



openDBL

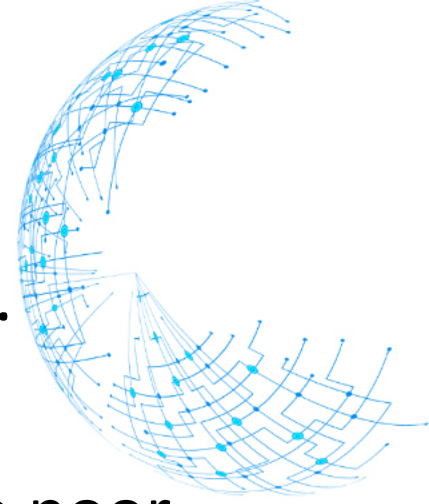
Soumya Kanti Datta Digiotouch

23rd March 2023

- Type of action: IA
- Project period: 36 months
- Project consortium: 13 partners from 8 countries
- Funded call: HORIZON-CL4-2022-TWIN-TRANSITION-01-09
- Grant agreement no: 101092161

Current state

- Scarce, unreliable and limited accessibility of building related data.
- Poor management of available data.
- Lack of uniform technical and information requirements leading to poor control of the costs of the works and of the impact on the environment.



Ineffective Asset Management



openDBL - One Stop DBL Platform

Project objectives and ambition

- Offer an integrated solution to simplify the workload of the AECO supply chain.
- Ensure DBL usability to facilitate usage and gain wide adoption.
- Economic viability through value propositions and market relevant pricing.

Ambition

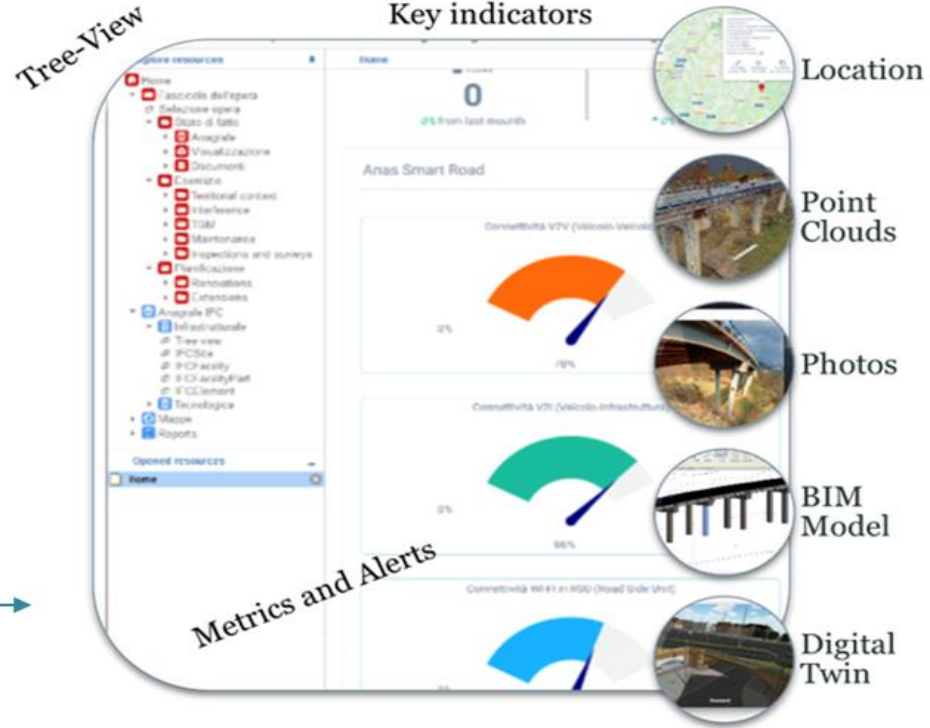
Data Generation



Technology Development

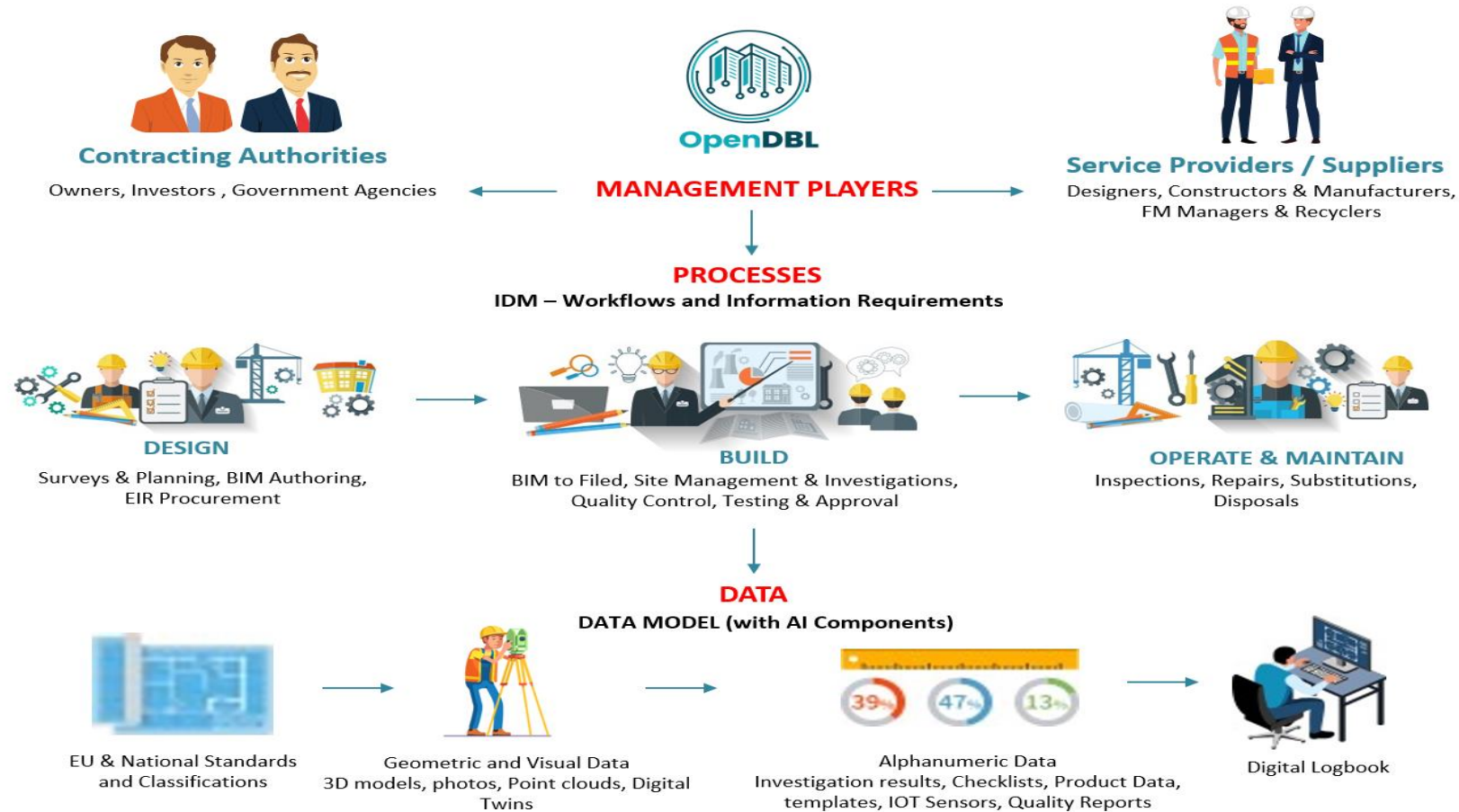


OpenDBL Dashboard



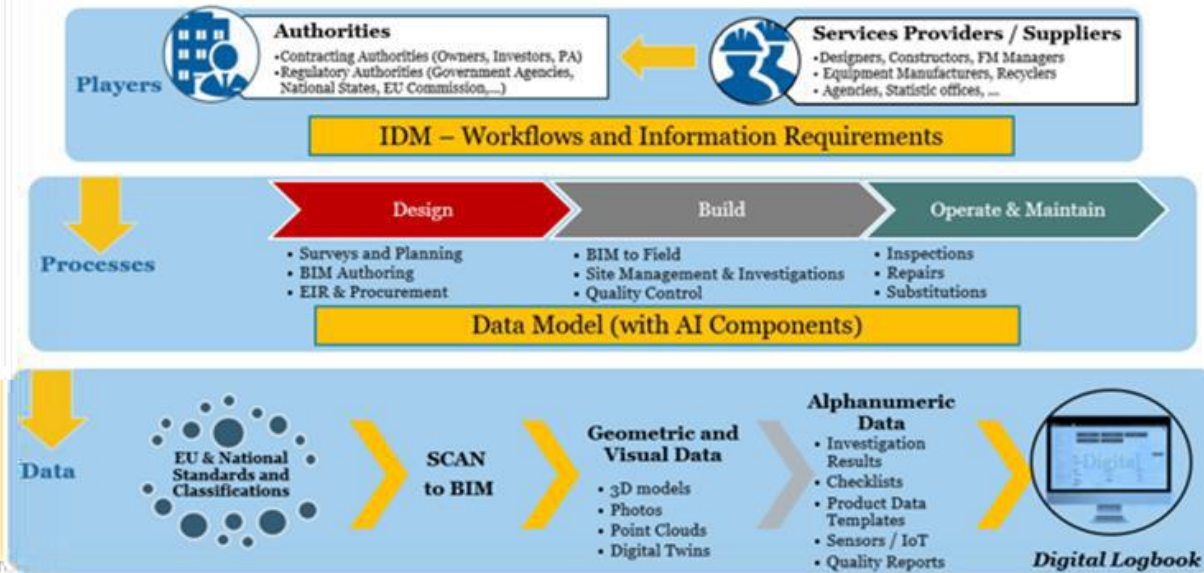
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the European Union

openDBL



openDBL Methodology

1. Data Generation



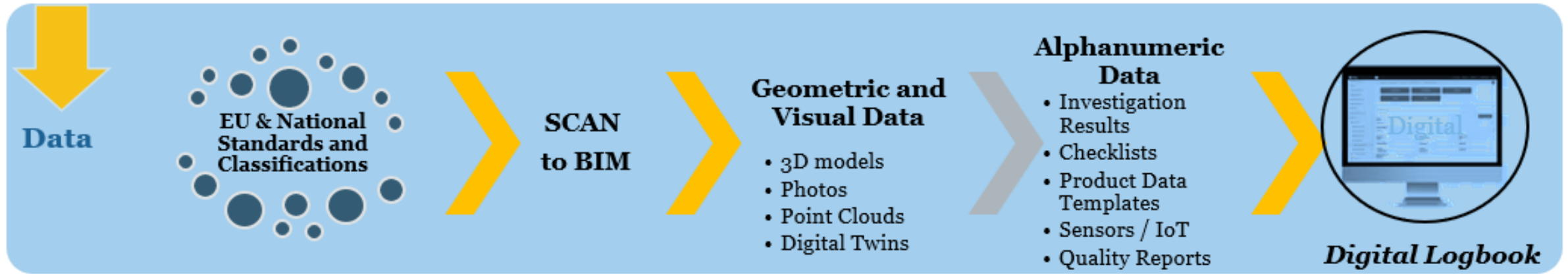
2. Technology Development



3. Test on Buildings and Components Manufacturers



Data Life Cycle



Disrupting the AECO Value Chain

CONCEPT, PLANNING & FINANCING

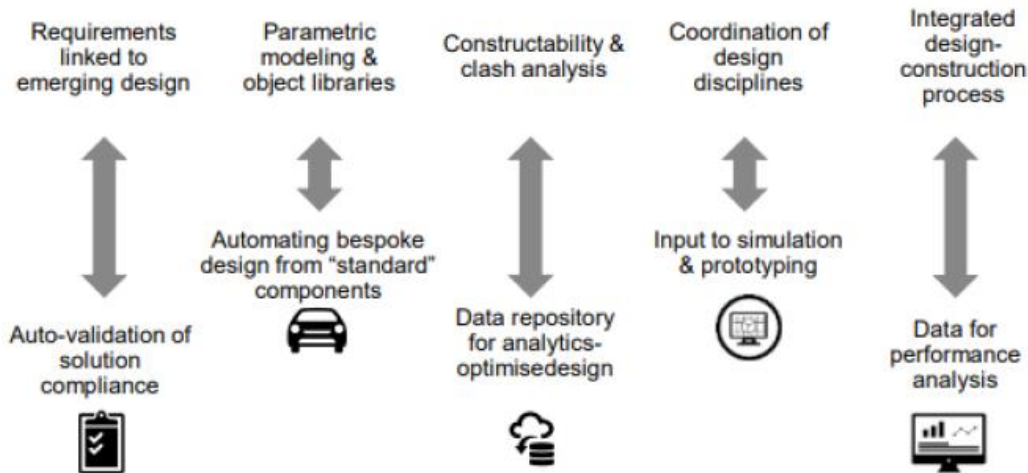
DESIGN & ENGINEERING

CONSTRUCTION

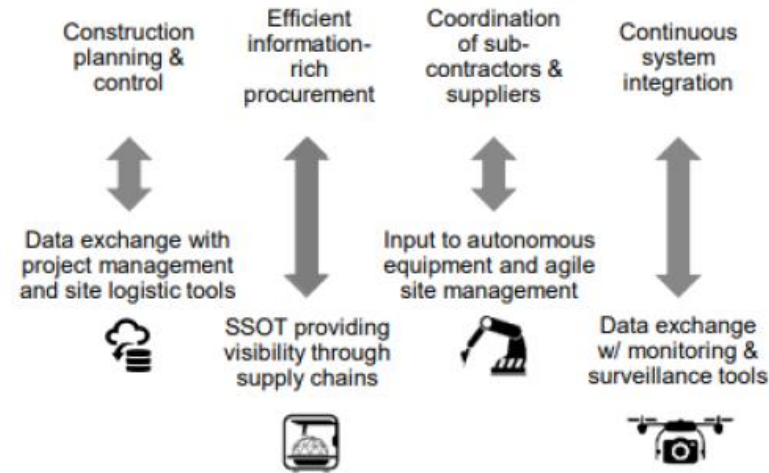
ASSET MGMT

Digital asset information (incl. BIM)

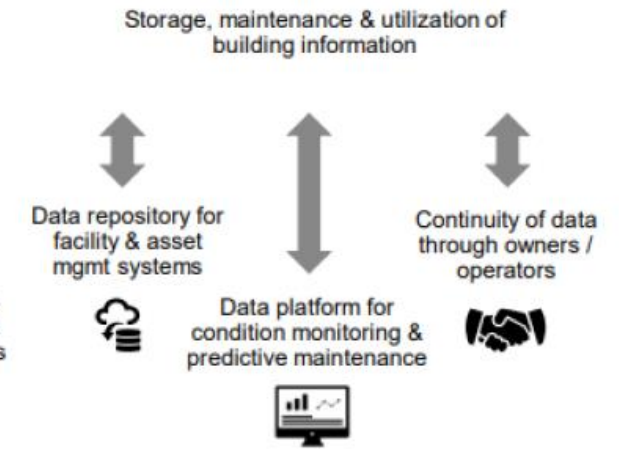
Parallel & robust planning, design & engineering



Real-time data sharing, integration & coordination



Enhanced operations & maintenance



openDBL Pilot Sites



Town Hall, KHFISIA, GREECE



KINDERGARTEN VILLA MICHL, KHFISIA, GREECE



SCHOOL GIOVANNI BOVIO
Ruvo Di Puglia, 70037, Italy



CASA CONSISTORIAL, Mislata, Spain



Funded by
the European Union

Consortium



CETMA



asro
ORGANISMUL NAȚIONAL
DE STANDARDIZARE



cemosa
Ingeniería y Control



mtodi



MISLATA
EUROPA



iabi



in2it



Digiotouch



amtrans progres
OCHRONA ŚRODOWISKA



dormakaba



Ajuntament
de Mislata

ELEKTRONIKAS UN
DATORZINĀTNU
INSTITŪTS



INSTITUTE OF
ELECTRONICS AND
COMPUTER SCIENCE



Funded by
the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under the grant agreement No.101092161

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Social Media



Thank You



Technical study for the development and implementation of digital building logbooks

23 March 2023, Michael Flickenschild

Final Conference *“Smart buildings in Europe: Strategic Research & Innovation Agenda, Policy recommendations, and the Smart Readiness Indicator development”*

DBL

DIGITAL BUILDING
LOGBOOK



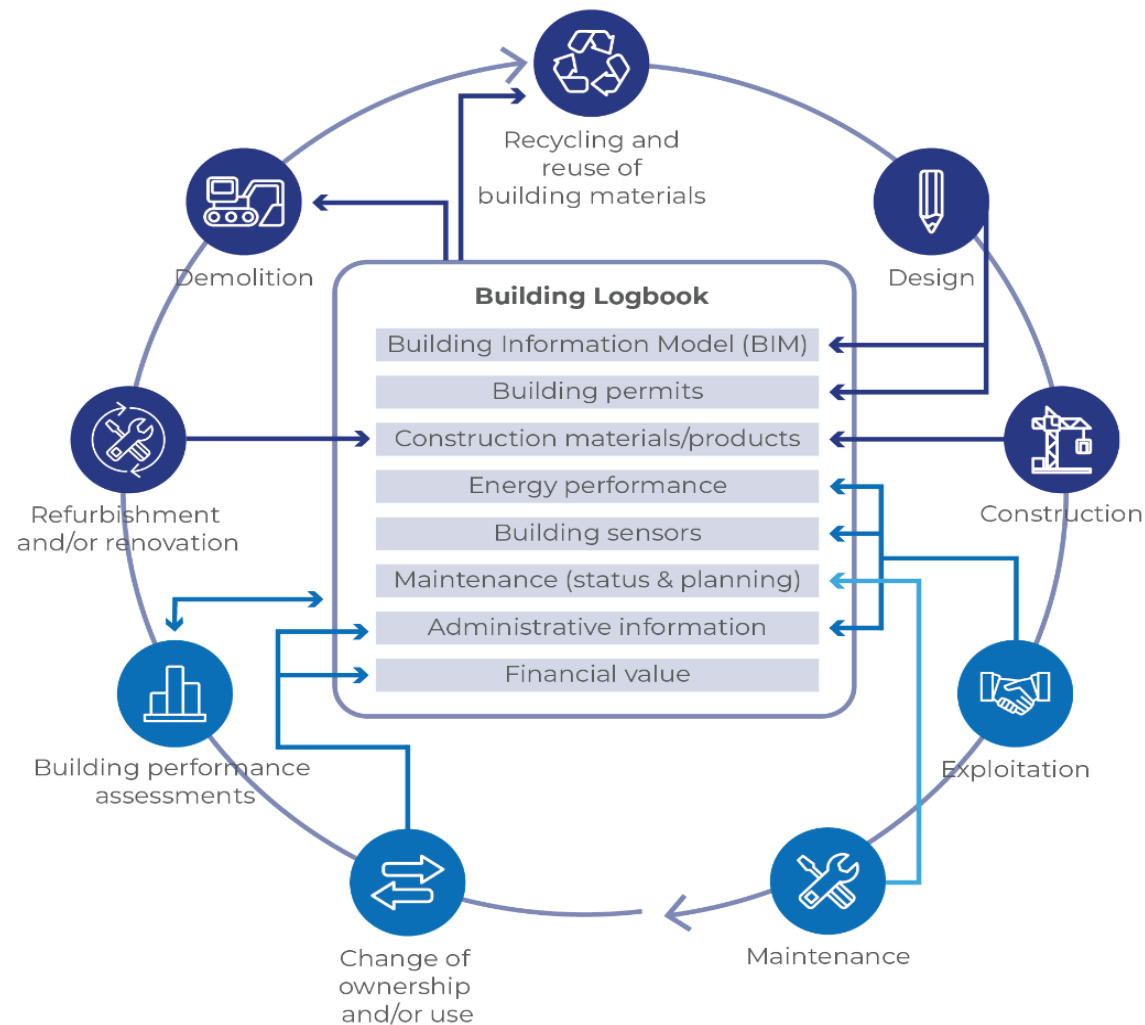
Technical study for the development and implementation of DBLs

Aim: development of a European model for digital building logbooks (DBLs).

With the purpose of:

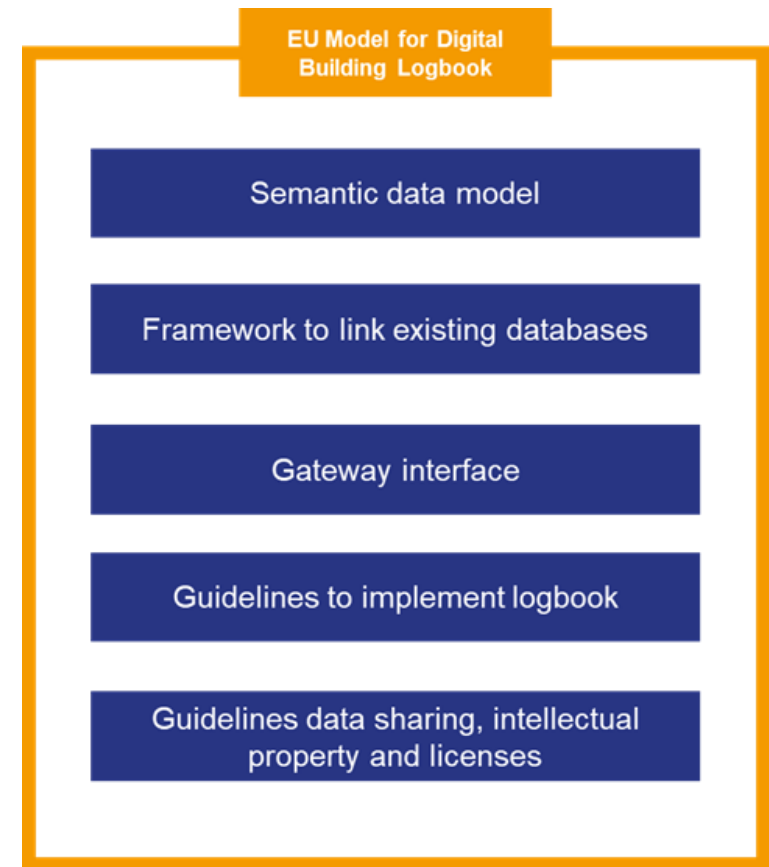
- Providing a common EU Framework to improve harmonisation, efficiency & effectiveness
- Improving data sharing, use and organisation in the built environment
- Supporting stakeholders and end-users through reuse of the framework for various use cases (e.g. energy efficiency)

Central idea: DBL is not a self-contained library but links existing databases



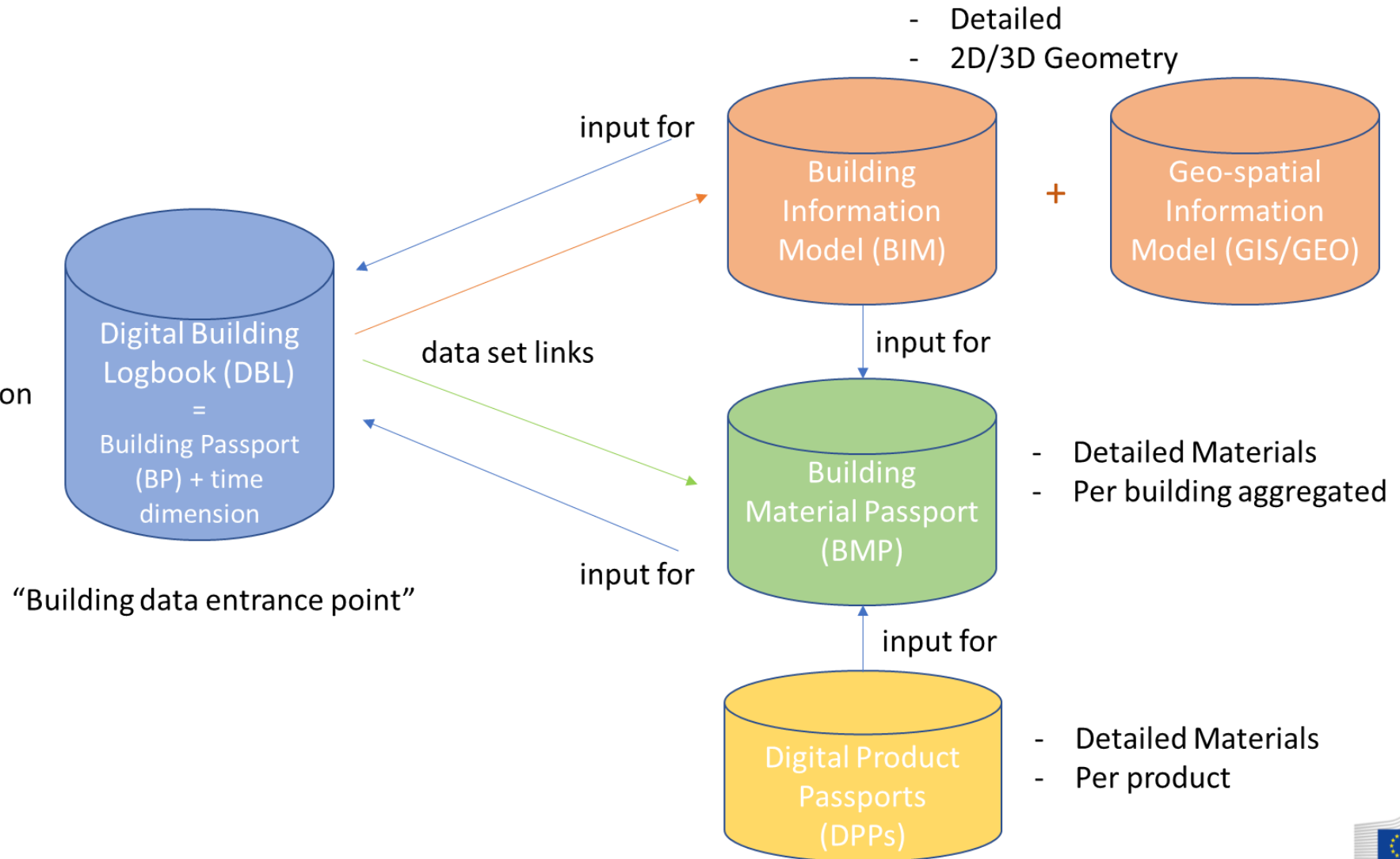
Towards an EU Model for Digital Building Logbooks

- **Main outputs:** an EU semantic data model for DBLs) as well as technical guidelines for its implementation at Member State level.
 - Overview of existing databases
 - Definition of essential elements to enable interoperability between existing data sets
 - The logbook as a gateway: linking existing data sets
 - Guidelines on data sharing, intellectual property and licensing models
 - Guidelines on the implementation of logbooks at Member State level



Context of the Digital Building Logbook

- Global
- Per Building
- Environment via GIS/GEO location
- Distributed
- Fully Semantic



Introducing the DBL Semantic Data Model

“According to the experts, the main purpose of an EU harmonisation or standardisation process for a digital building logbook should be to establish a semantic data model of the core digital building logbook elements”¹.

A **semantic data model** is a data specification that provides meaning and structure to data. It defines the possibilities and impossibilities in the data

Two parts:

1. **Ontology** specifies the relevant concepts and their attributes and interrelationships
2. **Dictionary** the multi-lingual terms with definitions used as names for elements in the ontology

D2.1 defines the **DBL Semantic Data Model** and its underlying principles and technologies:

- It is proposed as an EU ‘core model’ for EU Member States and related data providers.
- It provides agreed common meaning and terminology for the various relevant logbook data sets.
- It reuses existing semantics from INSPIRE, on buildings, building units, cadastral parcels and addresses.
- It makes technological choices (W3C Linked Data / Semantic Web) on format, access method and language.

Introducing the DBL Semantic Data Model



DBL Semantic Data Model

Providing standard form and meaning to digital building logbook data.

Authors: Michel Böhms (TNO), Ed.

Martin van der Ende, Michael Flickenschild (Ecorys)

Tom Borst, Niko Raes, Amy Cai, Yvon Gankema,

Robbin Schinkel (Arcadis)

16. March 2023 (final)

DG GROW

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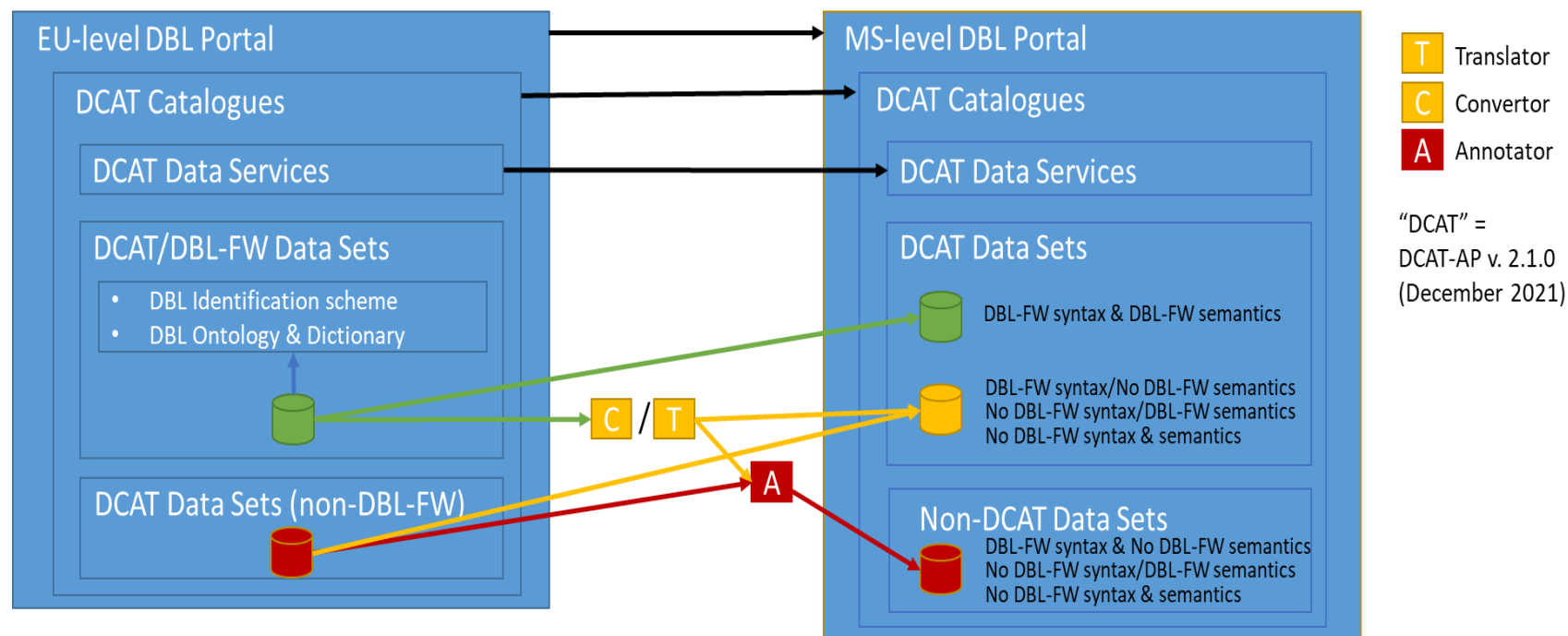
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Generic use case types for an EU DBL model

The generic use case types are the data exchange and/or data sharing and the subsequent integration of building-related data between different stakeholder types:

- The EC at the EU level;
- The national agencies at the Member State level; and
- The actual data providers like building owners and construction professionals.

Modes of interaction between building data portals example of EU and MS level



Ongoing work

Upcoming deliverables

The team is currently preparing and finalising the following deliverables

- **D2.3 - Key data sets and functionalities:** Building on the semantic data model (2.1) and its coding (2.2) the DBL model is confronted with some key available (public) building data sets and their related software functionalities.
 - The focus is on the most basic data that is in principle relevant for all EU Member States. That is, the bare minimum a DBL should have content for.
- **D.2.4 - Use cases:** To showcase how the DBL would work in practice and show potential advantages of the DBL.
 - The focus is on construction, financial institutions and public authorities
- **D2.5 - Essential elements for interoperability:** To elaborate on technical, syntactic and semantic interoperability for interactions between the EU level, Member State level and the level of actual building-related data providers

Timeline

Month	Activity	Aim	Aspect
Jun	Workshop	Start	Announcement of the study
Aug-Sep	Survey	Scoping	Database coverage
Oct	Workshop	Discussion	Linking data & gateway approach
7 Feb	Workshop	Discussion	Semantic data model approach
Mar-Apr	Survey	Feedback	Semantic data model, costs
Apr/May	Workshop	Discussion	Data sharing, costs, enforcement
May-Jun	Survey	Validation	Costs and benefits, technical guidelines inputs
Jun	Workshop	Validation	Discussion on technical guidelines
Sep	Final event	Next steps	Technical guidelines and final results



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Stay up-to-date and register to our mailing list:
<https://ec.europa.eu/eusurvey/runner/DBLsurvey2022>



DBL



**DIGITAL BUILDING
LOGBOOK**

The BuiltHub project

Pitch at Final SmartBuilt4EU
Conference 23/03/2023 in Brussels

Federico Garzia, Eurac Research (presenter)

Ulrich Filippi Oberegger, Eurac Research (slides,
BuiltHub project coordinator)





BuiltHub consortium



CARTIF



eurac
research



RI
SE





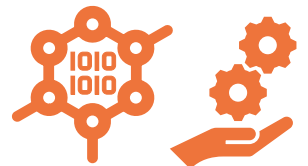
BuiltHub in brief

Coordination and Support Action (CSA)

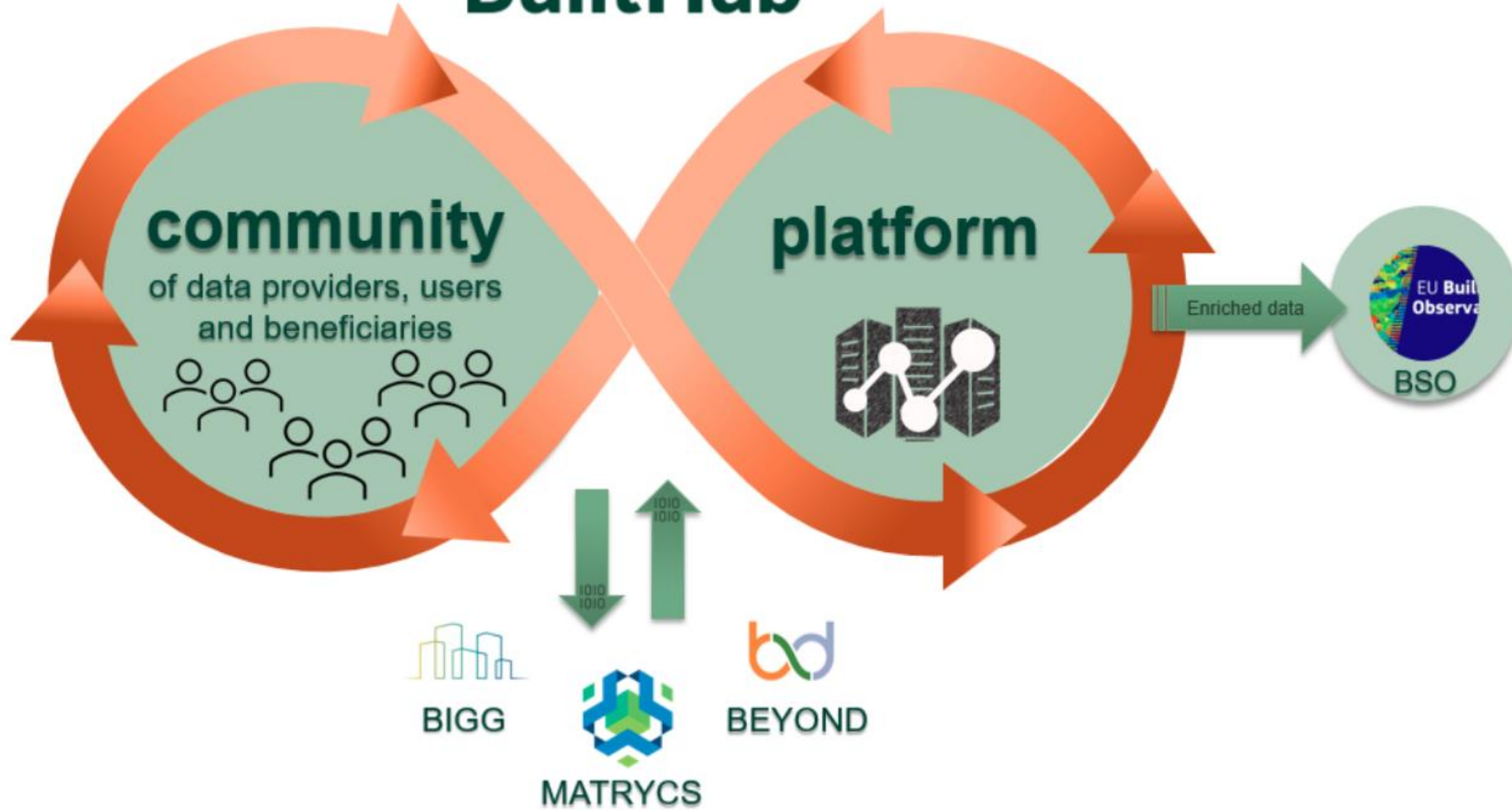
4 year-project, October 2020 - September 2024

BuiltHub's main goals

- Develop **roadmap** for constant data flow to EU Building Stock Observatory (BSO)
- Create and engage **community** for data collection, exchanges, data-to-knowledge processes
- Standardize **data governance and services** – offered, tested, demonstrated through web-based BuiltHub platform
- Coordinated action among associated projects



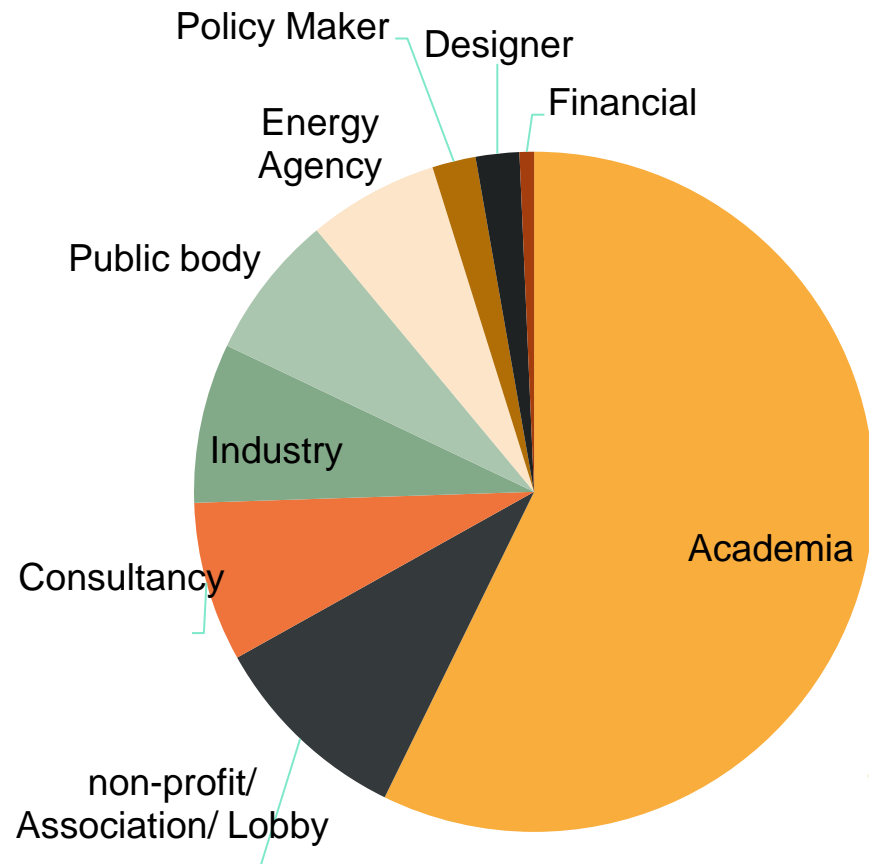
BuiltHub



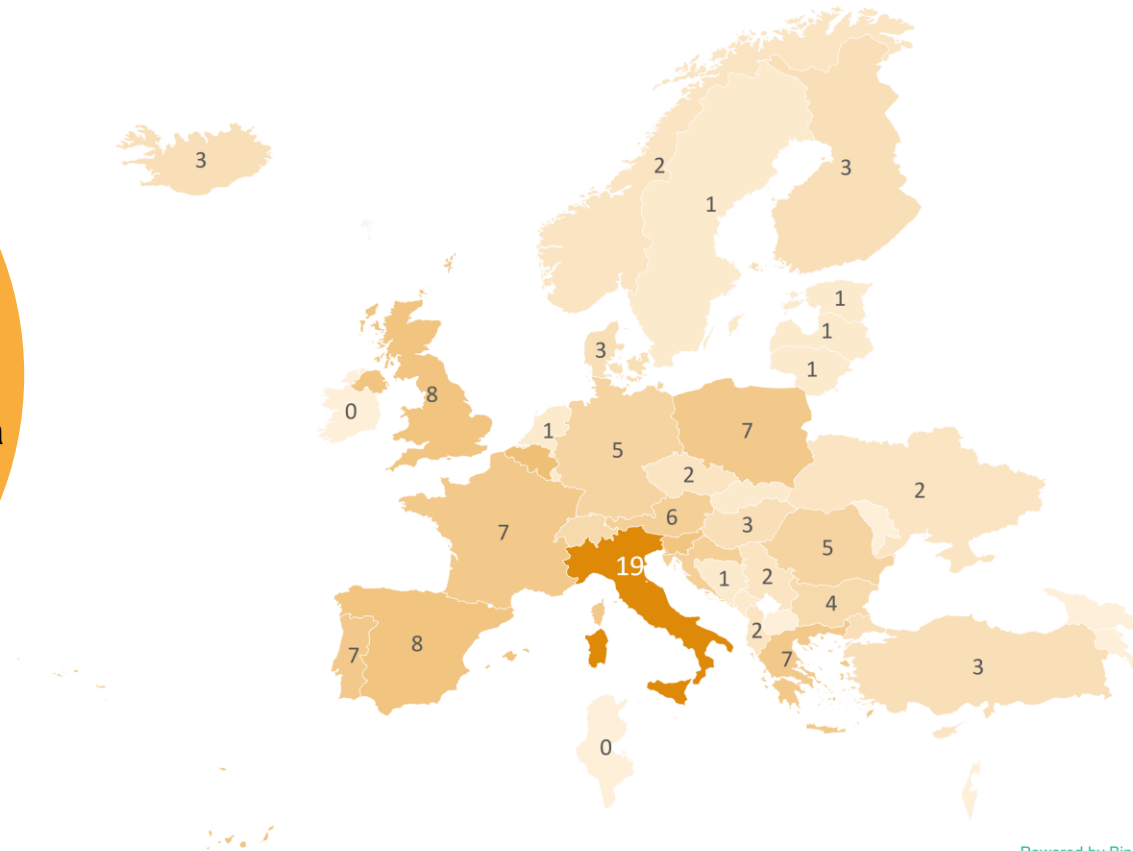
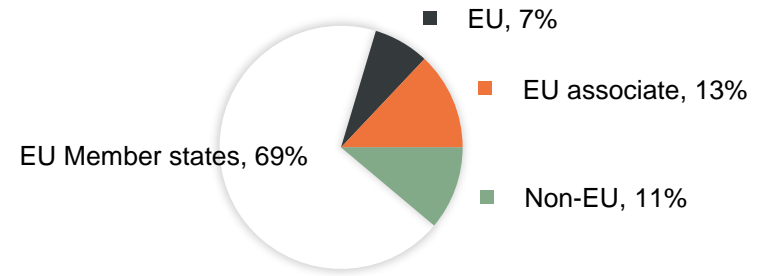


BuiltHub community

Per organisation type



By geography





BuiltHub data sources

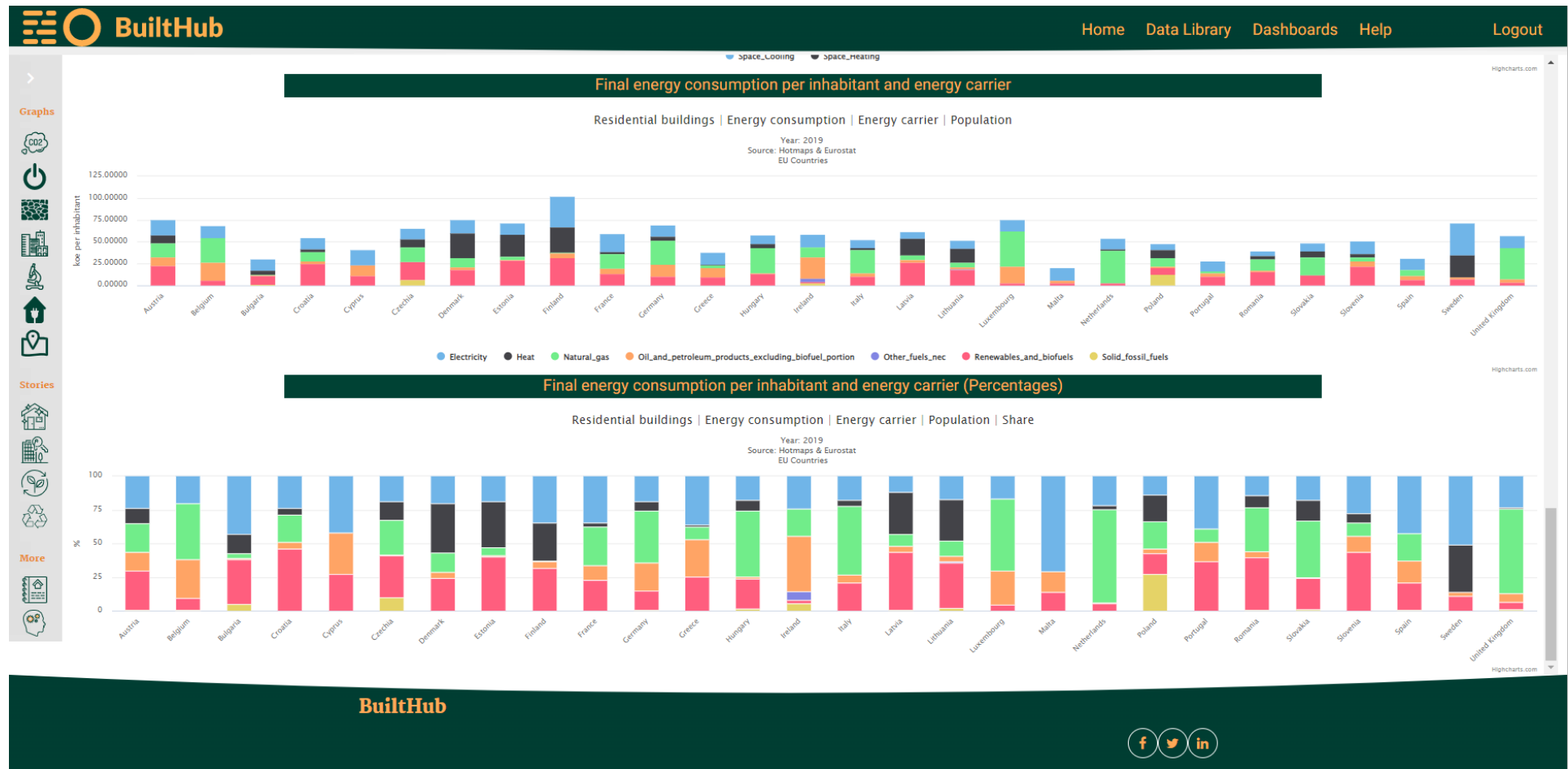
Legend	
A	Building stock related datasets
B	Socio-economic datasets
C	Climatic datasets

Dataset number	Topic type	Name	Content
1	A	Horizon 2020 HotMaps project: Building stock analysis	Complete building stock analysis for the EU27+UK. Values related to final energy consumption and useful energy demand for space heating, space cooling and domestic hot water, construction materials and methodologies, technologies used and building stock data/information (thermal transmittancy, building stock vintages and characteristics, household occupancy related data, etc.) can be found both for the residential and the non-residential sectors per building types and construction vintages.
2	A	IEE TABULA project: Typology Approach for Building Stock Energy Assessment	Building stock data and data focused on technical systems for heating, cooling and domestic hot water production in different buildings types are the main outputs of this dataset. Final energy consumption and envelope performance data are available as well.
...
28	C	EDGAR (Emissions Database for Global Atmospheric Research) CO2 Emissions	Carbon Dioxide (CO ₂) emissions by country and sector (Buildings, Transport, Other industrial combustion, Power Industry and other sectors) have been collected for the years between 1970 and 2018 and are reported expressed in MtCO ₂ /year.
29	C	CORDEX - Regional climate model data on single levels for Europe	Climatic data for Europe expressed in daily, monthly and seasonal mean values as well as 3 or 6 hours resolution. Data for air temperature at 2 m, wind speed, atmospheric pressure and humidity can be found.
30	C	PVGIS - Photovoltaic Geographical Information System	This GIS dataset contains data related to the solar radiation. It takes into account both day and night-time periodsexpressing the solar radiation raster map in W/m ² .
...



Key results & value proposition

- **Website:** <https://builthub.eu/>
- **Data platform** with interactive services: <https://platform.builthub.eu/>
- **Roadmap** for data collection and sharing (not yet public)





BuiltHub building data platform

Interactive material for stakeholders, e.g., comparison of datasets, storylines, and guidance on ML models

The screenshot displays the BuiltHub building data platform interface. The top navigation bar includes the BuiltHub logo and links for Home, Data Library, Dashboards, Help, and Logout. The left sidebar contains navigation icons for Graphs, Stories, and More.

The main content area is divided into several sections:

- Filters:** Country (Austria, Belgium, Croatia, Germany, Netherlands, Portugal, Slovakia, United Kingdom), Groups (EU27, EU28), Year (2000, 2001, 2006, 2009, 2012, 2015), Indicator Name (GHGbySector), and Sector (Buildings).
- Data Table:** A table with columns: Country, NUTS, Sector, Indicator Name, Period, and Value. The data shows GHG emissions for the Buildings sector across various countries and years.
- Data Source:** EDGAR (Emissions Database for Global Atmospheric Research) CO2 Emissions.
- Map:** A map of Europe showing the geographical distribution of emissions, with Germany highlighted in orange.
- Emissions per Country:** A pie chart showing the distribution of emissions in MTCO2e across countries: Germany (944.20, 45.08%), United Kingdom (602.10, 28.75%), Netherlands (216.12, 10.41%), Belgium (165.82, 7.91%), Austria (71.56, 3.42%), Slovakia (37.60, 1.80%), Portugal (32.43, 1.55%), and Croatia.
- Emissions per Year and Sector:** A bar chart showing emissions in MTCO2e for the Buildings sector from 2000 to 2015. The emissions show a general downward trend over the period.



BuiltHub building data platform

Standardised ontology (controlled vocabulary) and viewer

The screenshot displays the WebVOWL interface for the 'Core BuiltHub Service Vocabulary'. The main area shows a dense network of concepts represented by green circles, connected by dashed lines. A central concept, 'Concept (external)', is the hub for many other concepts. The interface includes a search bar at the bottom, navigation icons, and a right-hand sidebar with metadata and statistics.

WebVOWL

The element to be me...

Core BuiltHub Service Vocabulary

<http://data.builthub.eu/ontology/cbhsv>

Version: --

Author(s): BuiltHub's IT Solutions Architecture Team

Language: en

Description

The Core BuiltHub Service Vocabulary is designed to make it easy to exchange and relate information stored in BuiltHub's database with any other EC service.

Metadata

creator: BuiltHub's IT Solutions Architecture Team
created: 2021-03-17
preferredNamespacePrefix: bthb
publisher: BuiltHub's IT Solutions Architecture Team
modified: 2022-06-20
type: <http://purl.org/adms/assettype/Ontology>
title: Core BuiltHub Service Vocabulary
homepage: <http://data.builthub.eu/ontology/cbhsv.ttl>
status: <http://purl.org/adms/status/UnderDevelopment>

Statistics

Classes: 51
Object prop.: 22
Datatype prop.: 0
Individuals: 23
Nodes: 61
Edges: 155

Selection Details

Select an element in the visualization.

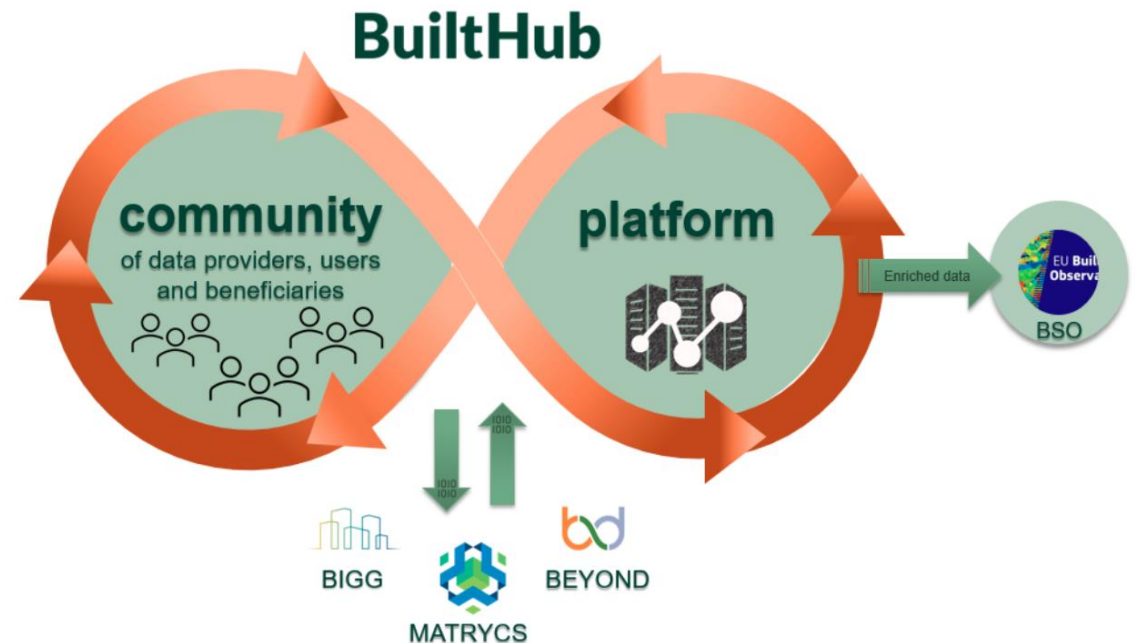
Search: []

Ontology | Export | Filter | Options | Modes | Reset | Pause | About



Expected impact

- **Better knowledge** about EU building stock
- **Monitoring** of policies
- **Revision** of energy efficiency and decarbonisation targets
- **Renovation plan** development
- **FAIR data collection & sharing**



Lessons learnt & good practices

- **Data to insight services very expensive & highly valued** on the market
- **Primary data on building stock transformation** at required granularity **scarce or difficult to access**
- **Data frequently modelled and highly uncertain** – commonly, uncertainty of 20-100% and more for even basic indicators
- **Data quality control** of primary concern
- **Official reports** (e.g., LTRS, Long-Term Renovation Strategies) incomplete, inconsistent, incomparable – commonly, pdfs in different formats, with different indicators
- **Standardised data models under development** – no official standard yet

BuiltHub contributions

- **Standardised indicators & reporting** about the EU building stock
- **Tables, charts, stories**
- **Data quality checks**
- **Data model & IT infrastructure**
- **Guidance on ML techniques**

Elaboration of the Strategic Research & Innovation Agenda (SRIA) for smart buildings

*This project has received funding from the European Union's
Horizon 2020 research and innovation programme under grant
agreement N° 956936.*



- The SmartBuilt4EU project consortium is tasked with drafting a European **Strategic Research & Innovation Agenda (SRIA)** for smart buildings for the European Commission.
- Starting from a longlist of R&I gaps and possible areas for improvement, **ten concrete key priorities for EU** were derived in order to support to research, innovation and market uptake in the field of smart buildings.



Topics covered

- | | |
|--|--|
| 1 INTEROPERABILITY IN BUILDINGS | 2 INTEROPERABILITY FOR GRID FLEXIBILITY |
| 3 INNOVATIVE BUSINESS MODELS | 4 TESTING FACILITIES AND LIVING LABS |
| 5 CO-BENEFITS | 6 LIFE CYCLE ENVIRONMENTAL IMPACTS |
| 7 MAKING BETTER USE OF THE DATA | 8 SUPPORTING INCREASED PUBLIC AWARENESS |
| 9 DATAPRIVACY AND CYBERSECURITY | 10 SUPPORT POLICY DEVELOPMENTS |



PRI06: Advances in products, services and decision support methods to improve Life Cycle Environmental Impacts of Smart Buildings

1

Further development of common Life Cycle Assessment methods and indicators

2

Streamline the use of dynamic data in Life Cycle Assessment approaches

3

Develop methods to assess and limit the impacts of the 'smart' devices

4

Investigate performance gap and rebound effects



PRI07: Making better use of the data

1

Expand the data collection
(amount/type)
(aiming at TRL 4-5) RIA

2

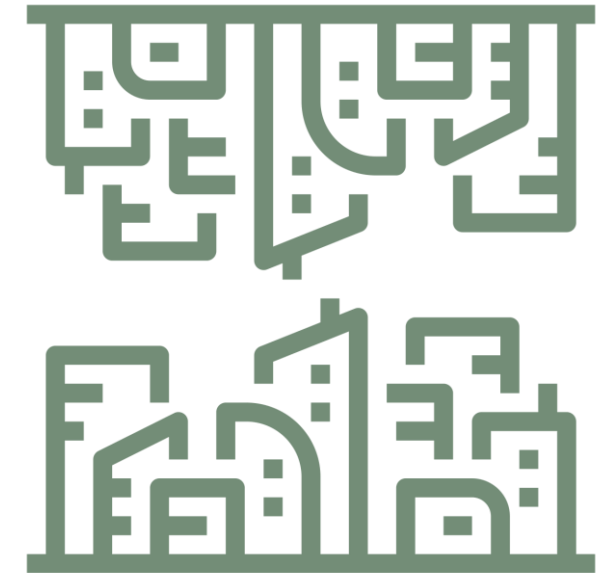
Strive for multi-use data possibilities
(aiming at TRL 8-9) RIA

3

Expand the Digital Twin Concept
(aiming at TRL 6-7)

4

Encourage/showcase testing of data collecting/usage
(aiming at TRL 7-8)



Panel discussion



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 956936.



BuiltHub web-based building data platform

Metadata and database predicates for each dataset

PVGIS – Photovoltaic Geographical Information System

This GIS dataset contains data related to the solar radiation. It takes into account both day and night-time period expressing the solar radiation raster map in W/m2.

Dataset metadata

Geo Info	NUTS	Measured Elements	Units	Time Ranges
Countries European Union	NUTS 0 Level	Average global irradiance on a horizontal surface	W/m2	Period from 2005 to 2015

Dataset database predicates

Title	Description	Predicate (Fields' name)	Range/Data Type	Cardinality	Content
Record Type	Defines the type of the record. This type must be defined in a known ontology. Usually, the ontology is specified with a prefix.	rdf:type	IRI	1.1	blthb:Dataset030
Record Key	The primary key of the record.	dc:identifier / skos:notation	rdfs:Literal (xsd:string)	1.1	"a14averageglobalirradianceonahorizontalsurfacewm200114bd98ab3bb6ab20e23197c9e750b"
Frecuency	This property refers to the frequency at which the Dataset is updated.	dct:accrualPeriodicity	dct:Frequency	1.1	http://purl.org/cld/freq/monthly
Temporal Coverage	Refers to a temporal period that the Dataset covers. It is defined as an interval of time that is defined by its start and end dates.	dcterms:temporal	dcterms:PeriodOfTime	1.n	
	This property contains the start of the period.	dcat:startDate	rdfs:Literal (xsd:date)	1.n	"2015-04-01"^^xsd:date
	This property contains the end of the period.	dcat:endDate	rdfs:Literal (xsd:date)	1.n	"2015-04-30"^^xsd:date
Belongs to Dataset	The dataset of this record	skos:broader	IRI	1.1	https://data.builtHub.eu/resource/Dataset/30
Spatial Coverage	This property refers to a geographic region that is covered by the Dataset. The EU Vocabularies Name Authority Lists must be used for continents, countries and places that are in those lists.	dcat:spatial	geo:hasGeometry geo:asWKT	1.1	"POLYGON ((19.6 42.325,19.6 42.3,19.625 42.3,19.625 42.325,19.6 42.325))"^^geo:wktLiteral
Inside NUTS boundaries	Indicates if the information is inside a NUTS boundaries.	blthb:hasNUTS	skos:Concept / co:Set (A group of NUTSs)	0.1	https://data.builtHub.eu/resource/nuts/NAP
Measured Element	The element/indicator which has been measured.	blthb:measuredElement	rdfs:Literal (xsd:string)	1.1	"Average global irradiance on a horizontal surface"^^xsd:string
	The magnitude and kind of the measurement expressed using the QUDT specification.	blthb:measurementQUDT	qudt:QuantityValue	1.1	
	The magnitude of the measurement expressed using a decimal number.	qudt:numericValue	rdfs:Literal (xsd:float)	1.1	"183.0"^^xsd:float
	The kind of the measurement (measurement unit) expressed using the QUDT specification.	qudt:unit	qudt:unit	0.1	
UCUM Measurement	The magnitude and kind of the measurement expressed using the UCUM specification.	blthb:measurementUCUM	rdfs:Literal (ucum:ucum)	1.1	"183.0"^^cdt:ucum
Literal Measurement Unit	The kind of measurement expressed using natural language.	blthb:measurementUnit	rdfs:Literal (xsd:string)	1.1	"W/m2"^^xsd:string
Literal Measurement					



BuiltHub web-based building data platform

SPARQL editor with sample queries

The screenshot displays the BuiltHub web interface. At the top, there is a dark green navigation bar with the BuiltHub logo on the left and links for Home, Data Library, Dashboard, and Log out on the right. Below the navigation bar, a dropdown menu shows 'Sample queries: Horizon 2020 HotMaps project: Building stock analysis'. The main area contains a SPARQL editor with a query tab titled 'Horizon 2020 HotMaps project: Building stock analysis'. The query text is as follows:

```
https://platform.builthub.eu/integration/sparql
1 prefix dcat: <http://www.w3.org/ns/dcat#>
2 prefix dc: <http://purl.org/dc/elements/1.1/>
3 prefix dct: <http://purl.org/dc/terms/>
4 prefix xsd: <http://www.w3.org/2001/XMLSchema#>
5 prefix siec: <http://dd.eionet.europa.eu/vocabulary/eurostat/siec/>
6 prefix nuts: <http://data.europa.eu/nuts/>
7 prefix skos: <http://www.w3.org/2004/02/skos/core#>
8 prefix adms: <http://www.w3.org/ns/adms#>
9 prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
10 prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>
11 prefix cbhsv: <https://data.builthub.eu/ontology/cbhsv#>
12
13 SELECT DISTINCT ?identifier ?startDate ?endDate ?location ?nutsLevel ?nutsName ?estimated ?source ?btype ?feature ?sector ?subsector ?topic ?ttype ?msrValue ?msrUnit
14 WHERE {
```

Below the query editor, the results are displayed in a table format. The table shows 78243 results in 85.123 seconds. The columns include Identifier, startDate, endDate, location, nutsLevel, nutsName, estimated, source, btype, feature, sector, subsector, topic, ttype, msrValue, and msrUnit. The first few rows of data are as follows:

Identifier	startDate	endDate	location	nutsLevel	nutsName	estimated	source	btype	feature	sector	subsector	topic	ttype	msrValue	msrUnit
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Vienna University of Technology, e-think, Invert/EE-La...	Appartemen...	Area@en	Residenti...	Apartment Bl...	Buildin...	Constructed...	17.3538048**...	Mm2
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...		Appartemen...	Area@en	Residenti...	Apartment Bl...	Buildin...	Cooled Area...	0.424888**xs...	Mm2
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	S. Pezzutto. Analysis of the space heating and coolin...	Appartemen...	Area@en	Residenti...	Apartment Bl...	Buildin...	Heated Area...	16.037835388...	Mm2
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Own calculations@en	Appartemen...	Area@en	Residenti...	Apartment Bl...	Buildin...	Number Of ...	0.08**xsd.float	1e6dimen...
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Own calculations@en	Appartemen...	Area@en	Residenti...	Apartment Bl...	Buildin...	Number Of ...	0.3766914999...	1e6dimen...
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Source residential part: IEE TABULA Project, TABULA ...	Appartemen...	Construction F...	Residenti...	Apartment Bl...	Buildin...	Floor@en	0.77**xsd.float	dimensio...
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Source residential part: IEE TABULA Project, TABULA ...	Appartemen...	Construction F...	Residenti...	Apartment Bl...	Buildin...	Roof@en	1.13**xsd.float	dimensio...
AustriaResidentialSectorResidentialSectorApp...	1945-01-01...	1969-12-3...	Austria@en	0.0**xsd.d...	ÖSTERREICH	0**xsd.inte...	Source residential part: IEE TABULA Project, TABULA ...	Appartemen...	Construction F...	Residenti...	Apartment Bl...	Buildin...	Walls@en	1.4**xsd.float	dimensio...



BuiltHub web-based building data platform

Dataset upload facility

The screenshot displays the BuiltHub web interface for dataset upload. At the top, the BuiltHub logo is visible. Below it, there is a 'Dataset:' dropdown menu currently set to 'Horizon 2020 HotMaps project: Building stock analysis'. Underneath, the 'Files:' section shows a 'Choose Files' button and the text 'No file chosen'. A green 'Upload' button is positioned to the right. A second, larger screenshot is overlaid on the bottom, showing the same interface but with the 'Files:' dropdown menu expanded to reveal a list of available datasets. The list includes various projects and reports, with 'DEEP - De-risking Energy Efficiency Platform' highlighted.

Dataset: Horizon 2020 HotMaps project: Building stock analysis

Files: Choose Files No file chosen

Upload

Dataset: Horizon 2020 HotMaps project: Building stock analysis

Files:

- H2020 ExcEED Project: building stock data
- FP7 INSPIRe project: building stock analysis
- Energy consumption and energy efficiency trends in the EU-27+UK for the period 2000-2016 - FINAL REPORT
- Comprehensive study of building energy renovation activities and the uptake of nearly zero-energy buildings in the EU - FINAL REPORT
- EUROSTAT: Final energy consumption in households
- EUROSTAT: Final energy consumption in households by fuel
- EUROSTAT: Disaggregated final energy consumption in households
- ZENSUS 2011
- DPE - Diagnostic de Performance Energetique
- Towards a sustainable Northern European housing stock - Sustainable Urban Areas 22
- DEEP - De-risking Energy Efficiency Platform**
- Energy consumption and efficiency technology measures in European non-residential buildings
- Dataset of the publication: Europe's Building Stock and Its Energy Demand: A Comparison Between Austria and Italy
- National Housing Census: European statistical System
- Energy prices in 2019 - Household energy prices in the EU
- EUROSTAT: GDP per capita in PPS
- EUROSTAT: Population on 1 January by age, sex and NUTS 2 region
- EUROSTAT - Cooling and heating degree days
- EDGAR (Emissions Database for Global Atmospheric Research) CO2 Emissions
- CORDEX - Regional climate model data on single levels for Europe

Roadmap for a living Building Stock Observatory

