

## Bringing Dynamic Cultural Heritage into the Digital Age

Meet the project creating 4D Digital Twins for Europe's moving historical assets



### #01 Newsletter

#### Welcome to the first KINETIKA newsletter!

We are thrilled to present to you a pioneering Horizon Europe initiative that is set to redefine how we preserve, monitor, and engage with Europe's mechanical and movable cultural heritage.

Over the next three years, our consortium aims to bridge the gap between historical cultural heritage and Industry 4.0 to create a full digital ecosystem that goes beyond static representations.

### Our vision

Digitising dynamic cultural heritage

Historically, digital preservation has focused on static monuments and artefacts. **But what about the moving structures?**

Bell towers, historic lifts, cable systems, historic buildings, as well as industrial infrastructures, show complex behaviours and mechanical functions that reveal their real historical contexts.

This is where KINETIKA (Advancing the Digitization and Analysis of Dynamic Cultural Heritage Objects) comes in with a pioneering 4D digital twin framework for dynamic heritage objects.

### Our main goals include

- **Capturing real-time behaviour**  
Moving beyond traditional 3D models to document internal structures and structural evolution of kinetic assets.
- **Applying cutting-edge technologies**  
Utilising non-invasive technologies such as muography (MUSICA), IoT sensors (STEALTH), drone-based automated inspections (DYNAMO), and AI-driven analysis
- **Enriching the European Heritage Infrastructure**  
Integrating our modular, cloud-based tools (e.g., predictive maintenance, physics simulations) into the European Collaborative Cloud for Cultural Heritage (ECCCH).

### READ MORE ABOUT OUR OBJECTIVES ON THE WEBSITE

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### Real-scale validation

The 5 pilot sites

To ensure our digital framework is scalable and realistically applicable, KINETIKA's technologies will be validated over five full-scale pilots representing diverse historically important structures across Europe.

These sites will become the proving ground for our advanced digital twins:



Cathedral Bell System (Salamanca, Spain)

Building a 4D digital analogue of the Old Cathedral's bell tower using drone-based 3D scanning and vibration sensors to diagnose faults, mechanical wear and the dynamic effects of the moving bells on their supporting 3D structures enabling preventive conservation without changing the historic components.



The Santa Justa Elevator (Lisbon, Portugal)

Deploying an advanced IoT-based structural health monitoring network using high-sampling frequency sensors (e.g., accelerometers), strain gauges and temperature sensors. This system will continuously assess the mechanical structure, electrical motor, and connecting physical infrastructure of this iconic 19th-century elevator supporting predictive maintenance and seismic resilience.



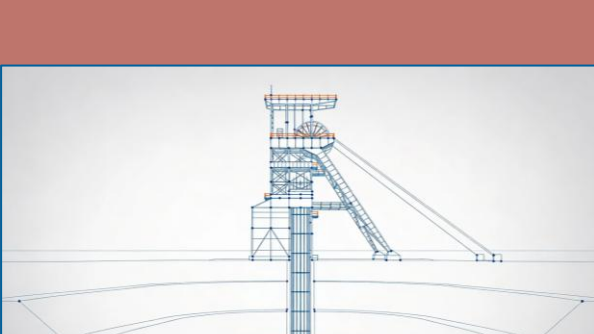
"Eneaerios" Cable System (Naxos, Greece)

Focusing on the remedial conservation of a historic 19 km aerial ropeway and its ore-transport infrastructure. By using Unmanned Aerial Vehicles (UAVs) and developing an Augmented Reality (AR) digital twin, this pilot will project virtual replicas of the system's dynamic operations into AR goggles, enabling experts to evaluate structural health, inspect cable wear, and test different restoration strategies without impacting the living physical elements.



High Castle (Vienna, Austria)

Implementing a full-scale digital twin and a wireless IoT sensor network to monitor the structural integrity, mechanical performance, and environmental factors of the fortress in real-time. Artificial intelligence will process this data to monitor building foundations, and mechanical moving parts to guide preventive maintenance and early anomaly detection.



Pyhäsalmi Mine (Finland)

Digital reconstruction of the 1959 industrial hoist tower using historical blueprints, LiDAR surface scanning, and advanced muography to image the internal structure.

This comprehensive 3D modelling approach will enable the early diagnosis of mechanical failures, erosion, and ageing, helping heritage professionals reconstruct the original shape and operation of its hoisting mechanisms.

### EXPLORE THE PILOT SITES

[Read more](#)

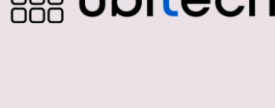
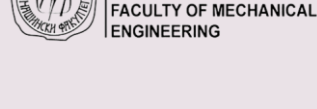
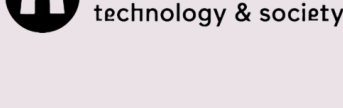
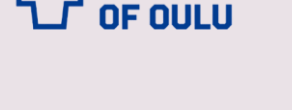
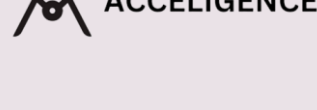
### Meet the consortium

A challenge of this scale requires a highly multidisciplinary approach.

The KINETIKA consortium brings together **18 partners from 11 European countries**, balancing academic excellence, technological innovation, and practical heritage management.

Coordinated by the **Universidad de Salamanca (USAL)**, our team includes leading universities, innovative technological companies, public authorities, and the managers of the pilot sites themselves.

Together, we combine expertise in 3D digitisation, AI, mechanics, monitoring, and cultural preservation.



[Discover our Partners](#)

### Our launch

Kinetika kick-off meeting

The official start of the KINETIKA journey: our successful kick-off meeting!

Hosted by our project coordinator, **Universidad de Salamanca (USAL)** this inaugural meeting brought together partners from all 11 European countries participating in the project in Ávila.

During the meeting, the consortium aligned with the technical roadmap of the project, reviewed the work packages, and coordinated the next steps for deploying our non-invasive technologies across the 5 pilot sites. It was an inspiring beginning, and it strengthened our shared commitment to bring dynamic cultural heritage into the digital age.

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## Synergies in action

Kinetika & MusicSphere joint webinar

At KINETIKA, we believe in strong partnerships that could shape the future of Europe's digital heritage. On June 9th, we had the pleasure of participating with our ECHOES sister project, **MusicSphere**, in a valuable joint webinar.

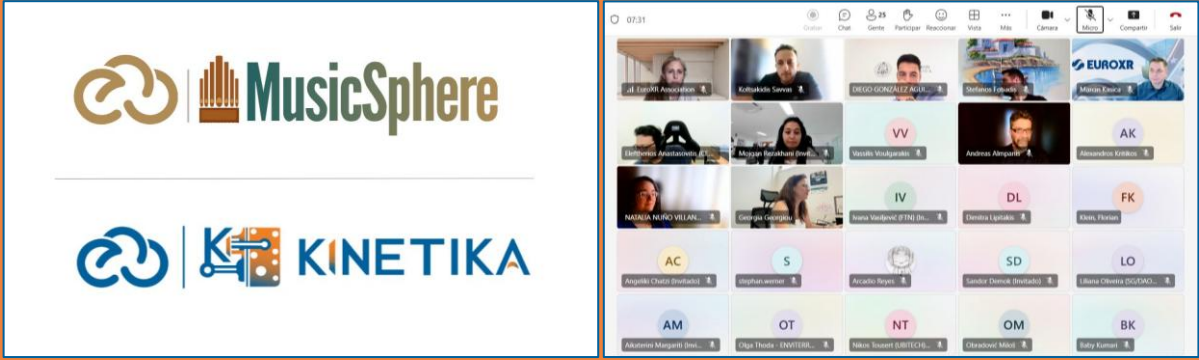
As members of the wider Cultural Heritage Cloud ecosystem (developed by ECHOES), we consider that creating opportunities for mutual learning and knowledge exchange is essential to expand our collective impact.

The session provided a fascinating insight into our complementary approaches: while MusicSphere focuses on the digitisation, modelling, and immersive simulation of musical heritage, KINETIKA is developing advanced 4D digital twins and monitoring technologies for mechanically driven cultural heritage assets.

The webinar was a chance for both consortiums to present their goals, technologies, innovative toolkits, and use cases. We also explored potential synergies between both initiatives and highlighted upcoming opportunities for third-party participation through our respective Open Calls.

By connecting projects across the ECCCH community, we are building a stronger, more collaborative digital ecosystem for Europe's cultural heritage.

A big thank you to the MusicSphere team and everyone who joined us to discuss the future of cultural heritage preservation!



[Discover MusicSphere](#)

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KINETIKA is part of the [ECCCH](#) initiative.