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Abstract	<p>The DMP presents the data management in the project, and in particular:</p> <ul style="list-style-type: none"> <li>• the data that will be collected, processed and generated</li> <li>• the methodologies and standards that will be applied</li> <li>• the handling of research data during and after the end of the project</li> <li>• whether data will be shared/made open access and</li> <li>• how data will be curated and preserved (also after the project is finalised).</li> </ul> <p>The plan will be updated in time with the periodic reporting of the project, i.e. M18, M36 and M48. It will also be updated once per year, before a Steering Committee meeting.</p>

HISTORY OF CHANGES		
Version	Publication date	Change
1	31 May 2020	• Initial version





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## 1. Introduction

A Data Management Plan (DMP) describes the data management life cycle for the data to be collected, processed and/or generated by a Horizon 2020 project<sup>1</sup>. As part of making research data findable, accessible, interoperable and reusable ('FAIR'), a DMP should include information on:

- the handling of research data during and after the end of the project
- what data will be collected, processed and/or generated
- which methodology and standards will be applied
- whether data will be shared/made open access and
- how data will be curated and preserved (including after the end of the project).

The due date of the first version of the DMP is month 6 (i.e. 30 November 2019).

The first version of the DMP does not provide detailed answers to all the questions in Annex 1 of the guideline. The DMP is intended to be a *living document* in which information can be made more detailed and specific through updates as the implementation of the project progresses and when significant changes occur. Thus, the DMP has a clear version number and includes a timetable for updates.

The DMP must be updated, as a minimum, in time with the periodic evaluation/assessment of the project, or whenever significant changes arise, such as (but not limited to):

- new data
- changes in consortium policies (e.g. new innovation potential, decision to file for a patent)
- changes in consortium composition and external factors (e.g. new consortium members joining or old members leaving).

In CIRCUIT we aim to update the DMP once per year, before a Steering Committee meeting.

This first version of the DMP focuses on data management in WP3-9 and presents the initial thoughts on data collection and management across the partners in the four city clusters, as well as aspects of the General Data Protection Regulation<sup>2</sup>.

## 2. GDPR

This section is a very brief introduction to the EU General Data Protection Regulation (GDPR) that entered into force on 25 May 2018. The presentation aims at the regulation and type of data relevant for the CIRCUIT project. For the full text in the regulation, see the General Data Protection Regulation<sup>3</sup>.

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<sup>1</sup> *Guidelines on FAIR Data Management in Horizon 2020*, Version 3.0, 26 July 2016

[http://ec.europa.eu/research/participants/data/ref/h2020/grants\\_manual/hi/oa\\_pilot/h2020-hi-oa-data-mgt\\_en.pdf](http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf)

<sup>2</sup> [https://ec.europa.eu/info/law/law-topic/data-protection/reform/rules-business-and-organisations\\_en](https://ec.europa.eu/info/law/law-topic/data-protection/reform/rules-business-and-organisations_en)

<sup>3</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32016R0679>





In delivering project activities, project partners will comply with the GDPR, applicable in all Member States in the EU, as well as in EEA countries.

### 1.1 Personal data

'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. In some cases, 'regular' personal data can become sensitive, if more regular data are combined, so that it is now possible to identify a specific person, e.g. geolocation and data concerning occupation.

Common Personal Data	Sensitive Personal Data
<ul style="list-style-type: none"> <li>• Name</li> <li>• Identification number</li> <li>• Location data</li> <li>• Online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity.</li> </ul>	<ul style="list-style-type: none"> <li>• Racial or ethnic origin</li> <li>• Political opinions</li> <li>• Religious or philosophical beliefs or trade union membership,</li> <li>• 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</li> </ul>

Source: Regulation (EU) 2016/276 of the European Parliament and of the Council, 27 April 2016.

#### *Names, emails etc. in CIRCUIT:*

Names and emails are personal data, also as work information. However, sending an email where the email addresses are visible (not bcc or some 'send safe' mode) is fine. If you are in doubt, send the email to yourself with all receivers in bcc.

If we organise a workshop where citizens have signed up to participate, we can

- write in the invitation, that we will prepare a list of participants (with names only, if we do not need other contact information)
- include the CIRCUIT informed consent form.

Likewise, if we send a newsletter to citizens as well as other parties, we must remember to add a possibility to unsubscribe to the newsletter.

### 2.1. Data processing

'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.

The GDPR is based on five basic data protection principles<sup>4</sup>:

<sup>4</sup> <https://gdpr.eu/what-is-gdpr/>





- 1) **Lawfulness:** there must always be a legal basis for processing personal data. Personal data must be used in a way that is fair and transparent.
- 2) **Purpose limitation:** you may only process personal information, if there is an explicit purpose for it and you may not use data for purposes other than for what they have been collected.
- 3) **Data minimisation:** you may only collect the personal information necessary for the purpose of your processing.
- 4) **Accuracy:** information must be correct and up to date.
- 5) **Storage limitation:** data must be deleted when the purpose of their collection and processing is achieved. Before, it is necessary to assess whether data is to be archived. In CIRCUIT, it would be relevant to delete all data (interviews, questionnaires, etc.) at when the project is finalised and approved by the EASME, if not sooner.

Personal data that has been rendered anonymous in such a way that the individual is not or no longer identifiable is no longer considered personal data. For data to be truly anonymised, the anonymisation must be irreversible.

In addition, the GDPR requires that you to take responsibility for what you do with personal data and that you have appropriate security measures in place to protect the personal data you hold.

## 2.2. Processing of personal data

When processing personal data, organisations must provide citizens with clear information relating to the use of the personal data, this includes information such as<sup>5</sup>:

- for what purposes the personal data will be used
- the legal basis for processing the personal data
- how long the personal data will be stored
- with whom they will share the personal data
- the citizen's basic data protection rights
- whether the personal data will be transferred outside the EU
- the citizen's right to lodge a complaint
- how to withdraw the citizen's consent, if it has been given
- the contact details of the organisation responsible for processing the personal data and their Data Protection Officer, if there is one.

This information should be presented in clear and plain language.

In deliverable D1.1 we have prepared an informed consent form to be used for data collection through interviews, questionnaires, etc.

Partners using and processing personal data must store and manage data in such a way that individual personal data can be deleted, if a citizen requires us to do so. If a citizen requires the data deleted, they cannot be included in CIRCUIT reports and deliverables.

## 2.3. Other definitions

**Data controller:** The person who decides why and how personal data will be processed.

**Data processor:** A third party that processes personal data on behalf of a data controller.

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<sup>5</sup> [https://ec.europa.eu/commission/sites/beta-political/files/data-protection-overview-citizens\\_en.pdf](https://ec.europa.eu/commission/sites/beta-political/files/data-protection-overview-citizens_en.pdf)



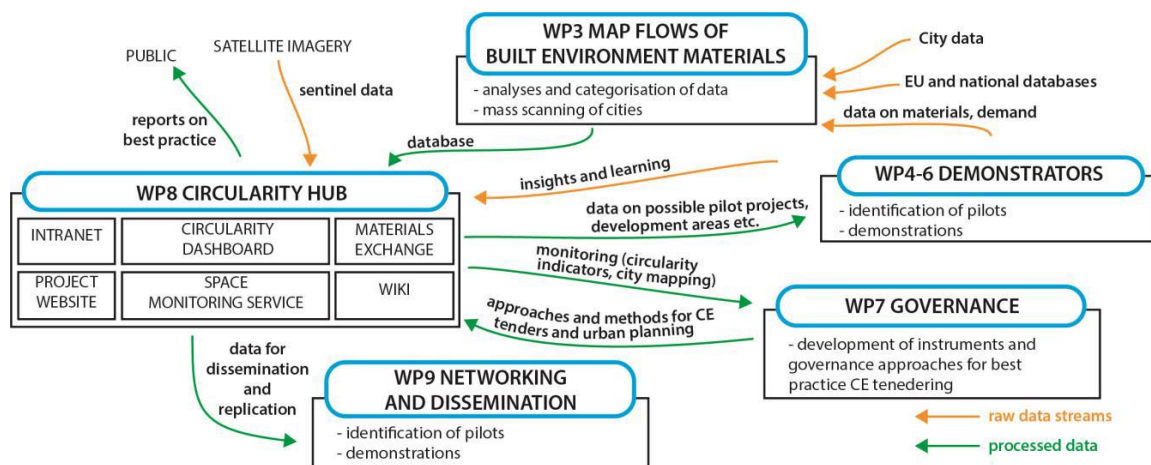
### 3. Data summary

The overall objective of CIRCuIT is to demonstrate innovative solutions for closing the loop of urban materials and resource flows in the built environment sector. The aim is that these solutions will support a transformation of cities into centres of circular innovation, and support and increase the regenerative capacity of each city.

In CIRCuIT the work packages generate data for different purposes:

- Map flows of building materials in the four cities using mass-scanning approaches and blockchain technology, alongside existing building datasets to support digital pre-demolition audits and matching of supply and demand, and to overcome the barriers of data interoperability and availability (WP3).
- Implement a cross-European and interdisciplinary Circularity Hub, as a data platform and one-stop-shop for evaluating progress of circular economy and regenerative capacity in urban and peri-urban areas of cities, including a range of indicators for monitoring this within the built environment (WP8).
- The data from demonstrations generated in WP4-6 will be utilised in WP7 to analyse existing European, national and local regulations and procedures, to identify the room for manoeuvre that the four cities have for including requirements on the reuse and recycling of building products and materials, adaptive reuse and refurbishment, and design for disassembly in urban planning (spatial, municipal and local) and building permits.
- Results are disseminated via WP9.

Figure 1: Collection and use of data between WPs



### 1.2 WP3: Map flows of built environment materials

#### Purpose of data collection

A key aspect of this project is to understand the potential for the existing built environment to supply products and materials into new construction works in the medium to long term.

CIRCuIT will collect and link data on the built environment in order to stimulate the market of construction and demolition (C&D) waste, and the distribution of reusable construction

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components. The data will promote supply and demand of 'soon-to-be released materials' of future demolition sites.

## Types and formats of data

Task 3.1 will explore the availability of the data which is likely to vary from city to city, as well as the quality and granularity. This task underpins the data requirements for WP4, WP5, WP6, WP7 and WP8. The following table provides an indication of the type of data that could be used for mapping data flows and the possible sources of data.

*Building Information Modelling* is a standardised form of data collection to promote project collaboration.

Table 1. City Data Map template

Type of Data	Example of parameters	Potential sources
<b>BUILDING DATA</b>		
Current split of building types (% land use, number of units, valuation)	By sector (housing, commercial, industry)	Studies (academic, Government), planning data
	By age groupings	
	By typologies e.g. apartment housing, concrete frame + brick and block infill	
Use of buildings	Renovation patterns	Planning data, business register data
	Vacancy rates	
	By occupation	
Levels of demolition	By sector (housing, commercial, industry)	Studies (academic, Government), planning data
	By age groupings	
	By typologies e.g. apartment housing, concrete frame + brick and block infill	
	Good examples of selective/high & reuse demolition e.g. 3D demolition simulation, concrete recycling robot	
Future building requirements	By sector	Planning data
	By scale	
	Large infrastructure projects	
<b>MATERIAL AND PRODUCT DATA</b>		
New construction products and material consumption	Building level e.g. housing, commercial, infrastructure	Studies (academic, industrial, Government)
	Sector level e.g. plasterboard, structural timber, windows	Manufacturers sales data and trade bodies
<b>REUSE, RECYCLING AND OTHER WASTE DATA</b>		
Construction/demolition/refurbishment waste benchmarks	Tonnes or m <sup>3</sup> waste relative to floor area or 100K euros	Waste statistics (Eurostat/National/Municipal), industry data
	% material breakdown by volume of weight	



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Type of Data	Example of parameters	Potential sources
	Total tonnage produced	
	Typical recycling/ reuse/ energy recovery etc rates	
	Typical costs for waste management	
General data on construction, demolition and excavation waste – especially precise information as indicated in the ‘benchmark’ section is not available	Amounts (tonnes/year)	Waste stats (Eurostat/National/Municipal), industry data
	Material breakdown (tonnes or %)	
	Levels of reuse, recycling, recovery etc..	
Current levels and trends for use of reclaimed (reused/secondhand) construction products (e.g. online platforms for reclaimed materials and usable building parts, salvo.co.uk Purkutorin.fi)	By product or material type	Surveys, trade bodies
	By sector e.g. housing	
	By company type e.g. third party urban mining, deconstruction companies, in house	
Current levels and trends for use of recycled products and materials	Recycled content of product groups	Studies (academic, industrial, Government)
e.g. RAL Quality Assurance for recycled construction materials	% Bulk materials e.g. recycled aggregates as % all aggregates	Studies (academic, industrial, Government), waste statistics, planning data
	Financial incentives (e.g. landfill tax)	Government
<b>PROCESS, STANDARDS DATA</b>		
Sustainability standards for buildings e.g. BREEAM	Relevant credits/ adaptation of approach, tools and standards used to assess whole life costs	Scheme providers, planning
Social value assessment	Tools or standards to measure	Social return on investment calculation method
Health & well being assessment	Tools or standards to measure, e.g. material passport	Methodology/ case studies
Economic assessment	Whole life costing analysis tools/standards	Standards/ Software/ Methodology/ case studies
Environmental assessment	Tools or standards to measure, such as EPDS for construction products, LCA software for buildings	Standards/ Software/ Methodology/ case studies
Pre-demolition audits undertaken	A standard or evidence/case studies e.g. EU CDW Protocol	Studies (academic, industrial, Government)
<b>POLICY DATA</b>		
Legal requirements that influence circularity	Mandatory pre-demolition audits, Eco-design, extended producer responsibility, eco labelling etc	city/region or national policy
Fiscal aspects that influence circularity	Green public procurement requirements/ weighting, tax / subsidies in place	city/region or national policy





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Type of Data	Example of parameters	Potential sources
Direction of travel'	Guidance, roadmaps, case studies, support for voluntary best practice	reports, websites, help lines, events
<b>DATA STANDARDS</b>		
Building information modelling related	Number/% of built assets scanned/have a BIM	reports, standards/ authoring software, training courses available
Classification systems typically used	Building typologies, product groupings	city/region or national policy/usage
Circularity Indicators	Existing Key Performance Indicators in use/proposed	Circularity reports/ software/ consultancy
<b>OTHER/ MISC</b>		
Physical context	Land use mapping, transport, climate, green/blue infrastructure	GIS, local development plans, mapping portals
Economic context	Local economy stats, future trends of growth. Breakdown of industry by sector esp. focus on 'circular economy' related.	reports, websites, local enterprise targets and themes
Social context	Health & well being stats, Social deprivation stats	reports, websites etc.
Environmental context	Energy, water, resources consumption, other waste flows, pollution	Mass flow analysis, urban metabolism, energy & water related reports/modelling software/ support/ targets etc..

As indicated in Table 1, a lot of data sources will be analysed in each city as part of the first task (3.1), although it is not expected that the actual data will be collected or stored. A few exceptions to this will be to illustrate best proactive examples, such as a sample data record.

Each data source is being summarised against a set criteria, as summarised below

- Category data source best fits into e.g. building stock, waste flows etc.
- Description of data
- Source/ contact of organisation providing data
- URL/ website link
- Private or public data
- Smallest geography covered
- Relevance to Current stocks / Future stocks / Disposal
- Quantity of data held
- Time range and frequency of data collection
- Ongoing or inactive data source
- Output/outcome based or linked e.g. materials exchange

### *Reuse of existing data*

The objective of the first task is to identify existing data sets that can be used to support other tasks within WP3 and other work packages. The data requirements for each work package will be summarised as 'use case (data) scenarios' that determine the data requirements versus the data availability within each city. This information can also be useful





for updating this data management plan over the course of the project. Deliverables D3.1 will summarise sources of existing data that could be useful in each city. The intention is to publish this report on the CIRCUI T website – it should be noted that actual data (within identified data sources) will not be published, unless as illustration and these will be checked for compliance with GDPR etc.

#### *Origin of data*

As indicated above, the data is expected to come from a wide range of sources, although public and openly accessible data is much preferred as the types of data sources we should be relying on to support WP3 and linked into other workpackages.

#### *Expected size of data*

This is unknown at this point in time and the activities leading up to D3.2 are expected to recommend further data capture approaches to fill identified data gaps. Most of the actual data will be held elsewhere, either in their originating sources or relating to the other work packages to support piloting and exploitation tasks.

#### *To whom are data useful*

WP3 is primarily a conduit for sourcing and standardising the data needs for other work packages in the CIRCUI T project. In this sense, the users of data captured in WP3 are the other WP leaders, partners and stakeholders. Through publishing the deliverables generated in WP3, we expect to provide a useful set of references and source material to support other researchers and practitioners operating in the space of circular economy in the built environment. Public access of these reports will be the default position, unless there is a need to suppress data for commercial or individual confidentiality.

### **1.3 WP4: Urban Mining and reverse cycles**

#### *Purpose of data collection*

Data collected in WP4 will support decision making regarding the design of buildings, for example through the requirements set in planning instruments and demolition permits and the results of Pre-Demolition-Audits. The aim is to analyse the possibilities in demolition and construction have for including requirements for circular economy in policy instruments and procedures.

Data collection will allow evaluation of pre-demolition audits and documentation of a harmonised approach, development of thorough and properly structured design protocols, and checklist (or group of checklists) and templates in order to effectively manage a deconstruction project. The most important though is to evaluate the accuracy of data and the usability - applicability of the audit results in order to improve decision-making based on a sound technical framework.

#### *Types of data*

Specifically, the following data collection is expected:

- Pre-demolition practice
- Demolition waste from Pilots and other sources
- Treatment plants and test results



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- In the eight actual demolitions, interviews with the property owner, authority, auditor, contractor, waste manager, wholesaler of recycled and reusable products and product manufacturers will be carried out to disclose possibilities on how to overcome the barriers and implement the guideline in cities.

Qualitative data from:

- Surveys, Statistics, field tests and evaluation of different case studies

Other:

- data in the format of photos and videos for field tests and relevant building or demolition objects

For task 4.1 it is expected that audit result, inventory and demolition data will be collected and processes. Evaluation of the eight pre-demolition audits and guide with design protocols and checklists.

For task 4.2 it is necessary to collect a number of data about reuse, refurbishment, the recycling quota, energy and resource balances and cost analyses for the demonstrator cases.

Task	Quantitative data	Qualitative material
4.1	<p>Demolition monitoring (Tendering stage, Pre-demolition stage, Actual demolition stage, and Post-demolition stage) to identify the construction stock, entire cost and environmental impact focused on reference buildings:</p> <ul style="list-style-type: none"> <li>• Data provided by the pre-construction documents (early design), and construction or else “as-built” documents of buildings (accessible by owners): initial construction design and actual construction design, structural characteristics of the building, namely material composition, core elements, loadbearing system, historical elements, etc. and their location in buildings.</li> <li>• Data provided by the auditor during the pre-demolition audit (recommended templates): material type, amount, quality and potential management option (reuse/recycling/recovery rate per material), etc. Mass flows of mineral and non-mineral construction stocks (volume, mass) derived from demolition projects by scanning existing datasets of stakeholders, as well as available statistics and academic researches. Purity of materials assessed (e.g. mixed mineral waste containing concrete, bricks, ceramics, etc). Mass flows of elements (e.g. windows, prefabricated parts, etc.) or materials (steel, etc.) sold</li> </ul>	<ul style="list-style-type: none"> <li>• Interviews with the involved parties: an anonymous questionnaire template distributed to owners, auditors, etc (for example a question could be if the audit help customers to find reusable materials). This will enable a rather important statistical sample.</li> <li>• Equipment and methods used for demolition and post demolition activities (excavators, crushers, magnetic separation of steel, crushers with sieves, handmade wood sorting, etc.) in connection with the building type, etc. This data may answer further questions about the impact of the dismantling/deconstruction/demolition techniques (easy-dismantling, production of dust, production of mixed waste, etc.), and will inspire recommendations to reduce environmental impact of demolition processing, transportation, storage and reuse.</li> <li>• Classification of the size of demolished materials: particle size (coarse or fine aggregates if crushed), pieces, prefabricated elements, etc. This qualitative data will assist the creation of reuse and recycling concepts, e.g. if demolition produces concrete aggregates, these may be reused in new construction materials as substitutes of raw materials, however,</li> </ul>



Task	Quantitative data	Qualitative material
	<p>to wholesalers of recycled and reusable products. Mass flows of hazardous materials.</p> <ul style="list-style-type: none"> <li>Actual waste rates diverted from landfill, actual reuse/recycling/recovery rates and comparison with the recommended rates provided by the auditor. This data is useful also for task 4.2.</li> <li>Costs and values of the above</li> </ul> <p>The above mass flows, reuse/recycling recovery rates of materials and, costs and values are also connected with the type of building, age, and other attributes.</p>	<p>bricks that are non-cracked/non-damaged may be reused after cleaning for decoration purposes in new constructions, etc.</p> <ul style="list-style-type: none"> <li>Accessibility of components, also in terms of pollutants (non-deconstructive techniques or deconstructive techniques needed for sampling and analysis during the pre-demolition audit and actual demolition).</li> <li>Auditor qualifications, employee training, safe working practices (airborne dusts, noise, etc.).</li> <li>Photos and videos for further documentation during the field survey.</li> </ul>
4.2	<ul style="list-style-type: none"> <li>Supply and demand for building elements or materials at a regional level</li> <li>Quality insurance of building stock samples (4 demonstrations based on the results obtained within task 4.1) involving -chemical, physical (density, etc.), mechanical (strength, etc.) properties, -chemical stability (leaching tests) and resistance to corrosion to explore the potential of reuse/recycling based on standard specifications of commercial material for specific applications</li> <li>Evaluation of demonstrations in future applications in terms of environmental and cost aspects (LCA and Cost analyses based on the embedded energy and resource balance) and comparison with the demolition scenario to identify the price drivers and environmental barriers.</li> </ul> <p>All the above data will enable creation of a standardised and practical method for assessing the environmental safety of reused materials, and the environmental and economic benefits of their reuse in construction works (CO<sub>2</sub> emissions and cost savings) as well.</p>	<ul style="list-style-type: none"> <li>Possibilities of applications of reused/recycled elements or materials in the new constructions (for interior, exterior use, decoration etc.) and barriers at national/regional level. Reuse and recycling processes developed and established in industrial level (e.g. reuse of concrete aggregates in road construction as a layer under asphalt, etc.), in lab or pilot level (e.g. reuse/recycling of construction and demolition as aggregates in the production of concrete) and other up-cycling options toward innovative uses, e.g. windows as decorative faux windows, etc.</li> <li>Requirements and national regulations of reused/recycled materials. Available instruments for certification. This data will be useful to identify gaps on valid data about the composition of the buildings and the instruments for certification of re-useable materials, and will improve the demolition activities.</li> </ul>

## 1.4 WP5: Extend life-cycles through transformation and refurbishment

### *Purpose of data collection*

Data collected in WP5 will support decision making regarding the transformation and adaptation of existing buildings, or their replacement.

The aim is to collect data that enables the project member cities to:

- 1) identify obsolete but transformable parts of the building stocks in their cities;
- 2) develop replicable design scenarios for such buildings to identify their transformation capacity and to support the extension of their life-cycles; and

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- 3) evaluate the environmental, economic and social/cultural potential of the exemplary interventions and similar measures, if used more widely.

For task 5.1 it is expected that the data is mostly used in city planning applications, pertaining to a relatively large geographical area, such as a city or a neighbourhood, and a 'high' aggregate level. The goal is to identify a type or a building or an area for addressing in the next task.

For task 5.2 it is necessary to collect a number of data in order to confirm that the cases selected for closer inspection and development represent sufficiently a larger mass of buildings (cf. task 5.1). Therefore, the quantitative and qualitative properties of buildings are examined on a more detailed level. They are also contrasted to the users' or other stakeholders' expectations.

In task 5.3 data will be required to evaluate the interventions developed in the previous task. The evaluation will take into consideration many kinds of existing data, both qualitative and quantitative, often embedded in existing databases.

Specifically, the following data collection is expected:

Task	Quantitative data	Qualitative material
5.1	Geographical information systems containing data including, but not limited to: <ul style="list-style-type: none"> <li>• Infrastructure</li> <li>• Buildings</li> <li>• Population demographics</li> <li>• Enterprises</li> </ul>	Records, notes and/or transcripts of in-depth interviews of key players and stakeholders, such as: <ul style="list-style-type: none"> <li>• City planners</li> <li>• Architects</li> <li>• Property owners</li> <li>• Developers</li> </ul>
5.2	Data on the economic value of buildings, such as: <ul style="list-style-type: none"> <li>• Land value</li> <li>• Rental or sales prices of properties or units</li> </ul> Data on the technological performance of buildings, such as: <ul style="list-style-type: none"> <li>• Energy consumption</li> <li>• Physical condition</li> <li>• Repair needs</li> </ul>	Architectural and structural plans and drawings of buildings  Photos and videos of buildings  Notes of field observations  Value assessments of buildings including, but not limited to: <ul style="list-style-type: none"> <li>• Architectural values</li> <li>• Heritage values</li> <li>• Social/cultural values</li> </ul> Records, notes and/or transcripts of interviews and/or surveys of key players and stakeholders, such as: <ul style="list-style-type: none"> <li>• Property owners</li> <li>• Developers</li> <li>• Users</li> </ul>
5.3	Data for LCA and LCC regarding: <ul style="list-style-type: none"> <li>• Environmental impacts of buildings works and materials</li> <li>• Economic impacts of building works and materials</li> </ul>	Value assessments of buildings including, but not limited to: <ul style="list-style-type: none"> <li>• Architectural values</li> <li>• Heritage values</li> <li>• Social/cultural values</li> </ul>



### 3.1. WP6: Design for disassembly and flexible construction

#### *Purpose of data collection*

Data collected in WP6 will support design development of demonstrators and decision-making regarding design for disassembly and adaptable/flexible building systems.

The aim is to collect data, which can inform the development of demonstrators. Additionally, data collected will aim at informing decision makers on a technical level that can feed into implementation strategies of the demonstrators. The types and formats of data collected is related to each of the three work package tasks.

For task 6.1 it is expected that data collected is mainly related management of the Urban Decision Maker Forum. Additionally, data collection will happen to inform and identify focus areas for the next task (6.2).

For task 6.2 the data collected will be related to ensuring applicability and scalability of the demonstrators. Therefore, quantitative and qualitative data concerning existing products, but also common construction processes as well as information regarding building typologies and layouts, will be relevant.

For task 6.3 the need for data collection is linked to retrieving information on production, construction and tendering processes. Data on common practices in the industry will be relevant in order to create implementation roadmaps.

Specifically, the following data collection is expected:

Task	Quantitative data	Qualitative material
6.1	Data providing information within categories of buildings, construction, tender and policy, such as: <ul style="list-style-type: none"> <li>• Relevant research papers</li> <li>• City policy and planning frameworks</li> <li>• Circular construction business models</li> <li>• Toolkits for flexible circular construction</li> <li>• Mapping of local value chains</li> </ul>	Data from interviews, report, notes, and/or transcripts obtained from key persons such as: <ul style="list-style-type: none"> <li>• Local construction stakeholders</li> <li>• City decision makers</li> <li>• Developers</li> <li>• Building owners</li> </ul>
6.2	Data regarding information on market accessibility obtained from both task 6.1 and elsewhere, including, but not limited to: <ul style="list-style-type: none"> <li>• Local legislation, policy and regulation</li> <li>• Market ready products and services</li> <li>• Local building systems and information, such as: Products, composition and dimensions</li> <li>• Embedded values of building materials from established methods of calculation, such as LCA and LCC, and TCO or ROI</li> <li>• Relevant literature</li> </ul>	Data focused on ensuring applicability of developed demonstrators by key regional construction stakeholders (architects, engineers, constructors and contractors), such as: <ul style="list-style-type: none"> <li>• Reference projects</li> <li>• Best practice interviews</li> <li>• Local development scenarios</li> <li>• Relevant data from task 6.1</li> </ul>
6.3	Cross sector learnings from reference projects including findings from other project WPs, including, but not limited to: <ul style="list-style-type: none"> <li>• Task 4.2: demolition requirements and reuse strategies</li> </ul>	Data obtained from urban decision-maker forum (Task 6.1) such as: Know-how on circular markets, business models, policies and tender and procurement procedures.



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Task	Quantitative data	Qualitative material
	<ul style="list-style-type: none"> <li>Task 5.3: Life cycle cost calculations</li> <li>Task 6.2: Specification of design for disassembly principles and construction.</li> <li>Interface for new policy instruments developed in WP7</li> </ul>	<ul style="list-style-type: none"> <li>Prospects for circular building systems demonstration</li> <li>Interviews, notes, transcripts etc. on suitable market offerings from stakeholders such as SMEs, entrepreneurs and product manufacturers.</li> </ul>

## Other:

- Data in the format of photos and videos, or other visual representation is expected to be gathered throughout the project for both registration and documentation purposes.
- For the information and data gathered in WP6 it is expected that it will mainly be useful for developers, architects and entrepreneurs for task 6.1 & 6.2 and developers, contractors, municipalities for task 6.3.

## 1.5 WP7: Governance, instruments and urban planning approaches

### Purpose of data collection

Data collected in WP7 will support decision making regarding the design of the city, the urban areas and buildings, for example through the requirements set in planning instruments and building permits. The aim is to analyse the possibilities city administrations have for including requirements for circular economy and construction in their policy instruments and procedures.

The data generated in WP7 will be utilised to analyse existing European, national and local regulation, to identify the room for manoeuvre that the four cities have for including requirements on the reuse and recycling of building products and materials, adaptive reuse and refurbishment, and design for disassembly in urban planning (spatial, municipal and local) and building permits.

### Type of data

Little or no new data will be produced in this work package. Data will mostly be from existing, public data sources and studies. In the work package we will also carry out a market engagement process and workshops with organisations where primarily qualitative data may be generated.

Specifically, we expect to collect and use the following types of data:

Task	Quantitative data	Qualitative material
7.1	Urban planning and building permits <ul style="list-style-type: none"> <li>None expected</li> </ul>	<ul style="list-style-type: none"> <li>Interviews with personnel in city administrations – conclusions only will become public</li> <li>Desk study of public reports on planning procedures and procedures for construction application in the four cities.</li> </ul>



Task	Quantitative data	Qualitative material
7.2	Replicable criteria for public tenders <ul style="list-style-type: none"> <li>Possibly some data on market prices and costs for construction and materials</li> </ul>	<ul style="list-style-type: none"> <li>Information on criteria on circular construction applied in partner cities, European cities, etc.</li> <li>Market engagement: feasible criteria (technical)</li> <li>Workshops with organisations</li> </ul>
7.3	Templates for business cases <ul style="list-style-type: none"> <li>Economic analysis of direct investment costs, e.g. TCO/LCC</li> <li>Evidence/data on performance of circular construction, e.g. data on implementation gap, inclusion of recycled content in new constructions, reuse and recycling targets for different types of building products and materials</li> </ul>	<ul style="list-style-type: none"> <li>Results from reusable buildings pathfinder work</li> </ul>
7.4	Instruments for dialogues with developers <ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Best practise examples</li> <li>Experience/assessment of similar instruments</li> </ul>
7.5	Embedded values of building materials <ul style="list-style-type: none"> <li>Environment data: LCI/LCA, embedded energy in construction materials</li> <li>Economic data: LCC</li> <li>Indicators on embedded values of building materials</li> </ul>	<ul style="list-style-type: none"> <li>Cultural heritage</li> </ul>
7.6	Implementation of EU guideline on pre-demolition audits	<ul style="list-style-type: none"> <li>Evaluation of how to use data from WP4 in policy making</li> </ul>
7.7	Roadmaps <ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

In addition, we expect to gather visual information (mainly photos) of reusable and recyclable construction materials, of venues that may be relevant for the roadmaps.

*To whom are data useful*

The information and data gathered in WP7 is mainly useful for municipals and their city planning or construction departments. The information in task 7.4, 7.5 and 7.6 is also relevant for developers, architects and entrepreneurs as well as research institutions. The information in task 7.3, 7.5 and 7.6 could be relevant for research institutions.

**1.6 WP8: The Circularity hub**

*Purpose of data collection*

CIRCuiT will bring together data and knowledge on a holistic basis, initiating a Circularity Hub as a one-stop-shop for demand and supply of circular materials and construction components. The Circularity Hub will be the primary facilitator of data driven circularity, as data will be collected, linked and visualised in a Data Portal.

The data generated in WP8 will be utilised to develop a Circularity Index to better assess regenerative practices in the cities. Data from WP3 will be used to develop a City Circularity



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Atlas which gives various users access to a quick overview of planned and built environments.

Specifically, the following data collection is expected:

Task	Quantitative data	Qualitative material
8.1	<ul style="list-style-type: none"> <li>A database will be created on the arising, stock and flow of materials.               <ul style="list-style-type: none"> <li>The database will be part of the core of the Circularity Hub.</li> <li>Satellite data e.g. Sentinel data, to calculate and compare cross-country urban metabolism e.g. growth in nature areas, 'green' development</li> <li>New indicators which take into account aspects beyond sustainability, including liveability, greenness and mental health.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>n/a</li> </ul>
8.2	<ul style="list-style-type: none"> <li>Links to all data and output mentioned below</li> </ul>	<ul style="list-style-type: none"> <li>Links to all data and output mentioned below</li> </ul>
8.3	<ul style="list-style-type: none"> <li>Quantities of available materials.</li> </ul>	<ul style="list-style-type: none"> <li>Contact information of users (person and/or company – user and supplier) of the portal.</li> <li>History and/or detailed information of materials.</li> <li>Location of materials.</li> <li>Dates concerning availability.</li> <li>Links to other materials-platforms.</li> </ul>
8.4	<ul style="list-style-type: none"> <li>Satellite imagery from Sentinel programme.</li> <li>Data from mass scanning from WP3.</li> <li>Web-map tool.</li> </ul>	<ul style="list-style-type: none"> <li>Equation, calculations and/or descriptions of different indices.</li> <li>Images pertaining output from different analyses.</li> <li>Scripts for automatization of the different analyses-processes.</li> <li>Maps visualising analysis results.</li> </ul>
8.5	<ul style="list-style-type: none"> <li>The three indices: Urban Mining Index (UMI), Lifespan Index (LI), Circularity Index (CI).</li> <li>(possible) Indicators per index:               <ul style="list-style-type: none"> <li>UMI: materials reused[kg], circular projects ongoing[n], total amount of materials in the city[tons], materials released within the next 6 months[tons], climate impact [CO2 eq.], financial benefits [€]</li> <li>LI: extension of a buildings lifespan [years], substituted material [tonnes]</li> <li>CI: products reused [n], substituted materials [tonnes], climate impact [CO2 eq.]</li> </ul> </li> <li>Data from mass scanning from WP3.</li> </ul>	<ul style="list-style-type: none"> <li>Graphs and tables visualising the data.</li> </ul>
8.6	<ul style="list-style-type: none"> <li>n/a</li> </ul>	<ul style="list-style-type: none"> <li>Documents pertaining experiences with circular construction, such as:</li> </ul>





Task	Quantitative data	Qualitative material
		<ul style="list-style-type: none"> <li>- tried methodologies,</li> <li>- best practices,</li> <li>- list of certified reused products and materials,</li> <li>- details concerning the subject of e.g. legal, financial or technical issues.</li> <li>• Contact information on all members involved (persons, companies, stakeholders, partner cities, public administrations)</li> </ul>
8.7	<ul style="list-style-type: none"> <li>• 3D city models</li> </ul>	<ul style="list-style-type: none"> <li>• Comments/reviews from citizens concerning circularity building materials and/or projects.</li> </ul>
8.8	<ul style="list-style-type: none"> <li>• n/a</li> </ul>	<ul style="list-style-type: none"> <li>• Business transfer model per application.</li> <li>• Marketing strategy for each application.</li> </ul>

*Other*

Formats of data collected, while in general will consist of texts and datasheets, will potentially include task-specific formats:

- 8.3: photos of the materials.
- 8.4: raster and vector data.
- 8.5: graphs.
- 8.7: 3D-models.

The partners will continue the Circularity Hub five years after project finalisation.

**1.7 WP9: Networking, training and dissemination: the CIRCUI T Academy**

*Purpose of data collection*

Data collected in WP9 will support communication, dissemination and exploitation activities that are generated from learnings and results from WP4-6. Activities are outlined in D9.2, which include workshops, local and wider city network meetings, public events, summer schools, hackathons, and promotions through print and digital communication channels. Additional data will also be collected during the dissemination and exploitation activities to monitor progress and make improvements where possible.

The aim is to harness this data to share learning about CIRCUI T with the cities taking part in the project as well as with a wider group of stakeholders. Some of the data collected will also be used to improve dissemination and exploitation activities. All data will be analysed and contribute to the final communication, dissemination, and exploitation report at the end of the project.

The data generated in WP9 will be utilised to:

- Build local and international city and built environment network
- Encourage key stakeholders to participate in CIRCUI T
- Share project learnings with key stakeholders in city network and widely throughout Europe



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- Highlight opportunities to accelerate the transition to a circular construction industry
- Deliver training sessions and materials to build knowledge capacity within the city network and widely throughout Europe
- Promote dissemination and exploitation activities.

Data will be collected using print and digital forms including Form APIs, surveys, interviews, web analytics, and questionnaires. Collection will generally be collected from activity participants and be voluntary in accordance with the informed consent forms provided in WP1. The size of data will vary depending on the activity's scope, target audiences, and method(s) of dissemination, ranging from a group of 10 to up to several thousands.

Specifically, the following data collection is expected:

Task	Quantitative data	Qualitative material
9.1	<ul style="list-style-type: none"> <li>• n/a</li> </ul>	<ul style="list-style-type: none"> <li>• n/a</li> </ul>
9.2	<ul style="list-style-type: none"> <li>• Social media analytics</li> <li>• Website analytics</li> <li>• Newsletter analytics</li> <li>• Webinar analytics</li> </ul>	<ul style="list-style-type: none"> <li>• Contact information: names, email addresses, job roles, organisations, locations, social media accounts</li> <li>• Comments on feedback forms for webinars</li> </ul>
9.3		<ul style="list-style-type: none"> <li>• Contact information (see above)</li> </ul>
9.4	<ul style="list-style-type: none"> <li>• Events analytics (attendance, registration)</li> </ul>	<ul style="list-style-type: none"> <li>• Contact information (see above)</li> <li>• Consent forms (photo and/or video release, speaker release)</li> <li>• Hackathon outcomes</li> <li>• Comments on feedback forms</li> </ul>
9.5	<ul style="list-style-type: none"> <li>• Circularity Hub analytics</li> <li>• Participant demographics</li> </ul>	<ul style="list-style-type: none"> <li>• Contact information (see above)</li> <li>• Comments on feedback forms</li> <li>• Interviews with participants to measure impact</li> </ul>
9.6	<ul style="list-style-type: none"> <li>• n/a</li> </ul>	<ul style="list-style-type: none"> <li>• Contact information (see above)</li> </ul>
9.7	<ul style="list-style-type: none"> <li>• All of the above</li> </ul>	<ul style="list-style-type: none"> <li>• All of the above</li> </ul>

*Other:*

- Data in the format of photos and videos gathered for evidence and promotional use at events etc.



## 4. FAIR data management

### 1.8 Making data findable, including provisions for metadata

To ensure comparability of data, standard naming conventions will be used whenever suitable.

For the waste materials, the [European list of waste](#) will be used as a standard nomenclature. EWC-Stat nomenclature: European Waste Classification for Statistics (EWC-Stat categories).

Wherever possible, CIRCUI T will use [Creative Commons Licenses](#) (CC-BY (figures, media, posters, papers, file sets), CC0 (Metadata only & datasets) and MIT Licence (Software).

Naming conventions and categorisation will be used for specifying keywords. Search keywords will be included in the Circularity Hub.

#### *Metadata:*

All data will be accompanied with metadata which will contain as a minimum:

- Description of contents;
- Author/owner;
- Date of creation;
- Datatype;
- License description;
- Terms of use;
- Keywords.

Inspiration for the setup of metadata is drawn from open data catalogues, such as [opendata.dk](#).

### 1.9 Making data openly accessible

Aggregated data (e.g. sectoral data, geographical data) will be made public whenever the privacy of the donor or recipient is not at stake. This will be done through the Circularity Hub, a public access webpage, accessible by any browser.

Access to the disaggregated data might be possible for academic purposes under a confidentiality agreement. Data can be supplied in CVS File format in order to be universally accessible.

The need for a data access committee will be established once the datasets to be supplied regarding the collection and treatment process are determined. Until then it is difficult to analyse the full involvement of each partner in the decision process. When such is established conditions for access as well as the methodology to do so will be defined.

Scientific publications coming out of CIRCUI T will be in green open access to ensure easy access to the findings.

#### *Software needed:*





In order to access data provided on the hub different software are needed edit, display or otherwise interact with, such as:

- Text documents: LibreOffice\*, Microsoft Office
- Spreadsheet files: LibreOffice\*, Microsoft Office
- Map related files: QGIS\*, ArcGIS Map / Pro
- PDF files: Acrobat Reader\*

\* freely available software

### 1.10 Making data interoperable

All data published through this project will be made available through the Circularity Hub (WP8). Data will be updated continuously and available for use as soon as the data is ready and cleared for publishing. All data published during the project period will be made available for use by third parties even after the end of the project period. In addition, datasets will be available through direct contact with the project partners.

The project aims to make data openly accessible and exploitable, which will be relevant for the key stakeholders. However, it will not always be possible to publish data, due to contractual and confidentiality reasons.

The project partners will continue the Hub five years after project finalisation.

### 1.11 Increase data re-use (through clarifying licences)

Data licensing will be clarified by the project partners once the main datasets have been developed. At this point, it is too early to define licensing issues.

Data will be available for reuse on a continuous basis as soon as the data is ready and cleared for publishing. All data, which is made public during the project period, is useable by third parties also after the end of the project period. Public data will be available via the Circularity Hub.

## 5. Allocation of resources

The four cities already generate and curate considerable amounts of data regarding the built environment, which is either contained in static files or in databases. As it is not expected that this project will generate terabytes of data, it is expected that current data infrastructures can accommodate the data generated by this project without much (if any) added cost. Costs for making data FAIR are under consideration by the project partners.

*Table 2. Overview of partners responsible for data management in each WP*

WP	Beneficiary	Data management
3	BRE	Collection of publicly accessible data and statistics on built environment, e.g. building register data
	DTU	Collection of publicly accessible data and statistics on built environment, e.g. building register data
4	TUHH	Data collection for demolition activities and reused materials, and interviews with stakeholders involved in the demolition chain



WP	Beneficiary	Data management
	CPH	Test results on specific reusable or recyclable construction materials (e.g. robustness, cleanness, longevity)
	Clear Village	Collection of data from hackathons
5	<b>TAU</b>	
	CPH	Test results on specific solutions
	TUHH	Data collection and processing to identify transformable buildings/areas
	Clear Village	Collection of data from hackathons
6	<b>GXN</b>	
	CPH	Test results on specific solutions
		Results of the specific building case, principles and criteria for future plans
	Clear Village	Collection of data from hackathons
7	<b>CPH</b>	Little specific data management. More likely to be a library of relevant studies, reports, and best practises.
8	<b>CPH</b>	City Circularity Atlas Space Monitoring Service Citizen Engagement Portal
	LWARB	Materials Exchange Portal Circularity Wiki
	HSY	The Circularity Dashboard
9	<b>LWARB</b>	Collection of data including contact information, events analytics, feedback forms, interviews, photos, videos, informed consent forms as needed for activities, registration lists
	CPH	Access and storage of data in Circularity Hub, including web analytics
	Imperial, TUHH	Collection of data from summer schools, including application information

Note: WP leader in bold.

## 6. Data security

The data security will follow D1.4 on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation:

The rules for storing personal data are the same for digital and physical material. Only trusted persons with an objective need should have access to personal data. All partners collecting and analysing qualitative data will further comply with the following principles and national policy requirements:

- Personal data must be anonymised at transcription stage, ensuring that confidential information cannot be traced to specific individuals.
- If personal data needs to be stored digitally, it must take place with a secure storage of all data will be ensured through password protected digital file spaces. The physical material containing personal data must also be kept locked when not in use.
- Data will only be accessible to named project partners and subcontracted research staff working directly on the project.





- Employees and officers must never store or process confidential or sensitive personal data on a private computer or other personal equipment. If you work with personal data, always use the computer provided to you as an employee by the authority.
- Emails with sensitive personal information must be deleted from the mailbox within 30 days of dispatch. Emails with ordinary personal information must be deleted from the mailbox when there is no longer a legitimate purpose for storage.
  - If you send an email containing personal information, you can insert the following text by default into the mail signature: "Please note that this email contains personal information. This means that you must partly ensure that the personal data is not unnecessarily accessible to others and that the information is immediately deleted when the information is no longer necessary in relation to the purpose for which it was transmitted".
- All records to be safely destroyed when project partners no longer need the data or no later than three years after completion of the project.

All data management will be done under the surveillance of each partner's Data Protection Officer. Data collection, storage, protection, retention and destruction and confirmation will also comply with national and EU legislation.

Work Package leaders and work package participants collecting data will have joint responsibility for the data security, with the main responsibility lying with the WP Leader generating or applying a specific set of data. Joint rules for data security and management in CIRCUIT has been directly implemented in the project plan as milestones and specific deliverables.

## 7. Ethical aspects

An Informed Consent Form needs to be signed and collected from individuals who participate in interviews or workshops. Individuals have the right to take back their consent, which means revisions would be necessary. As names and personal information are not relevant to CIRCUIT, interviews and questionnaires should be kept anonymous, where possible, to avoid any conflict with the Informed Consent Form. If data and the Informed Consent Form are used, a copy of opinion is required.

Individuals participating in their professional capacity, e.g. representing private companies, non-governmental organisations or public authorities, will not be asked to fill in the informed consent form.

Templates of the informed consent form and an information sheet about the FORCE project has been prepared as part of the deliverables in WP1 Ethics, D1.1: H – Requirement no 1. The form includes a brief presentation of the project, a description of how participants will be involved, and how data will be used in the project. Deliverable D1.1 is in English, but informed consent form will be translated to the native language before it is used.

Deliverable D1.4: POPD – Requirement No 4, includes detailed information on the procedures that will be implemented for data collection, storage, protection, retention and destruction and confirmation that they comply with national and EU legislation.





## 8. Other issues

All procedures followed comply with national and international legislation.

### 8.1. Knowledge management and protection of intellectual property rights (IPR)

In managing the new knowledge and intellectual property generated by CIRCUIT the consortium aims to balance the principles of Open and Public Access which is in the interest of the public authorities and the protection of IP necessary to provide the incentives for private investment and exploitation of the results. The management of knowledge and intellectual property (IP), including use and dissemination of foreground IP generated, is addressed in the consortium agreement (CA), signed by all CIRCUIT partners.

Scientific publications coming out of CIRCUIT will be in green open access to ensure easy access to the findings. The WP leaders for WP4-6 will monitor IP generation and exploitation by the partners in the consortium. Together with the Project Coordinator and WP9 lead, they will stimulate wide replication, as long as exploitation by partner companies is not endangered the knowledge gained will be shared Europe-wide via the communication, dissemination and exploitation activities detailed in this report.



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