Co-funded by the European Union

D2.8 Publication of content in Europeana

Due date M15: 30/04/2026

Dissemination level: Public

Authors:
Valentina Bachi (Photoconsortium)

HISTORY OF CHANGES			
Version	Date	Author	Comments
0.1	21/04/2026	Valentina Bachi (PHC)	First draft
0.2	24/04/2026	Antonella Fresa (PHC), Daniel Brennan, Lianne Helsinga (Europeana), Agathe Le Riches-Maugis (Bibracte), Marinos Ioannides, Drew Baker (CUT)	Peer review
1.0	30/04/2026	Antonella Fresa, Valentina Bachi (PHC)	Final version

TABLE OF CONTENTS

TABLE OF CONTENTS 2
EXECUTIVE SUMMARY 3
1. INTRODUCTION 4
1.1 WORKFLOW 5
2. THE EVOLUTION OF THE EUROPEANA DATA MODEL IN EUREKA3D DATA HUB 7
3. SUPPORTING THE TWIN IT! CAMPAIGN 8
4. DESCRIPTION OF THE EUREKA3D-XR COLLECTIONS MADE AVAILABLE FOR PUBLICATION IN EUROPEANA 10
4.1 CUT CYPRUS UNIVERSITY OF TECHNOLOGY (CY) 10
4.1.1 Models and additional collections 10
4.1.2 Editorials associated with the collection 12
4.2 CRDI – AJUNTAMENT DE GIRONA (ES) 12
4.2.1 Models and additional collections 12
4.2.2 Editorials associated with the collection 14
4.3 BIBRACTE (FR) 14
4.3.1 Models and additional collections 14
4.3.2 Editorials associated with the collection 17
5. ADDITIONAL COLLECTIONS OF 3D CULTURAL ITEMS PUBLISHED IN EUROPEANA 18
6. CONCLUSIONS 19

EXECUTIVE SUMMARY

This document is the report on the 3D and 2D content used in the XR pilots and aggregated to Europeana (the common European data space for cultural heritage).

The deliverable provides details of the aggregation performed in the EUreka3D-XR project, describing the collections prepared for publication by the content partners.

These collections are used in three real-life setting pilots that demonstrate the Eureka3D-XR scenarios.

The contents produced in Eureka3D-XR and used for its demonstration scenarios are made available also to all the stakeholders of the common European data space for cultural heritage in the form of individual digital records published on europeana.eu.

Furthermore, these contents highlighted on the data space as well as on the Eureka3D-XR channels with blogs and galleries enriched with videos and other demonstrative materials that represent a rich holistic documentation of the contents.

The requirements of the Europeana Publishing Framework for content and metadata quality were addressed, to produce collections for aggregation into the Europeana portal that match the tiers min. 3 (for content) and min. A (for metadata). The extensions required by the new Europeana Data Model for 3D were implemented where necessary.

In addition to the content provided by project partners according to the provisions in the Grant Agreement, various other models were published by external organizations. In particular, several Member States have requested to publish their content in europeana.eu via the Eureka3D Data Hub, in the context of the Twin It! part 2 campaign, to be demonstrated at the upcoming event in Brussels on 12 May 2026. The content published in europeana.eu for the Twin It! Campaign as well more contents provided by other cultural heritage institutions are described in this deliverable D2.8

The document is composed of the following chapters:

1. Introduction
2. The evolution of the Europeana Data Model in EUreka3D Data Hub
3. Supporting the Twin It! campaign
4. Description of the collections made available for publication in Europeana
5. Conclusions

1. INTRODUCTION

This report illustrates the details of the aggregation process performed in the EUreka3D-XR project, describing its various phases and challenges relating to the aggregation of 3D cultural content. It also outlines the various collections prepared for publication by the content partners on Europeana website.

This deliverable D2.8 is the report on the 3D and 2D content to be to be published in Europeana and to be used in the Eureka3D-XR pilots.

The contents produced and aggregated in Eureka3D-XR have been used by the five EUreka3D-XR tools to produce creative and user engaging storytelling delivered in the three Eureka3D-XR scenarios. For each scenario, 3D models and other content in 2D such as images, texts, audio files and videos are combined into XR experiences that can be accessed online and on-site: in Girona (by partner CRDI), in Paphos (by partner CUT) and in the Celtic city of Bibracte (by partner Bibracte). The five tools are fully described in the deliverable D3.5 "EUreka3D-XR Toolbox final release". The version 0.1 of the Girona, Cyprus and Bibracte pilot prototypes was delivered at the end of month 12 within the documents D2.2 , D2.3 and D2.4. The final version 1.0 is planned to be delivered at the end of the project, including the full description of the scenarios and their assessment reports.

The targets for new content, according to the indications in the Grant Agreement, consist in the following:

High quality 3D and XR content and documentation	
Quantity	Analysis of the existing contents Digitisation of min. 9 new digital objects in 3D (min. 3 models used in each scenario), combined with XR content and documentation. Accompanying documentation and training resources
Quality	Quantitative metrics to assess visual quality of the content. Quantitative measures to assess the comprehensiveness of the paradata in accordance with the VIGIE study 2020/654.
Timing	month 12: quality level for 3D objects is assessed month 15: aggregation of new datasets in Europeana month 18: availability of XR data, documentation, and training resources
Resources	27 person-months for CH content development 1 person month for the training resources

Fig. 1: Extract from the Grant Agreement: KPI about contents and documentation

The documentation accompanying the 3D contents is provided in the form of 2D collections, demonstration videos and editorials delivered through the Europeana and the Eureka3D-XR communication channels.

The process for the publication in the data space is coordinated by Photoconsortium in its role of accredited aggregator and data service provider for Europeana, in close collaboration with content providers and Europeana Foundation.

A provisional list of the content used in the narrative of each XR scenario was indicated already in the *D2.1 Pilot Specification* delivered in the planning phase of the project. Refinements of this provisional list followed in the course of the iterative development of each pilot scenario, leading to the final selection of 3D and 2D records made available for publication in Europeana, as described in the present document.

Quality and compliance checks were made on the aggregated datasets, by Photoconsortium and by the Europeana Foundation to ensure that the records comply with the Europeana Publishing Framework (EPF).

1.1 WORKFLOW

Content providers are responsible for preparing the 3D collections (data, metadata and paradata). The EUreka3D Data Hub[1] is used to manage the 3D models, and to associate the respective metadata, paradata and various types of additional documentation and content, published as open access files. The datasets, created in compliance with the Europeana Data Model (EDM) format and including a Persistent Identifier (PID) associated with each object, are exposed via OAI-PMH protocol for harvesting and publication in the Europeana.eu website.

In addition to 3D objects stored and aggregated via the EUreka3D Data Hub, the MINT mapping tool[2] was used to aggregate additional 2D collections and videos, which are stored in the content providers' own repositories.

Figure 1 below shows the process to prepare for the publication in Europeana: content providers prepare their datasets and Photoconsortium, as accredited aggregator and data service provider, supports the workflow with the most appropriate tool.

MINT tool is used for the aggregation for 2D collections while the EUreka3D Data Hub is used for 3D collections. MINT and the Data Hub generate the EDM-compliant dataset, in line with the prescription of EPF.

The EDM dataset is aggregated and exposed on OAI-PMH server for the harvesting by Europeana. The dataset is verified using the Europeana Metis Sandbox[3] to double check the quality and technical functionality.

Later, the Europeana data service team harvests the dataset and proceeds with publication.

Publication is then followed by the creation of editorials like blogs and galleries to facilitate discovery and promotion of the collections.

[1] EUreka3D Data Hub is the cloud e-infrastructure developed in the EUreka3D project, specifically intended to facilitate the sharing of 3D cultural collections in the common European data space for cultural heritage, offering an EU based, non for profit, integrated solution tailored to CHIs. https://eureka3d.eu/eureka3d-data-hub/

[2] MINT (Metadata INTeroperability services) is an open source web-based data aggregation platform used by cultural heritage content providers for managing their metadata records and for publishing them to Europeana. It is a component of the Europeana ingestion infrastructure, maintained as part of the data space for cultural heritage. https://mint-projects.image.ntua.gr/mint4all/

[3] The Metis Sandbox is a test environment for EDM data, that simulates ingesting and running the Europeana Metis workflow, see previews of the records and assess their quality. https://metis-sandbox.europeana.eu/

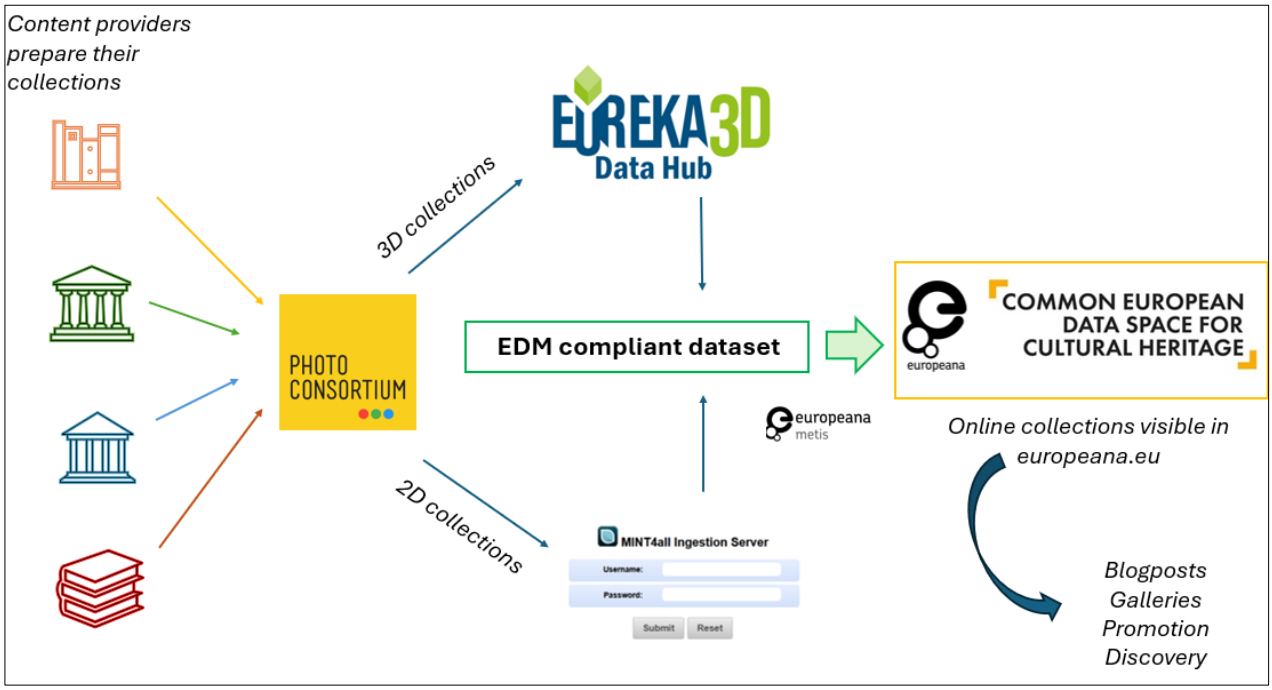

Fig. 2: Overview of the process, with use of EUreka3D Data Hub to aggregate 3D collections and use of MINT mapping tool to aggregate 3D collections, and Europeana Metis Sandbox to support quality checks.

2. THE EVOLUTION OF THE EUROPEANA DATA MODEL IN EUREKA3D DATA HUB

The Europeana Data Model (EDM) is a metadata schema which aims to distinguish between the information related to the cultural heritage object as such (represented by the class edm:ProvidedCHO) and the information related to its digital representation (edm:WebResource), brought together in the class ore:Aggregation. In the context of the common European data space for cultural heritage, inputs were collected from experts and initiatives working on 3D to identify a roadmap and requirements for the extension and adaptation of EDM classes for better representing and sharing 3D digitised cultural heritage collections. Photoconsortium in its role of accredited aggregator for Europeana participated in the complex discussions on the matter, mainly taking place in the data space 3D Working Group and in the Europeana Data Quality Committee, which focused on the challenges posed by 3D digitisation of heritage items when incorporating more and higher quality information into the EDM to better support 3D models for users and stakeholders. As a public result from the task, a paper was published in 2024[4] that summarized the main outcomes and expected implementation phases of the extended EDM, which will gradually make the representation of 3D collections in Europeana portal and API richer and more meaningful to different types of users.

The first real-life testing of the extended EDM took place in the context of the Twin It! part 2 campaign, which invited Member States to publish in Europeana at least one 3D model, representative of national heritage and submitted for publication according to the new requirements. Key new features in the metadata were selected as mandatory requirements for acceptance, most of them relating to the structure of the data, and also including information about the digital model provided with a direct link to the actual file, information about the viewer used to visualize the model which should be integrated in Europeana via an oEmbed mechanism, and a statement about the intended usage of the model according to a dedicated Europeana vocabulary.

These extensions of the EDM imply structural changes of the xml file that content providers submit for Europeana aggregation, and this needs to be implemented in the aggregation tools used to expose the metadata for Europeana harvesting. In the case of the EUreka3D Data Hub, the necessary extensions were implemented by allowing to provide manual enrichments and changes in the xml prior submission to Europeana. Albeit this solution is not scalable, and structured development actions should be planned to implement the new EDM in the metadata editor tool, it was possible already in March 2026 to deliver models for aggregation via the EUreka3D Data Hub according to the new requirements.

More details about the evolution of EDM to better depict 3D objects, and the work done to adapt the EUreka3D Data Hub to this extended model are provided respectively in *D3.8 Paradata and sustainability report* and *D3.3 Cloud infrastructure final release*.

[4] Isaac A., Fernie K., Bachi V., Tsoupra E., Medici M., Alkemade H., Münster S., Charles V., Heslinga L., (2024). Making the Europeana Data Model a Better Fit for Documentation of 3D Objects. In: Ioannides M., Baker D., Agapiou A., Siegkas P. (Eds) "3D Research Challenges in Cultural Heritage V: Paradata, Metadata and Data in Digitisation". Springer, Print ISBN: 978-3-031-78589-4, Online ISBN: 978-3-031-78590-0, DOI: 10.1007/978-3-031-78590-0_6 (eBook)

3. SUPPORTING THE TWIN IT! CAMPAIGN

As mentioned above, the EDM structure and requirements for 3D collections were upgraded by Europeana in December 2025, thus requiring additional information and structural changes in the provided datasets for aggregation, for the first time applied to the records selected for the Twin it! campaign part 2 from Member States.

This is not a trivial adaptation but requires some development work on the side of the aggregation pipeline and tools in use by aggregators. Not all national aggregators were equipped to implement these changes within the timeframe and deadlines of Twin it! and, for this reason, the EUreka3D Data Hub was chosen by several national providers to submit the models to Europeana by April 2026.

Eureka3D-XR supported the national aggregators to prepare their content for the aggregation in Europeana, providing advice on the creation of metadata and paradata, choice of the licence, as well as the conformance check of the 3D models and their upload on the EUreka3D Data Hub.

The list of the national contribution to the Twin It! Part 2 campaign, provided to European via the Eureka3D Data Hub as of April 2026 follows:

- Saint Neophytos Enkleistra (Cyprus)
- Archaeological site of Delos (Greece)
- Lootsi cog (Estonia)
- 18th century wreck (Estonia)
- Coach of Philip II (Portugal)
- Magic Lantern (Spain)
- Monument to Velázquez (Spain)
- Puerta de Alcalá (Spain)
- Transito de la Magdalena (Spain)

The Twin it! campaign will conclude with Hackit!4EU**,** a dedicated hackathon taking place on 27 – 28 May 2026 in Limassol, hosted by the Cyprus University of Technology, as part of the Digital Heritage Summit 2026, where the final event of EUreka3D-XR project takes place.

In line with the Twin IT! campaign's focus on reuse, the Hackit!4EU event will bring together creatives, developers, students, educators, researchers, and cultural heritage and tourism professionals to explore innovative and imaginative ways to reuse the collected 3D assets.

The contents aggregated via the Eureka3D Data Hub will be available for the work of the participants in the Hackit!4EU event.

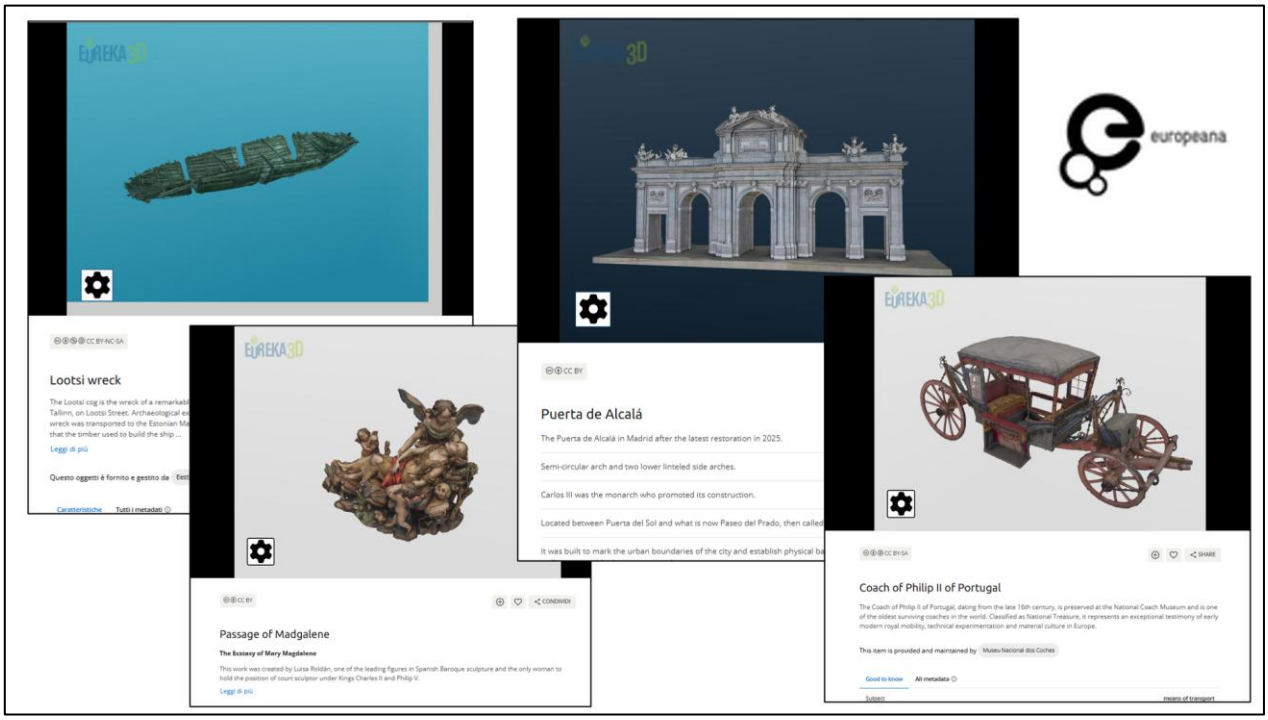

Fig. 3: Selection of the items published in Europeana from EUreka3D Data Hub, to feed the Twin it! collection.

4. DESCRIPTION OF THE EUREKA3D-XR COLLECTIONS MADE AVAILABLE FOR PUBLICATION IN EUROPEANA

This chapter reports on the collections selected for publication by the content providers in the project to support the development of the XR scenarios delivered as a proof of concept of the use of EUreka3D-XR tools.

4.1 CUT CYPRUS UNIVERSITY OF TECHNOLOGY (CY)

The content made available for aggregation consists of the main elements that compose the MR/VR experience of the Saint Neophytos scenario: the 3D model of the Enkleistra that is accompanied by a variety of 2D materials accessible via the EUreka3D Data Hub; and the animated avatars of Saint Neophytos and monks. The users with headset or visors can access the XR experience either on location in Paphos, by superimposing the 3D content to the real-life environment, or as a fully digital experience.

4.1.1 Models and additional collections

Enkleistra: OBJ model plus texture of the Enkleistra, appropriately compressed for online visualization in the EUreka3D viewer. This was created using TLS scan and panoramas which are also uploaded in the EUreka3D Data Hub as raw data. The STL corresponding to the OBJ file are also uploaded.

Fig. 4: Model of the Enkleistra and its frescoes

Avatars: animated GLB, that is viewed via a dedicated viewer that is able to show the animation and the audio track. The new viewer was developed specifically for this advanced type of 3D and was tested for embedding with Europeana. The avatars represent the historical figures of Saint Neophytos and of the monks who lived with him in the Enkleistra, reconstructed as animated speaking 3D models, based on the appearance the Saint and the monks on the original frescoes preserved in the Enkleistra, and on accurate scientific and historical research conducted together with the Monastic community of the Enkleistra. Due to

the innovative nature of the object (an animated 3D model with synchronized movements and audio track) that has never been published in Europeana, the avatar of Saint Neophytos is the testbed for the publication of the others.

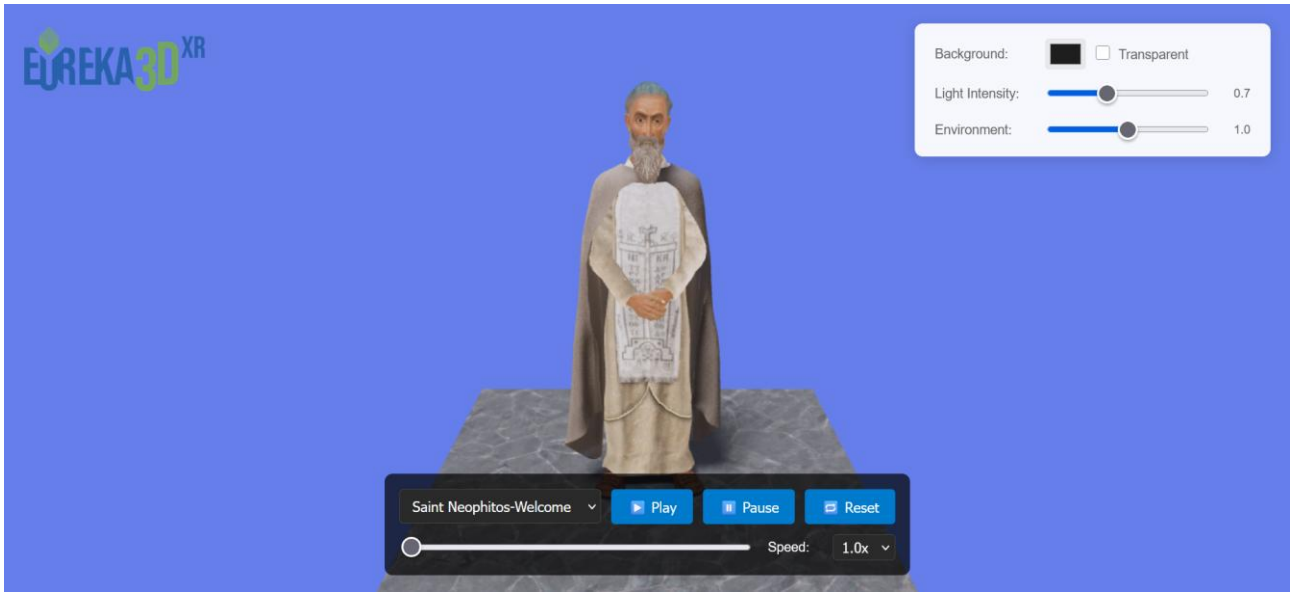

Fig. 5: Animated Avatar of Saint Neophytos

Complimentary materials are uploaded and made available for access to advanced stakeholders in EUreka3D Data Hub, currently organized in the following structure:

01_Tangible: this folder contains the raw data from the different digitization actions: 360 Capture; GIS data; Images from Photographer; LIDAR; UAV.
02_Intangible: this folder contains the recoding (images and video) of the Saint Neophytos liturgy, captured during the mission on 25 September 2025
03_Literature: this folder contains all the relevant scientific bibliography relating to the research around Saint Neophytos history and teachings, and also about the Enkleistra as cultural heritage monument.

Additional 2D materials are published in Europeana, to complement the 3D models. These are audiovisuals explaining about the Enkleistra and about the EUreka3D-XR pilot.

It is foreseen that additional 3D models of heritage icons and possible other resources will be published by CUT in the coming month of May, to complement the already published items of the Enkleistra for reuse in the Hackit4EU event in Limassol.

3D content	**2D content**
- Model of Enkleistra - Model of Saint Neophytos (animated) - Model of monk (animated)	- 3 documentary videos
EUreka3D Data Hub OAI setspec: https://datahub.egi.eu/oai_pmh?verb=ListRecords&metadataPrefix=edm&set=cb7fd2af32cc8258ce38b224538440d8ch9367	MINT OAI setspec: http://panic.image.ntua.gr:9000/manager/projects/photography/organizations/1097

4.1.2 Editorials associated with the collection

- Blogpost: History of San Neophytos (by CUT)
- Gallery: The rapturing frescoes of Saint Neophytos' enkleistra (by PHC)
- Additional editorials will be created and published, such as a gallery about the icons, a comprehensive gallery about the Enkleistra including the avatars and materials about the Saint Neophytos liturgy, an additional gallery with other videos about the site and the research, and others as applicable.

4.2 CRDI – AJUNTAMENT DE GIRONA (ES)

The 3D contents provided to Europeana reconstruct the main elements that composed the medieval walls of Girona, which no longer exist today. The 3D models of tower, bastion and walls were used to virtually recreate the entire walls in a XR application that can be accessed onsite in the city of Girona. The users with their smartphones can superimpose the virtual reconstruction to the real-life environment and follow a XR tour along the original location of the walls.

4.2.1 Models and additional collections

Sant Francesc Bastion: GLB model for 3D virtual reconstruction of the 17th-century bastion of Sant Francesc, adjacent to the Mercadal city wall in Girona.

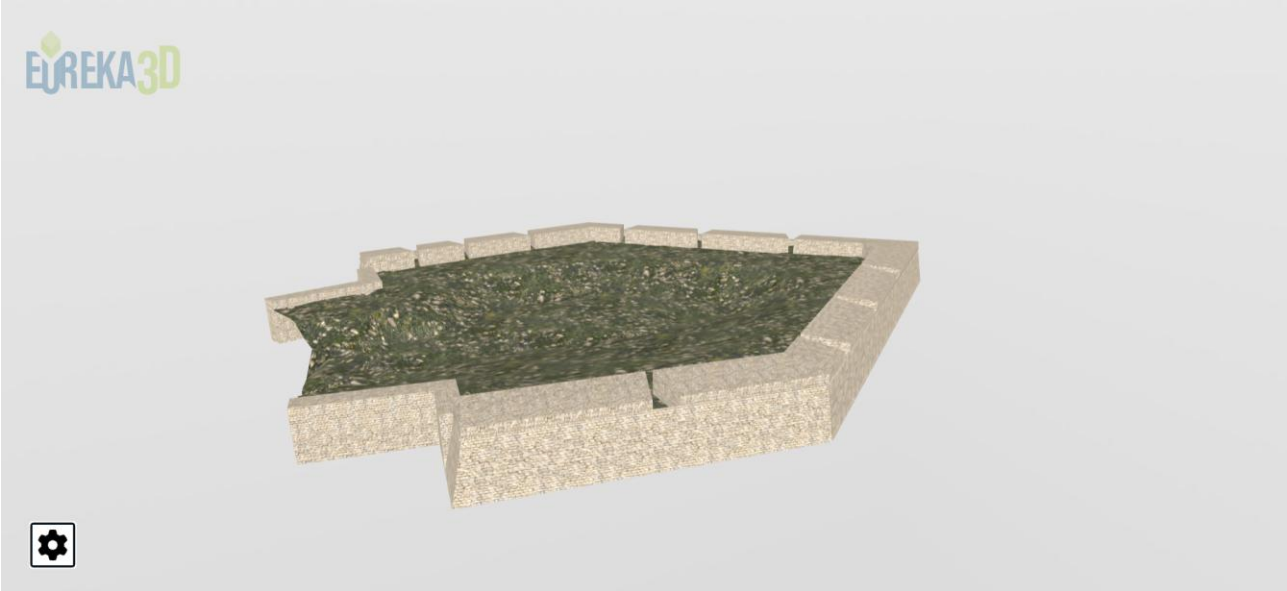

Fig. 6: Reconstruction of the bastion

Mercadal walls: GLB model for 3D virtual reconstruction of the Mercadal city wall in Girona.

Fig. 7: Reconstruction of a portion of walls

Tower of the Mercadal city wall: GLB model for 3D virtual reconstruction of a 16th-century tower of the Mercadal city wall in Girona.

Fig. 8: Reconstruction of the tower

To complement the 3D models, a selection of historical engravings which depict how the walls of Girona looked like in the medieval period are provided for publication in Europeana.

3D content	2D content
- Model of tower - Model of bastion - Model of walls	- 138 engravings
EUreka3D Data Hub OAI setspec: https://datahub.egi.eu/oai_pmh?verb=ListRecords&metadataPrefix=edm&set=94318854ea0727ebb9bb20a3268e8ec0chfc85	MINT OAI setspec: http://panic.image.ntua.gr:9000/manager/projects/photography/organizations/1019

4.2.2 Editorials associated with the collection

- Blogpost: History of the Girona walls (by CRDI)
- Blogpost: The heroines of Santa Barbara (by CRDI)
- Gallery: The historical walls of Girona (by CRDI)
- An additional gallery about the engravings is planned to be published in May, possible other editorials could be also published later.

4.3 BIBRACTE (FR)

4.3.1 Models and additional collections

The 3D models produced and aggregated document two main areas of the site: the domus PC2 and the PC15 terrace.

PC2 Domus – stone-built cellar

A 3D model created through photogrammetric acquisition reconstructs a masonry cellar uncovered during the 2016 excavations. The digitisation was carried out using photographic captures (Sony Alpha II camera) and processed with Agisoft PhotoScan (now Agisoft Metashape). This model documents a structure representative of the architectural transformations at the end of the Iron Age, marked by the gradual introduction of Roman-influenced stone construction techniques. The digitisation was performed at the end of the excavation in order to preserve a precise record of remains intended to be backfilled.

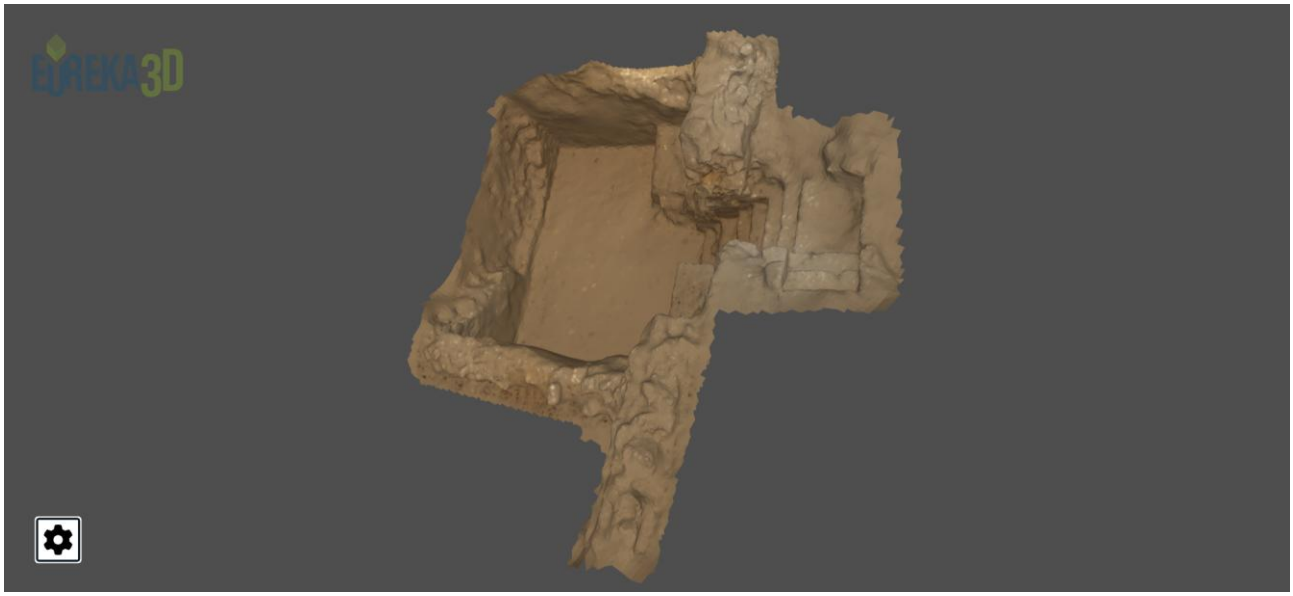

Fig. 9: Model of the PC2 Domus – stone-built cellar

PC15 terrace – excavation state

A 3D model derived from drone-based photogrammetric survey documents the state of the site after the remains had been uncovered. It highlights a dense set of negative features corresponding to postholes of wooden structures, reflecting several successive phases of construction. Data acquisition was carried out using a drone (DJI Phantom 4 Pro), and the model was processed using Agisoft Metashape and Blender. This model provides detailed documentation of a transient excavation state that disappeared after backfilling.

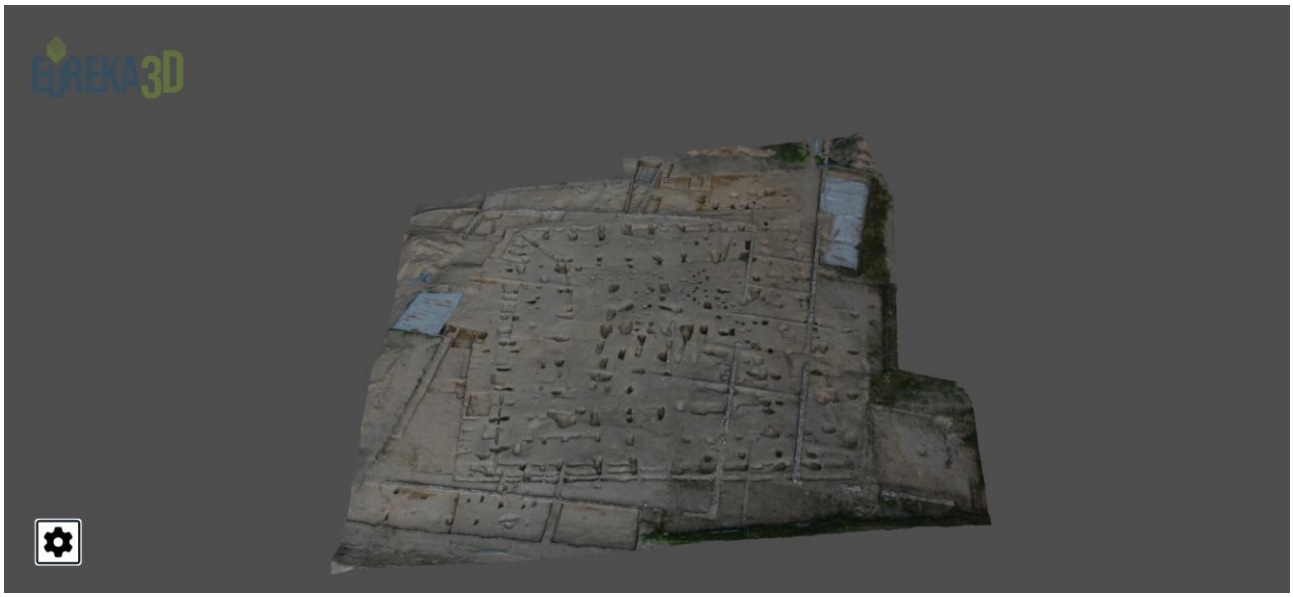

Fig. 10: Model of the PC15 terrace at the end of the excavations

PC15 terrace – post reconstruction

Based on archaeological data from the excavation, an interpreted version of the model includes the addition of structural posts corresponding to the building's first construction phase. This partial reconstruction helps to better understand the spatial organisation of the structure and to suggest its volumes, while maintaining a clear distinction between observed data and interpretative reconstruction.

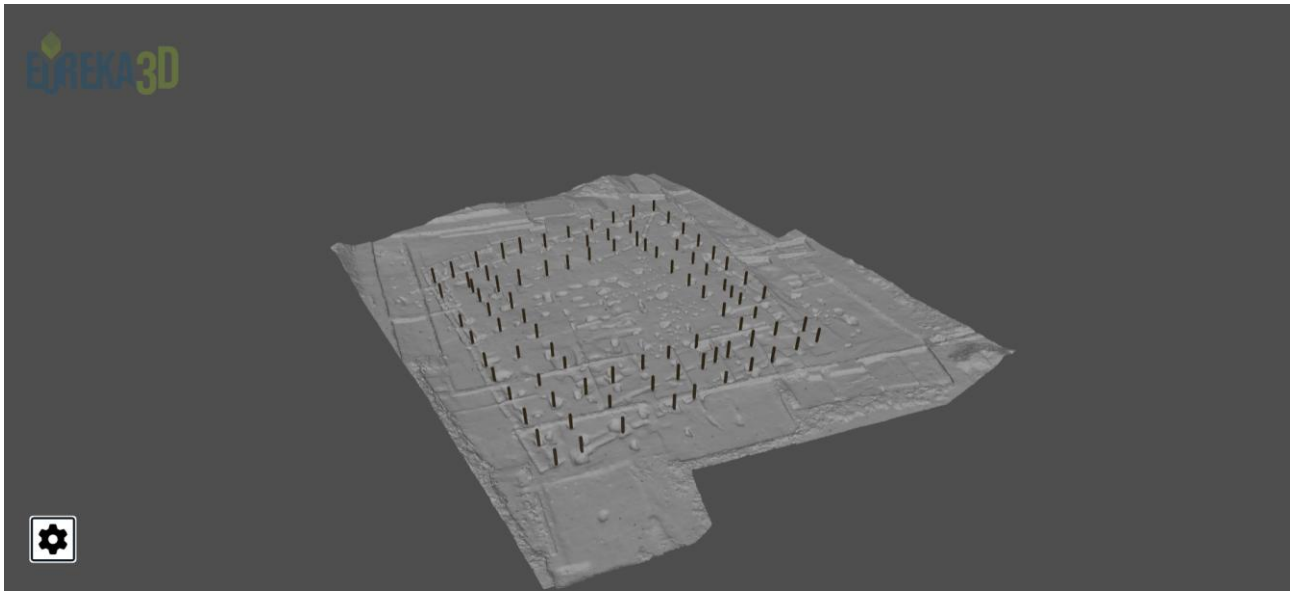

Fig. 11: Model of the PC15 terrace with reconstruction of posts

Two additional 3D models representing the reconstruction of the two subsequent phases will be aggregated at a later stage.

In order to complement the 3D models and provide contextualisation, a collection of 2D resources has been aggregated on Europeana. It includes:

• photographs documenting the different stages of the excavation, archaeological structures, uncovered artefacts, as well as acquisition and analysis methods (surveying, archaeobotany, etc.);

• educational videos presenting the scientific methods employed (palynology, dendrochronology, analysis of remains) and the results of the research, to which a demonstration video of the AR Tour Experience mobile application will be added;

• PDF documents derived from scientific research and mediation materials.

These resources make it possible to connect the 3D models with field data, analytical methods and archaeological interpretations, thus providing a comprehensive understanding of the site and the research processes.

3D content	2D content
- PC2 Domus stone-built cellar - PC15 terrace – excavation state - PC15 terrace – postholes reconstruction	- 8 pdf files - 8 videos - 29 images
EUreka3D Data Hub OAI setspec: https://datahub.egi.eu/oai_pmh?verb=ListRecords&metadataPrefix=edm&set=f5f5e13338851b6866b085fee019276ech038f	MINT OAI setspec: http://panic.image.ntua.gr:9000/manager/projects/photography/organizations/1095

4.3.2 Editorials associated with the collection

- Blogpost (in preparation): The Hidden Side of Bibracte, an augmented reality experience to reveal the invisible aspects of archaeology (by Bibracte)
- Gallery: The Hidden Side of Bibracte (by Bibracte)
- Gallery: A Gaulish public space: the PC15 terrace of the Bibracte oppidum (by Bibracte)
- Gallery: A large Roman house: domus PC1 at the Bibracte oppidum (by Bibracte)
- Gallery: An archaeological field school: domus PC2 at the Bibracte oppidum (by Bibracte)
- Gallery (in preparation): Archaeological methods (by Bibracte)
- Historiana quiz: Why are so few wooden objects found at Bibracte? (by Bibracte)
- Historiana quiz: How did Roman wine reach Bibracte? (by Bibracte)

5. ADDITIONAL COLLECTIONS OF 3D CULTURAL ITEMS PUBLISHED IN EUROPEANA

Aside from the beneficiaries who are partners in the project, and the national providers who used the EUreka3D Data Hub for sharing their models in the Twin it! campaign (cfr chap. 3), external organisations as associate partners normally use the EUreka3D Data Hub for the storage, management, and sharing of their data. This is a continuation of work started in the EUreka3D project, with the addition of new collections or records to pre-existing collections.

In some cases, the new records are finalized in the EUreka3D OAI and published in Europeana. The items published in Europeana during the course of the EUreka3D-XR project so far are:

- RAMS Regionaal Archeologisch Museum a/d Schelde (Belgium): 3 new models of archaeological artefacts, bringing the collection to 23 models in Europeana.
- Basilica del Pi (Spain): one additional relic from the Basilica del Pi, for a total of 2 models in Europeana. Work is ongoing to publish 2 new models following new digitisation at the Basilica.
- SPK (Germany): 3 archaeological artefacts and 4 fashion heritage items, for a total of 7 models in Europeana.

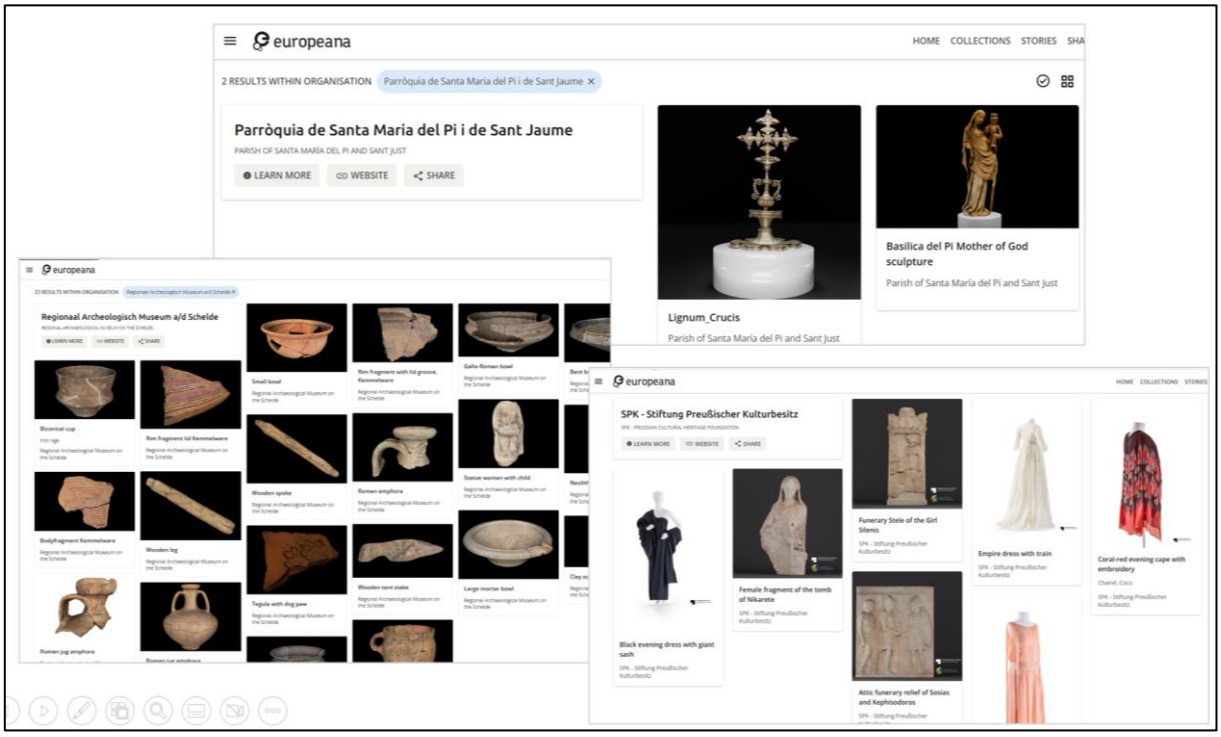

Fig. 12: Overview of the collections in Europeana by RAMS, Basilica del Pi and SPK

6. CONCLUSIONS

This deliverable illustrates the different collections made available by the EUreka3D-XR content providers and some associate partners.

All the contents from the EUreka3D partners are ready for publication to europeana.eu. This document corresponds to the timely and successful achievement of MS6 Aggregation described as “3D content used in pilots is aggregated for publication in Europeana and Data Space (D2.8)”.

While the existing MINT mapping tool operated by partner Photoconsortium was used for the 2D collections that complement the pilots’ content, the collections composed of 3D models were aggregated via the EUreka3D Data Hub. As the EUreka3D Data Hub is a specialised and dedicated solution for the storage, management and sharing of 3D data, metadata and paradata, including an OAI-PMH server for harvesting by Europeana systems, it was necessary to align it to the new requirements of the extensions of the Europeana Data Model, which were officially presented in December 2025. A manual workflow for the EUreka3D Data Hub has been established, which will then transformed in a structural amendment of the metadata editing tool, so that new collections in the future would be published according to the new requirements.

Due to this prompt alignment, the EUreka3D Data Hub was chosen by several Member States to provide their models in the Twin it! part 2 campaign, which will be demonstrated in the EU event in Brussels on 12th May 2026.