of data:

- Research involving sensitive topics - for example participants' sexual behaviour, their illegal or political behaviour, their experience of violence, their abuse or exploitation, their mental health, or their gender or ethnic status;
- Research involving groups where permission of a gatekeeper is normally required for initial access to members - for example, ethnic or cultural groups, native peoples or indigenous communities;
- Research involving deception, or which is conducted without participants' full and informed consent at the time the study is carried out;
- Research involving access to records of personal or confidential information, including genetic or other biological information, concerning identifiable individuals;
- Research which would induce psychological stress, anxiety or humiliation or cause more than minimal pain;
- Research involving intrusive interventions - for example, the administration of drugs or other substances, vigorous physical exercise, or techniques such as hypnotherapy. Participants would not encounter such interventions, which may cause them to reveal information, which causes concern, in the course of their everyday life;
- Research involving the tracking or observation of participants (e.g. surveillance or localization data, and Wide Areas Network -WAN- data, such as IP address, MACs, etc.). However, 'cookies' will used in the website and the graphic user interface to help analyse how users behave while interact with IMPETUS RKBs.
- A privacy statement will be put on the website regarding the use of external services like Google Analytical (or similar) to track and get statistics from users in the use and interaction with the website. A similar privacy statement will be put on the graphical user interface with similar purposes. Moreover, it is important to notice that none of the data collected by the IMPETUS project requires a notification or authorisation for the collection and/or processing of the personal data to authorities or other responsible entities.

To ensure that IMPETUS partnership's participatory research approaches (including those activities to collect user requirements and involvement of the demo-cases) follows good ethical practices and ensures fair and equal power relationships between researchers and participants, the consortiums agrees that they will sign, make public and implements an ethics agreement, based on the European Code of Conduct for Research Integrity, published by the European Science Foundation.

The IMPETUS consortium also agrees to follow the rules and guidelines of the GDPR EU regulation adhered to the data privacy and security of personal information across their digital and non-digital developments. In this regard, the following conditions enable to elaborate the Data Impact Assessment to ensure correct protection of the users' information:

- Use and elaboration of newer technology
- Track of people's location and behaviour.
- Systematically monitoring a publicly accessible place on a large scale.
- Processing personal data related to "racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation".

- Data processing is used to make automated decisions about people that could have legal (or similarly significant) effects.
- Processing children's data.
- Processing could result in physical harm to the data subjects if it is leaked.

6.1.1 Consent guidelines

For the purposes of the project and according to the GDPR guidelines specific consent guidelines are practiced:

- Consent must be freely given. No data subject will be cornered into agreeing upon the usage of their data. Consent to data processing will not be a condition of using the data. The one exception is when some piece of data is needed for the data subject to provide them a data related service.
- Consent must be specific. The request for consent will be presented in a manner which is clearly distinguishable from the other matters. It will be clear what data processing activities are carried out, granting the subject an opportunity to consent to each activity.
- Consent must be informed. The users will be aware of the data processor's identity, the processing activities that will be conducted, the purpose of the data processing, and that they can withdraw their consent at any time. The latter will be described in plain language ("in an intelligible and easily accessible form, using clear and plain language"). That means no technical jargon or legalese. Anyone accessing the digital twin will be able to understand what they are asked to agree to.
- Consent must be unambiguous. There will be no question about whether the data subject has consented. Consent will be clear in any circumstances.
- Consent can be revoked. Digital tools and data users will have the right to withdraw consent at any time. This process will be foreseen to be made easy for them to do so.

6.2 Intellectual Property Rights (IPR)

Intellectual Property Rights (IPR) will receive special attention from the beginning. All rules regarding management of knowledge and IPR are governed by the CA. IMPETUS will not act in contradiction with the rules laid down in Annex II of the Grant Agreement. The CA will address background and foreground knowledge, ownership, protected third party components of the products, and protection, use and dissemination of results and access rights. In this regard, the following principles are applied:

- ***Confidentiality***: During the project duration and beyond, the contractors shall treat any information, which is designated as property by the disclosing contractors, as confidential. They also shall impose the same obligations to their employees and suppliers.
- ***Pre-existing know-how***: Each Contractor is and remains the sole owner of its IPR over its pre-existing know-how. The Contractors will identify and list the pre-existing know-how over which they may grant access rights for the project. The Contractors agree that the access rights to the pre-existing know-how needed for carrying out their own work under the project shall be granted on a royalty-free basis.
- ***Ownership and protection of knowledge***: The ownership of the knowledge developed within the project will be governed by an open-source license.
- ***Open data***: Data and results obtained during the project that are based on open public-sector data will be made available free of charge.

The procedures for the dissemination, protection and exploitation of intellectual property rights (IPR) are in the Consortium Agreement (Section 6: Governance Structure, Sub-section 6.2.4). The intention has been to balance the requirements necessary to protect such intellectual property and the foreseen dissemination objectives. IPR will be applied according to the rules of the employer under the applicable European and national laws and regulations.

7 Other Issues

At the moment, no other procedures for data management are envisioned. If there are some changes on this, we will update the DMP accordingly.

8 Further Support in developing your DMP

(Section and subsections not modified from D8.6)

Regarding IMPETUS project, external tools to support the definition and publication of open research data has been detailed under the Section 3.

9 Conclusions & Future Work

This section is mainly devoted to the description of the main conclusions of the elaboration of this second version of the DMP. Furthermore, this section is also mainly devoted to describing future work in relation to the DMP their implicit datasets, ethics and data security.

9.1 Conclusions

The present deliverable mainly focuses on the revision of the initial version of the data management plan of IMPETUS. In this regard, this document describes main strategies and methodologies for the publication of open research data. Moreover, the present document tackles the possibility of having close proprietary assets like tools and data and information that will not avoid to evolve IMPETUS RKBs.

Complementary to the identification of open data information, the document focuses on the management of the information to make it compatible with and ensure the FAIR principles. This DMP also addresses the ethics and privacy aspects of the project.

As a main conclusion, the present document has revised the basis for a correct management of data across the entire project. As part of this, the project has established a methodology and guidelines to ensure data privacy an ethics. Another important aspect is the elaboration of a digital version the DMP (based on ARGOS and in parallel to this document) just to make it compatible with the FAIR principles and share datasets across main open repositories as Zenodo, Open Aire, EOSC and Github.

9.2 Future Work

As remarked within the document, the DMP is a live document that will be continuously updated within the project. In this regard, the future envisioned actions for the next version (M36) are (Table 24.):

Table 24. Future actions of the DMP

Future Actions	Brief Description
Update of the datasets list	Update of the datasets as the evolvement of the demo-cases interaction and also, the development of the IMPETUS RKBs, Risk Assessment and other digital assets.
Maintenance of the virtual version of the DMP	Publication of open IMPETUS datasets in the Argos platform in order to link it with Zenodo and make it available for further research
Data privacy and Ethics	Ensure the user accessible digital assets (websites, mobile APPs, exploration tools, etc) accomplish the EU regulations in data privacy and ethics

Appendix I.

Data Source Definition Template

Table 25. Data source template

Data Source Definition Template	
Data set category	
Data set description	
What is the purpose of data collection/generation? "Data utility": to whom this dataset will be useful?	
Data set reference and name	
Who (partner name) / When (which task and when the data will be available)	
Format (including related standards and metadata). For example, you can check whether any standards listed in the Metadata Standards Directory of Research Data Alliance makes sense for your data (http://rd-alliance.github.io/metadata-directory/)	
In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how	
Data sharing plan (license) **If open, please describe how it will be made available (e.g., submission to a repository?)**	
Relation to project Objective(s) - for which objective is this dataset relevant and why?	
Pre-existing dataset or new? (if pre-existing please provide a reference)	
Size / expected size (use a measurement unit that makes sense for the dataset)	

Appendix II.

Transfer of Materials and Data

The Supplier (as defined below) agrees to the transfer of or access to the Material and/or Data (described below) to the Recipient (as defined below) for the conducting of the Project in accordance with the terms and conditions of the Consortium Agreement No. …….. signed between XXXX, XXXX and XXXX on …/…/…….

Materials	Designation: …… Quantities: ……
Data	Designation: …… Form: ……
Party supplying or giving access to the Material and/or Data (the "Supplier")	……
Name and address of the laboratory supplying or giving access to the Material and/or Data	……
Contact details of the scientist supplying or giving access to the Material and/or Data	Name: …….. Email: …… Tel: …….. Fax: ……
Recipient party for the Material and/or Data (the "Recipient")	……
Delivery address for the Material and/or Data	Address …….. …….. Name of recipient ……. Email: …… Tel: …… Fax: ……

Signed in [-](-) original counterparts drafted in the English language, with one (1) for the Supplier and the other(s) for the Recipient

Witnessed, the Scientific Manager of the Laboratory	Witnessed, the Scientific Manager of XXXX
……	……

Appendix III.

Website Privacy Policy

9.3 Legal Warning

In compliance with Law 34/2002 of 11 July on Information Society and Electronic Commerce Services, the User is informed that the owner of the website https://climate-impetus.eu ESCI whose identification information is as follows:

Registered office:
Post code:
Town/City:
Region:
VAT:
E-mail:
Website hosting provider:

9.4 Access to the website

This legal notice regulates the access and use of the website by Users and aims to inform about the services and products of the entity and allow general access for all Internet users.

Any person who accesses or uses the Website is considered a User and accepts, without reservations of any kind, each and every one of these general conditions, as well as of other special conditions that, if applicable, govern the use of the Portal or the services linked to it.

The User must carefully read the Legal Notice and the Privacy and Cookies Policies when they intend to use the Website, since ESCI reserves the right to make, at any time and without prior notice, any modification or update of the contents and services, of the present provisions for access and use and, in general, of all the elements that comprise the design and configuration of its Website. If you do not accept the conditions of access and use, please refrain from using the Website and its content.

9.5 USE OF THE WEBSITE

The User undertakes to make diligent use of the Website, as well as the information relating to its services and/or activities, in full compliance with the applicable regulations, ethics and generally accepted good practices and law and order, the conditions of access and use and any other conditions established on the Website.

In addition, the user agrees to refrain from using any of the content for illegal purposes or effects, prohibited in this document, which may be harmful to the rights and interests of third parties, or that in any way may damage, disable, overload, deteriorate or prevent the normal use of the content (hardware and software) of other Users or of any Internet user in general.

9.6 OPERATION OF THE WEBSITE

In the event of non-compliance with the conditions of the Legal Notice, or the Privacy and Cookies Policies, ESCI reserves the right to limit, suspend and/or exclude access to its website, adopting any technical measure necessary in this respect. ESI will do everything possible to keep the website in good working order, preventing faults, or repairing them and keeping the contents up to date. However, ESCI does not guarantee the availability and continuity of access to the Website or the absence of errors in the content.

9.7 LIABILITY

The User is solely liable for the use that they may make of any information or mechanism of the Website.

ESCI will not be liable for any damage to the hardware and/or software of the User that may arise from access and use of the Website. Likewise, it will be not liable for damages or losses that may be caused by accessing and/or using the information on the Website, and specifically those that may occur in computer systems or those caused by computer viruses/attacks, crashes, interruptions, absence or defects in connectivity and/or the Internet.

The User will be liable for the damages and/or losses that ESCI may suffer as a result of the breach of any of the obligations to which they are subject to through this Legal Notice, applicable regulations and the Privacy and Cookies Policies.

9.8 POLICY ON LINKS

9.8.1 Web Linking

Third parties who intend to include a link on this website must comply with current legislation and may not host content that is inappropriate, illegal, pornographic, violent, etc.

ESCI will in no case be liable for the content of that Website, nor promote, guarantee, supervise or recommend the content therein.

If the linking Website fails to comply with any of the above aspects, it will be obliged to delete the link immediately.

9.8.2 Linking Website

This Website may include links to third-party websites that allow the User to access them. Nonetheless, ESCI is not liable for the content of these linked websites, but rather the User will be responsible for accepting and verifying access each time they connect.

These links or mentions have a use that does not imply the support, approval, commercialization or any relationship of this website and the persons or entities that own the site where they are located.

9.8.3 INTELLECTUAL AND INDUSTRIAL PROPERTY RIGHTS OF THE CONTENT

ESCI, or its licensors, are holders of all intellectual property rights over the Contents of the Website, understood as all the designs, databases, underlying computer programs (source code, included), as well as the different elements that make up the Website (texts, graphics, photographs, videos, colours, etc.), structure, layout, etc. The trademarks and trade names ("distinctive signs") are owned by ESCI or the licensors.

The use of the Website by the User does not imply the transfer of any intellectual or industrial property rights. The User is totally prohibited from reproducing, copying, distributing, making available or publicly communicating, transforming or modifying the Contents or Distinctive Signs in any way, unless the authorization of the owner of the corresponding rights is granted or it is legally permitted.

9.8.4 APPLICABLE LEGISLATION

The Legal Notice will be governed and interpreted in accordance with Spanish legislation.

Any conflict that may arise from accessing the website will be submitted to the relevant courts or tribunals for resolution in accordance with consumer and user regulations.

9.8.5 Contact

For any questions or comments on this Legal Notice you can contact us at info@climate-impetus.eu

Appendix IV.

Website Cookie Policy

9.9 COOKIES

Cookies are small files that are downloaded to your computer when you visit a website to improve your experience. Almost all browsers support Cookies; however, you are able to set your preferences (decline or delete them) whenever you like. For more general information on cookies see the ICO's cookie page.

9.10 HOW DO WE USE COOKIES?

We use cookies in order to manage functionality on our website and to have insights on how to improve our services for our users. When a cookie is not necessary, we give you the option to opt-out of it and disable it.

9.11 WHAT TYPE OF COOKIES DOES THE WEBSITE USE?

We use two main types of cookies:

- Necessary cookies, which are essential for the operation of the website by enabling basic functions like page navigation and access to secure areas of the website.

- Statistic cookies, which allow us to see the number of visitors and they move around our website when they are using it. This helps us to improve the way our website works, for example, by ensuring that users are finding what they are looking for easily. The analytics solution we have opted for preserves our visitor's privacy by e.g. anonymising IP addresses. The information collected by these cookies is aggregated and therefore anonymous.

9.12 HOW TO MANAGE COOKIES?

Most web browsers allow some control of most cookies through the browser settings. To find out more about cookies, including how to see what cookies have been set, visit www.aboutcookies.org or www.allaboutcookies.org

By following the links below you can find out how to manage your Cookies preferences on popular browsers:

- Google Chrome
- Microsoft Edge
- Mozilla Firefox
- Microsoft Internet Explorer
- Opera
- Apple Safari

9.13 THIRD PARTY COOKIES

Third-party cookies are only generated with your agreement. We use third-party cookies to provide enhanced site functionality.

This site uses Google Analytics which is one of the most widespread and trusted analytics solutions on the web for helping us to understand how you use the site and ways that we can improve your experience. These cookies may track things such as how long you spend on the site and the pages that you visit so we can continue to produce engaging content. For more information on Google Analytics cookies, see the official Google Analytics page.

Appendix V.

Privacy Policy

9.14 WHO IS THE DATA CONTROLLER FOR YOUR PERSONAL DATA?

Data controller: FUNDACIÓ EURECAT ("EURECAT")

Tax ID number: G66210345

Address: Parc Tecnològic del Vallès. Avinguda Universitat Autònoma, 23 08290 Cerdanyola del Vallès

Email address: legal@eurecat.org

Telephone: +34 93 238 14 00

Data protection delegate contact: dpo@eurecat.org

9.15 FOR WHAT PURPOSE WILL BE PROCESSED YOUR PERSONAL DATA?

Your personal data received through the contact form will be processed for the purpose of managing your query or request. However, the data collected as the result of the cookies installation, will be used for collecting statistical information on the browsing of users and improve the website based on their browsing habits. You may consult further information about the cookies purposes and its data treatment at the Cookies Policy.

On our website, there may be several forms that collects your personal data for specific purposes. In those cases, you will be previously informed about the specific data treatment information to each case, and your specific consent shall be sought.

9.16 IS IT MANDATORY TO PROVIDE ALL THE INFORMAITON REQUESTED IN THE FORMS ON THE WEBSITE?

The user must complete the fields marked as "required". Failure to complete the required personal information or to partially do so may mean that Fundació Eurecat cannot meet your requests and, consequently, Fundació Eurecat will be exempt from any liability for the non-provision or incomplete provision of the requested services.

The personal data provided by the User to Fundació Eurecat must be up to date so that the information in our records is current and without errors. The user will be liable for the veracity of the data provided.

9.17 HOW LONG WILL YOUR PERSONAL DATA BE RETAINED FOR?

The personal data obtained, will be kept for the duration of the purposes for which it was collected for and its erasure is not requested, and consent is not revoked. The personal data, also, will be kept, in any case, during the legal term applicable.

9.18 WHAT IS THE LAWFUL BASIS FOR US TO PROCESS YOUR PERSONAL DATA?

The lawful basis for the processing of your data is the consent provided through acceptance of the data processing clause.

9.19 WHAT RECIPIENTS WILL YOUR DATA BE SHARED WITH?

The personal data received through the forms of the website may be shared with members of the project for the exclusive purpose of managing your query or request and be able to send you the latest news about the project through periodic newsletters. You may consult the list of members here.

The personal data may be shared to third-parties whose develop services to the Data Controller, those ones who has access to the personal data will not treat the personal data fort their own or different purposes and they will not sold or rent them.

The personal data will not be passed on to any other third-parties, unless there is a legal obligation to do so.

9.20 WHAT ARE YOUR RIGHTS REGARDING YOUR PERSONAL DATA?

The user may exercise their right to access their personal data, to request the rectification of inaccurate data and, where applicable, to request the data to be erased if it is no longer necessary for the purposes for which it was collected. The user may also exercise their right to data portability and to the restriction of or opposition to the processing of their data, in certain circumstances and for reasons related to their specific situation.

The user also has the right to revoke their consent at any time, without any retroactive effect on the processing of their personal data carried out until that point.

The user may exercise the aforementioned rights, under the terms provided for in current legislation, at the registered office of Fundació Eurecat or request to do so by sending an email to legal@eurecat.org.

Should the user not receive a satisfactory response, and should they wish to make a complaint or obtain more information on any of these rights, they may contact the Spanish Data Protection Agency (www.agpd.es - C/ Jorge Juan, 6, Madrid).

9.21 AUTOMATED DECISIONS

The personal data shall not be submitted to automated decisions.

The personal data may be processed to create profiles according to the cookies that has been consented to installed by the user.

9.22 INTERNATIONAL DATA TRANSFERS

The personal data shall not be summited to international transfers out of the European Union. However, the Data Controller may have several suppliers that develop services out of the UE, in those cases, Fundació Eurecat shall assure that the personal data shall be treat with the legal requirements through agreement that may include standard contractual clauses or privacy certification.

9.23 WHAT SECURITY MEASURES HAS THE INSTITUTION IMPLEMENTED?

Fundació Eurecat declares that it has implemented the necessary technical and organisational security measures that guarantee the security of the User's personal data and avoid its alteration, loss, processing and/or unauthorised access considering the state of technology, the nature of the stored data and the risks to which it is exposed, whether from human action or from the physical or natural environment, in accordance with the provisions of current regulations.

9.24 SOCIAL MEDIA

IMPETUS, a project coordinated by FUNDACIÓ EURECAT (EUT) has a profile on Twitter and LinkedIN for publishing and disseminating information about the services provided through the website, interacting with users and acting as a customer service and social interaction channel.

The following are links to the privacy policies of the social networks on which IMPETUS has an active profile:

Twitter: https://twitter.com/en/privacy

10 PRIVACY INFORMATION CONTRACT FORM

Pursuant to Regulation (EU) 2016/679, of 27 April 2016, on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and the relevant State regulations, FUNDACIÓ EURECAT, the controller, hereby provides the following basic information regarding data protection:

10.1 Controller

FUNDACIÓ EURECAT

G66210345

Av. Universitat Autònoma, 23 – 08290 Cerdanyola del Vallès (Barcelona), Spain legal@eurecat.org
Details of the data protection officer: dpo@eurecat.org

- ***Purpose of the processing of your personal data***: Managing your request or queries
- ***Legal Basis***: The basis for the processing is the specific consent granted by the data subject for this activity.
- ***Recipients***: The data will be disclosed to the partners involved in the IMPETUS project; you may consult them at: https://glomicave.eu/partners/
- ***Rights***: You may access, rectify or erase the data and exercise your right to restriction of the processing and portability of the data by contacting the controller at its address or the email address legal@eurecat.org.
- ***Storage***: The data will be stored for the term required to render the data treatment purpose.

FUNDACIÓN EURECAT hereby informs you that it meets all the requirements stipulated by the data protection regulations and has in place all the technical and organisational measures to ensure the security of personal data. Moreover, in the event of any breach by the controller in the processing of your personal data, you are entitled to file a claim with the Spanish Data Protection Agency