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D2.2 Girona Pilot Prototype v0.1

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HISTORY OF CHANGES			
Version	Date	Author	Comments
0.1	13/01/2026	Valentina Bachi (PHC)	First draft
0.2	29/01/2026	David Iglésias Franch (CRDI)	Main content
1.0	30/01/2026	Francesco Generali (Swing:IT), Valentina Bachi (PHC)	Peer review and refinements
1.0	30/01/2026	Valentina Bachi (PHC)	Final version for submission

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EXECUTIVE SUMMARY

This document accompanies the Deliverable *D2.2 Girona Pilot Prototype v0.1* in order to provide documentation on the first version of the prototype for this scenario, with short description and a preliminary assessment report.

This deliverable is deeply linked to other documentation provided in the project, and specifically:

- D2.1 Pilot Specification and planning, which illustrates the specifications of the end product for each pilot, with production schedule and planning (M6, 31/07/2025)
- D3.4 Toolbox Beta version, which illustrates the status (testing phase) of the tools that are used to create and deliver each Pilot scenario, and which compose EUreka3D-XR toolbox (M9, 31/10/2025).

The prototype uses a 3D reconstruction of a portion of the lost medieval walls of the city of Girona, in an augmented reality experience to be accessed onsite in Girona. A set of still images and short demonstration videos present the work for designing the tour, and the onsite experience.

The document is composed of the following chapters:

1. Description, with short summary of the Pilot scenario, including access to the prototype
2. Assessment, with indication of challenges encountered and preliminary assessment report
3. Next steps and conclusions

This deliverable and the prototype v0.1 will be followed by a second prototype (internal version), to be showcased in the EUreka3D-XR final event in Cyprus held on 26 May 2026; and a final release of the pilot scenario with extended description and assessment report delivered at the end of the project on 31/07/2026, corresponding to D2.5.

1. DESCRIPTION

This pilot scenario focuses on the virtual reconstruction of the western side of the historic walls of the city of Girona, which were partially demolished at the beginning of the 20th century due to urban development. Because these structures were destroyed and could not be archaeologically restored, a physical reconstruction is no longer possible. Within the framework of the EUreka3D-XR project, advanced 3D modelling and Extended Reality (XR) technologies are used to digitally recover them.

The reconstruction is based on a wide range of historical 2D sources, including photographs, cartography, engravings, films, and textual records preserved in archives. By combining these materials with AI-driven image-to-3D technologies, the pilot enables the creation of highly realistic 3D models of the demolished walls, towers, and bastions. These models are then integrated into immersive XR experiences that allow users to explore the reconstructed walls directly on site, reconnecting the present-day city with its historical past.

Two tools developed by the project partner Swing:It are used in this scenario: the AI 3D Builder, which generates 3D models from 2D image collections, and the 3D XR Studio, which enables the creation and delivery of AR/VR experiences through web and mobile applications.

The pilot addresses multiple types of users, each interacting with the system in different ways depending on their role:

- The first group consists of professional users, including archivists, records managers, curators, cultural heritage institution (CHI) staff, researchers in digital humanities, and digitisation specialists. These users are responsible for selecting historical source materials, generating and refining 3D models, and designing XR experiences. For them, the pilot acts as a demonstrator of how archival 2D collections can be valorised and reused through AI-based 3D reconstruction and immersive technologies.
- The second group consists of end users and visitors, such as Girona citizens, tourists, cultural visitors, educators, students, and participants in cultural events. These users do not create content but instead experience the reconstructed heritage through a mobile XR application during onsite or remote visits. Additional stakeholders include local authorities, tourism boards, educational institutions, and community organisations that support or benefit from the dissemination of the experience.

For professional users, the process begins with the AI 3D Builder, a web-based tool that allows curators and archivists to upload curated collections of historical 2D images. The AI processes these materials using an advanced image-to-3D pipeline and generates industry-standard 3D models (GLB files). Human expertise remains central to the workflow, as professionals refine, validate, and improve the AI-generated results to ensure historical accuracy and visual quality. Once finalised, the 3D models can be stored, shared, and reused in other platforms, including the 3D XR Studio.

Using the 3D XR Studio, curators and CHI professionals design XR experiences by defining geographic areas, importing 3D models, positioning them accurately in space, and enriching them with narratives, audio content, and additional contextual information. Through a web interface and a companion mobile app, they can build a guided pathway along the former western walls of Girona and fine-tune the placement of virtual elements directly on site.

For end users, the experience is delivered through a mobile application. Users download the app on their smartphone and follow a predefined route. During the route they can view the virtual walls located in the original places. The experience is enhanced with historical narratives, linked archival information, audio

content in Catalan and English. Through this guided and immersive journey, users gain a deeper understanding of Girona's urban evolution, from the medieval and early modern periods to the present day.

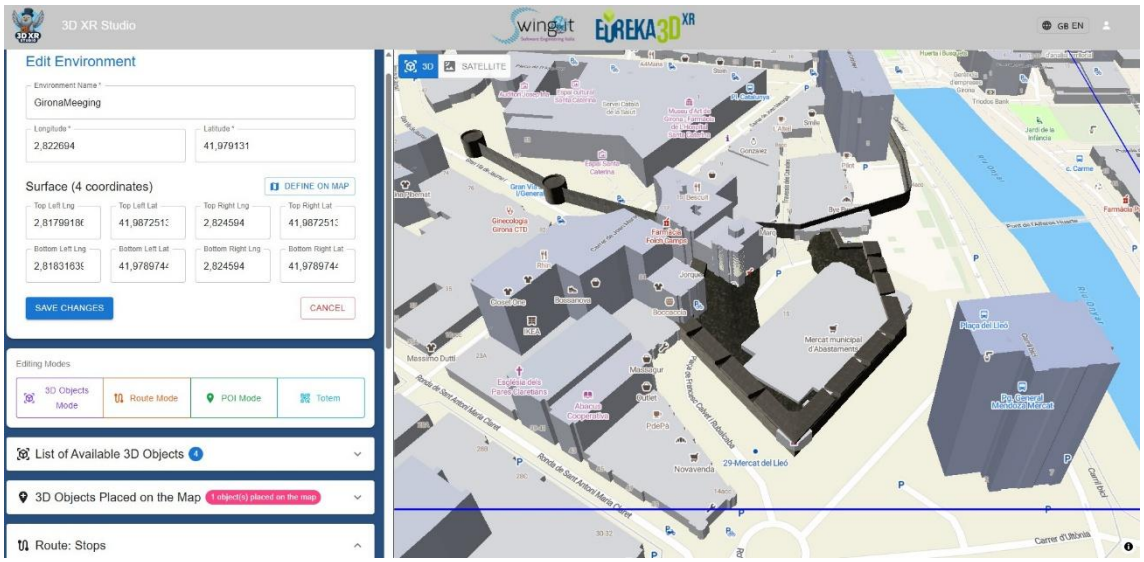
Overall, the pilot demonstrates how AI, 3D modelling, and XR technologies can be combined to restore access to lost cultural heritage, support professional heritage workflows, and offer engaging, educational experiences to the public.

ACCESS TO THE PROTOTYPE V0.1

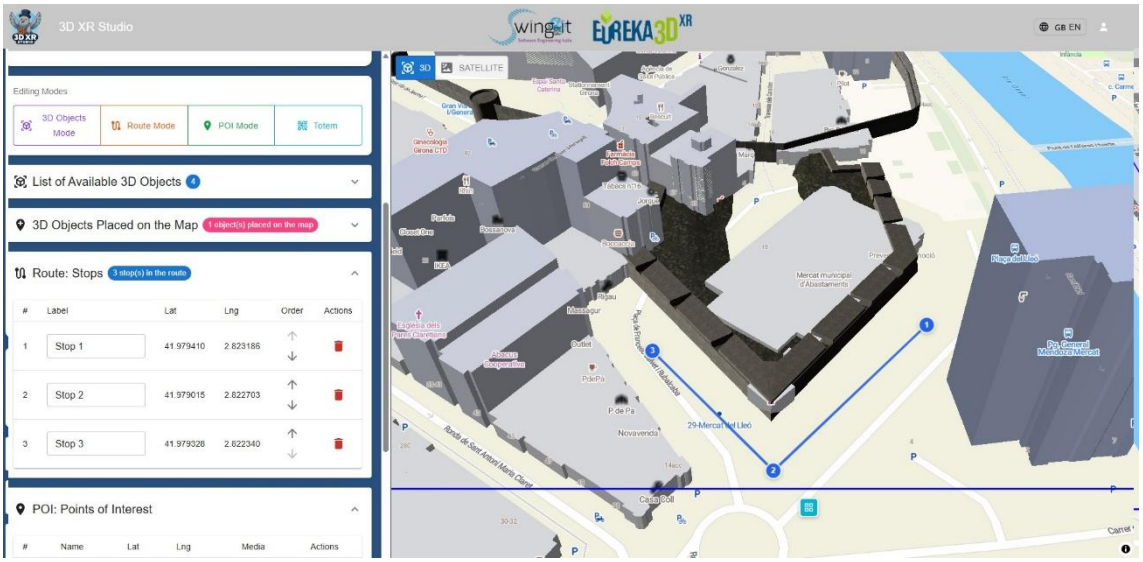
In order to illustrate the prototype, a series of still images and videos are presented below, that provide a clear understanding of the prototype and how it works from the point of view of the administrator (i.e. the curator of the tour) and from the point of view of the user who accessed the tour on site in Girona.

STILL IMAGES:

WebApp views

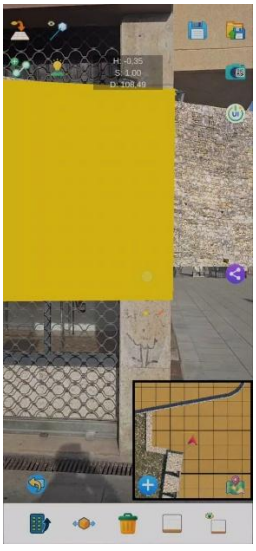


General view on the WebApp with the wall 3D model positioned on the map.

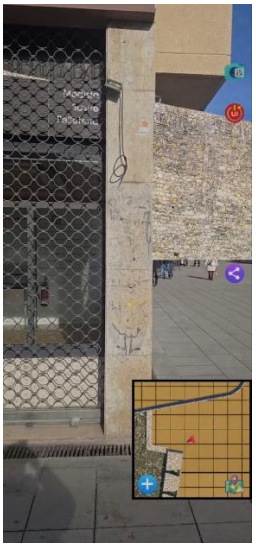


View of the WebApp with focus on path points.

Administrator's views



Occlusion wall position.

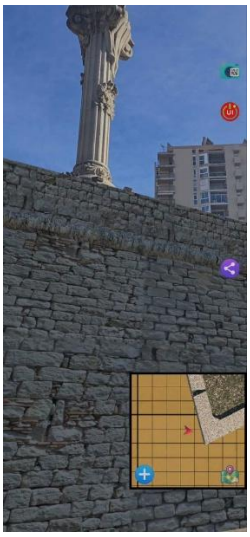


Occlusion wall positioned on the previous image enhance the visitor experience

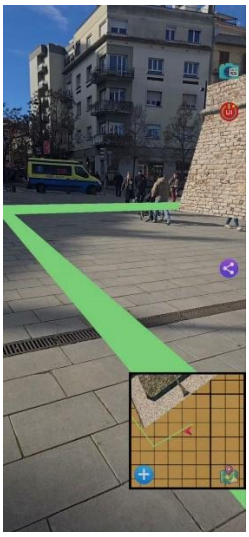
Manage the 3D model of the wall (yellow indicates is selected).

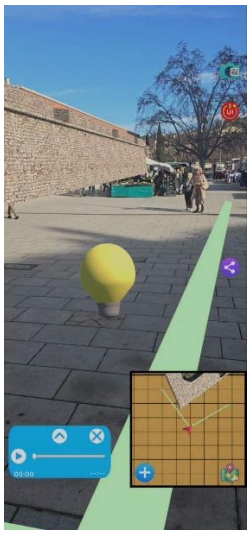
Near the corner of the bastion (all admin UI visible).

Visitor's views


Bastion area, focus on the height of the wall.


Walking near the first tower.


Following the path.


Clicking on the interest point (pop-up audio).

VIDEOS

Administrator's views

- Position and rotation of a 3D model from mobile component app.
  https://youtube.com/shorts/FfFTiq9OPTY
- Position of path points from Mobile app component.
  https://youtube.com/shorts/DyEqBbS98X4
- Position of interest point, switch to visitor view and autoplay audio pop-up when clicked (the audio to be set in the web app component)
  https://youtube.com/shorts/KKd7JXOPyqI
- Demonstration how occlusion wall works
  https://youtube.com/shorts/eUwztqmvlW8

Visitor's views

- Follow path.
  https://youtube.com/shorts/sfLecrgazRU
- Walking on the bastion area.
  https://youtube.com/shorts/Bv3opOnjJW8
- Third person view of walking around the bastion area.
  https://youtube.com/shorts/YX4yddCtR2E

2. ASSESSMENT AND CHALLENGES ENCOUNTERED

The Girona pilot faced several challenges related to the digital reconstruction of lost heritage, the integration of AI-generated 3D content into XR environments, and the design of user-friendly tools for diverse audiences. One major challenge was the heterogeneity and variable quality of historical 2D sources, including gaps in visual documentation, missing perspectives, and inconsistencies across cartographic and photographic materials. These limitations required careful curatorial selection, interpretation, and iterative refinement of AI-generated 3D models to ensure historical plausibility and visual coherence.

Another challenge concerned the balance between automation and human expertise. While the AI 3D Builder significantly accelerates 2D-to-3D conversion, achieving high-quality and accurate results still requires human intervention for validation, fine-tuning, and contextual interpretation. Ensuring that the tool supports professional workflows without oversimplifying complex heritage reconstruction tasks was a key design consideration.

From a user experience perspective, the pilot also addressed the challenge of serving multiple user profiles—from archivists and curators to tourists and local citizens—each with different levels of technical expertise and expectations. Designing an XR mobile application that is both powerful for curators (in terms of editing and positioning 3D models) and intuitive for end users (in terms of navigation, comprehension, and engagement) required careful interface design and continuous testing. Additionally, on-site XR experiences introduced technical constraints related to GPS accuracy, spatial alignment, device performance, and environmental conditions.

Evaluation was embedded as a continuous and iterative process throughout the development of both the AI 3D Builder and the 3D XR Studio. Internal evaluation is carried out by professionals from the Centre de Recerca i Difusió de la Imatge (CRDI) with the involvement of other Girona City Council departments, including the Cartography Department and the City History Museum. These stakeholders provide expert feedback on historical accuracy, spatial positioning, data management workflows, and the overall suitability of the tools for real-world cultural heritage contexts. Feedback is collected through hands-on testing sessions, structured discussions, and iterative reviews of intermediate results. This allows technical partners to refine the tools incrementally, addressing usability issues, improving model quality, and adjusting workflows to better match professional practices.

External evaluation activities complement the internal process. Additional feedback is gathered during project focus groups with the Advisory Board, as well as during international capacity-building events, including the Brussels event in September, through surveys, interviews, and one-to-one reflections. Further large-scale evaluation took place during a workshop in Girona in 29th January 2026, involving Catalan cultural heritage institutions, mainly archives and some professionals of the 3D sector. Participants learned about the tools through guided training and hands-on practice, and they provided feedback on usability, learning curve, and perceived value for their institutions.

Towards the end of the project, the mobile application will be presented to a selected group of Girona citizens and local authorities. This final evaluation phase will focus on the clarity, engagement, and accessibility of the experience for non-expert users.

Usability assessment focuses on both professional and end-user perspectives. For curators and archivists, evaluation criteria include the clarity of the interface, ease of uploading and managing 2D materials, transparency of the AI-driven 2D-to-3D process, and the effectiveness of editing and refinement tools. For the 3D XR Studio, usability testing examines the ease of creating pathways, positioning models, managing reference points, and deploying XR experiences through web and mobile applications.

For end users, the assessment prioritises ease of navigation, clarity of instructions, intuitive interaction with XR content, and the overall coherence of the guided tour. Particular attention is given to whether users can easily follow the pathway, understand when and how to access augmented content, and engage with the historical narrative without prior technical knowledge.

Accessibility considerations include language availability (Catalan and English audio content), readability of on-screen information, and compatibility with commonly available mobile devices. The evaluation also considers physical and contextual accessibility, such as the feasibility of following the route in real urban conditions and the robustness of the experience under varying environmental factors.

Finally, key features such as historical accuracy, visual realism, performance, and stability of the XR experience are assessed throughout the evaluation process. Together, these activities ensure that the Girona pilot delivers an application that meets the needs of both heritage professionals and the wider public.

3. NEXT STEPS AND CONCLUSIONS

For the Girona pilot prototype, several next steps are foreseen to consolidate the results of the project and extend its impact at both professional and public levels.

- Final validation and readiness for deployment. The immediate next step focuses on completing the validation of both the AI 3D Builder and the 3D XR Studio in operational conditions. Feedback collected during internal testing and external evaluation activities will be consolidated to finalise technical adjustments, improve stability, and confirm the reliability of the XR experience in real urban environments. This phase aims to ensure that the tools are mature, robust, and ready for sustained use beyond the pilot.
- Professional dissemination and capacity building. A key milestone has been the assessment of the survey of the demonstration event in Girona, the 29th January, which is the main professional dissemination activity at local level
- Public rollout of the XR experience. Once the tools have been fully validated, the XR application will be introduced to the public through on-site guided visits along the virtual walls. These visits, coordinated by CRDI after project completion, will allow citizens, visitors, and local stakeholders to experience the virtual reconstruction in situ.
- Extension of dissemination formats. To complement the digital experience, CRDI foresees the production of a physical 3D-printed model of the reconstructed walls, intended for exhibition in a public space. This output will provide an alternative, tangible way of engaging with the reconstructed heritage and will support inclusive access for audiences less familiar with XR technologies.
- Long-term access and data publication. All validated 3D models and related documentation will be preserved and shared through the EUreka3D Data Hub, ensuring long-term accessibility and reuse. Selected 3D models, supporting 2D materials, and a video presenting the XR experience will be published on Europeana, contributing to the wider European digital cultural heritage ecosystem and enabling future research, education, and creative reuse.

As a conclusion, we can say that the Girona pilot confirms the value of integrating AI-based 3D reconstruction, XR technologies, and archival expertise to recover and reinterpret urban heritage that can no longer be physically restored. By addressing professional workflows and public engagement within a single scenario, the pilot demonstrates how digital tools can bridge research, heritage management, and citizen-oriented experiences. As a pilot, the scenario has also highlighted the importance of iterative development, interdisciplinary collaboration, and sustained institutional commitment. The structured next steps outlined above aim to ensure that the results achieved are not only technically successful but also socially meaningful, reusable, and scalable. In this way, the Girona pilot provides a solid foundation for future extensions at local level and a transferable model for similar heritage contexts across Europe.