IMPLEMENTING THE 4CH VISION

4CH Kick-off Meeting | 9 February 2021

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The landscape of Cultural Heritage in Europe and the necessary actions

The landscape

- Cultural Heritage is universally acknowledged as a key factor for identity, cohesion and people's well-being

- Tangible heritage is facing a number of challenges such as degradation due to time, climate change, or pollution; effects of natural or man-made disasters; lack of finance or insufficient valorisation. Intangible heritage is at the risk of oblivion, which can be addressed only involving communities and preserving their memories

- Digital technologies appear to be key to mitigate such risks and to remediate their adverse effects. But still, cultural heritage digitization has made less progress than necessary and building professionals' capacity is required

- Cultural Heritage is an important economic resource, both for its value for Cultural and Creative Industries and as an attraction for tourism. Also under this regard, the digital turn is decisive

- In conclusion: preserving, safeguarding and valorising cultural heritage is of paramount importance for Europe; state-of-the-art digital technologies are a pillar to achieve this result

Cultural Heritage and societal issues:

From the *Europe Day Manifesto** titled "*Cultural Heritage: a powerful catalyst for the future of Europe*", underwritten by the European Heritage Alliance, an informal platform formed by 49 major cultural organizations in Europe:

- Cultural heritage can act as a catalyst for **positive change in society**
- Cultural heritage plays an essential role for the **physical and mental wellbeing** of every individual and of our societies
- Cultural heritage ensures the link between our **roots, identities, and traditions** and the wider European and global picture
- **The COVID-19 outbreak has underlined the critical importance of digital access to cultural heritage. For this it is paramount to narrow the divide between institutions that are digitally equipped, and those that are not**
- There are clear **benefits of heritage investment** for the regeneration of cities and regions, both on individual and community levels
- **Tourism** needs cultural heritage and cultural heritage needs tourism

* https://www.europanostra.org/europe-day-manifesto-cultural-heritage-a-powerful-catalyst-for-the-future-of-europe-just-released/

The 4CH approach

- Cultural Heritage must fully adopt the digital transformation as a goal, availing of state-of-the-art technological solutions
- Such solutions must be shared across Europe, supporting common standards and innovative services in which digital technology plays a key role
- To make the best out of this transformation, several subordinate goals must be attained:
  - Collect and harmonize data, digital tools & services based on innovative technologies
  - Tailor solutions to the diverse local contexts, regulations and backgrounds
  - Empower heritage professionals and institutions through a wide collaboration supporting the necessary knowledge transfer
  - Exploit the potential of Cultural and Creative Industries, especially SMEs
  - Secure (and enable heritage institutions in securing) the necessary financial support from public or private sources
  - Coordinate collaboration among institutions, organizations and individuals
  - Foster citizens' appreciation, participation and inclusion

Challenges, risks and opportunities for Cultural Heritage in Europe: the 4CH vision

Challenges and risks

Challenges for cultural heritage

- Disasters and other physical risks
- Missing the adoption of state-of-the-art digital technology for valorisation
- Lack of collaboration within and across subsectors, within and across national borders, within and across specific communities
- Lack of awareness and knowledge among professionals and institutions of the opportunities offered by the digital transformation

Adverse effects if not addressed

- Deterioration and destruction
- Lack of interest and participation by the public
- Fragmentation and reduced impact

- Increase of the digital divide between digitally-equipped and not equipped actors

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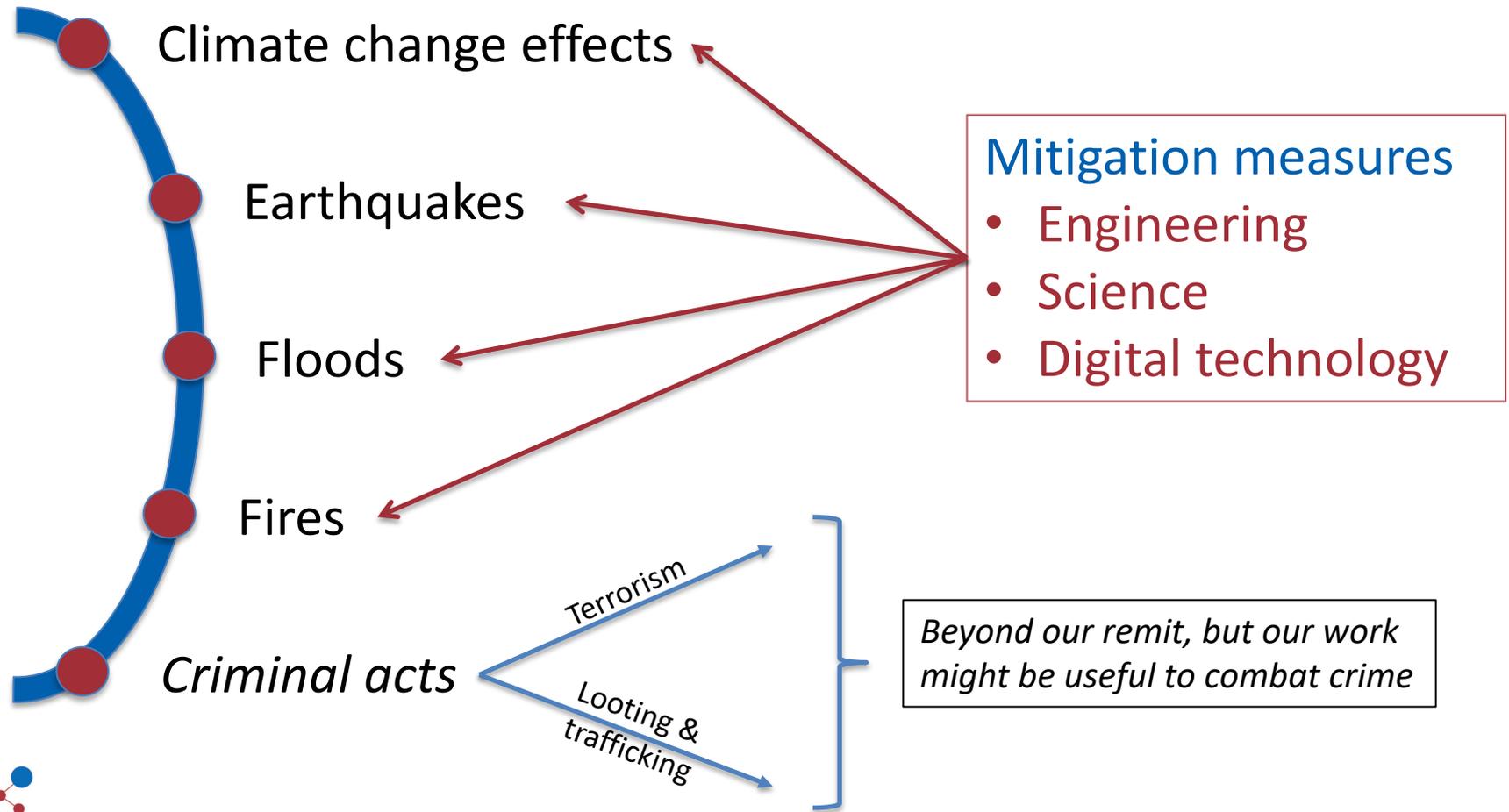
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Threats for Cultural Heritage

Climate change effects

Earthquakes

Floods

Fires

Criminal acts

Terrorism

Looting & trafficking

Mitigation measures
- Engineering
- Science
- Digital technology

Beyond our remit, but our work might be useful to combat crime

Climate change effects: '*Acqua alta*' in Venice

- *Acqua alta* (high water) is the combined effect of high tide and northern winds, which raise the water level in Venice. This damages historic buildings and their ornaments
- The threat is worsened by the sea level rise and by weather instability
- Local action: the MOSE (2020), an artificial dam raising up when *acqua alta* is expected; weather alerts based on **efficient meteo models**
- **Conservation and restoration** (e.g. St. Mark's mosaics)
- **Global action required: fight against global warming**
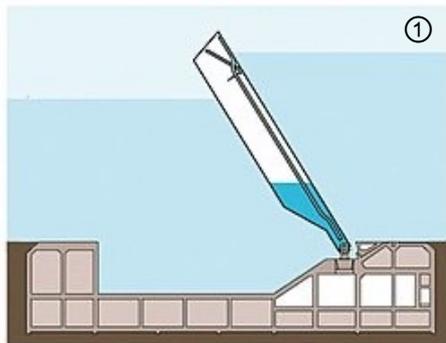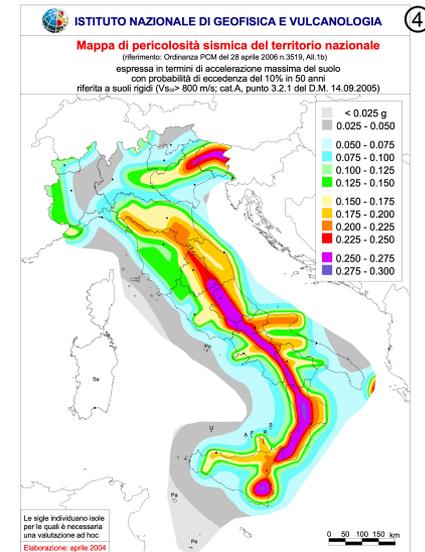

How the MOSE works

Earthquake in L'Aquila (2009)

- Exceptional earthquake (2009)
- Historic buildings heavily damaged or destroyed

Mitigation measures

- Seismic risk map (INGV+ICR)
- **Models of buildings statics** to assess stability and plan restructuring and conservation
- **3D models** for restoration or reconstruction

Roof of St. Mary's, Collemaggio

Façade and top floor, Spanish Fort

Collapsed dome of Holy Souls', Paganica

Flood in Florence (1966)

- Historic centre of Florence (UNESCO WH site) covered with 2-6 m of water by the disastrous flood of the Arno river (1966)
- Altarpiece by Cimabue damaged in Santa Croce
- Artworks and archive material irreparably damaged

Mitigating measures

- Hydraulic spillways and basins built upstream and downstream of Florence
- Risk alert for bad weather
- Maps of hydrologic risk
- **Restoration of damaged monuments and artwork** (digital documentation)

Fire of Notre-Dame, Paris (2019)

- Fire broke out in the attic during renovation works probably for a short circuit
- Misunderstandings in the beginning
- Fire brigade called 40 min after alarm

Damages:

- Destruction of 2/3 of the roof and of the spire
- Minor damages to the interior

Restoration and remedies

- **Use of graphic/3D documentation for restoration**
- **3D models (and VR) to be used to evaluate reconstruction projects**

Video: https://youtu.be/cwZq6LNdBLU

What can 4CH do to prevent disasters or to mitigate their effects

- Collect, select, assess, adapt and standardize tools & methods for
    - 3D modelling
    - Managing conservation documentation and other data
    - Testing heritage resilience on digital twins
- Set up interfaces with Big Data services such as
    - Weather forecast
    - Earth & environment data
    - Climate change impact
    - Risk maps
- Assess the impact of IoT
- Empower heritage professionals to avail of the above
    - Capacity building
    - Guidelines and best practices
    - Training
    - Advice

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Heritage valorisation

Is the potential of digital transformation fully exploited in the cultural heritage domain?

The recent closure of museums, monuments and sites due to the COVID-19 epidemy was disastrous: UNESCO estimates that 85% had to downsize their offer and 20% may not reopen at all. It forced heritage institutions to develop online resources.

- This experience was analyzed in the NEMO survey on museums, producing a report
- It recommends is to act immediately with **investments in digital cultural heritage**
- It could be the starting point for an in-depth analysis: how do heritage institutions avail of digital technology?
- What kind of alternative did they offer to the public:
    - Simple or panoramic virtual visits from their web site
    - Presence on social networks
    - (very little) VR and AR
- Indications expected from the results of the recent EU call H2020-SC6-TRANSFORMATIONS-2021 about small museums
- **What about monuments and sites?**

Some examples

⑮

A YouTube video demonstrating the use of VR to tell the history of the *Mausoleum of Augustus* in Rome through time, featured by the world-famous orchestra conductor Riccardo Muti

⑯

0:00 / 1:00

Video: https://youtu.be/zXSxe_AFyGg

4CH for the valorisation of Cultural Heritage

Supporting heritage valorisation may not be our core business, but we will collaborate with other organizations such as **Europeana**, heritage organizations and individual institutions to make our technology and our data available and re-usable to valorise cultural heritage.

Heritage valorisation is built-in in several 4CH tasks addressing this aspect and will grow trough:

- The work to be done within the **dedicated tasks** and the contribution of our **SME partners**
- The potential **re-use of our results** also for this purpose
- The **liaisons** established by our partners representing Europe-wide heritage associations
- At European level, the **forthcoming collaboration with Europeana as a strategic partner** and other Europe-wide organizations
- At national levels, the **collaborations** to be established with **heritage agencies**
- Via the presence of representatives of international heritage organizations in our **Advisory Board**, acting as 4CH ambassadors

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Collaborations on technology

In addition to the already mentioned collaborations about heritage valorisation, 4CH adopts an inclusive approach on technology and innovation
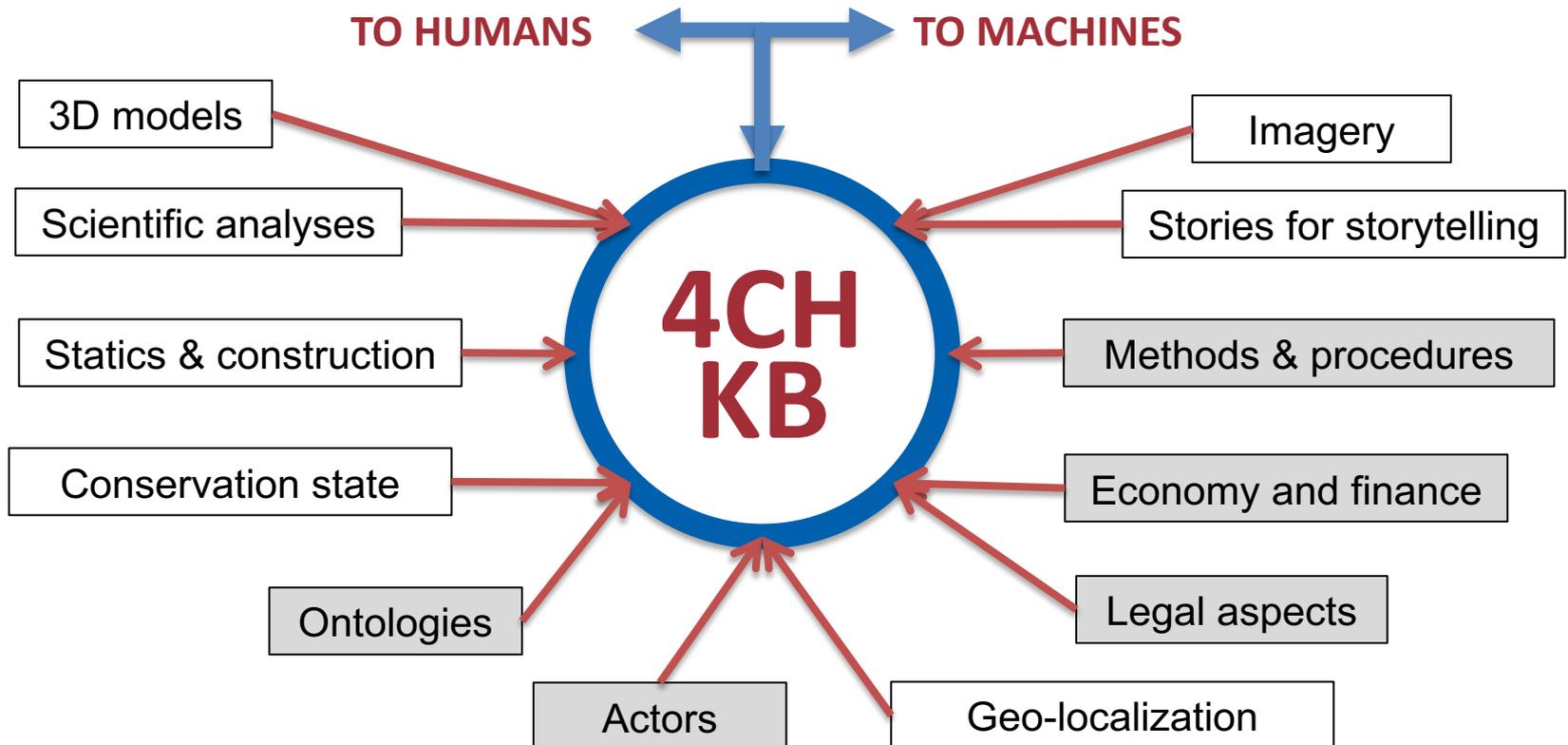
- Fostering the **co-operation** with qualified actors in all the technological fields
- Incorporating in our perspective the work done, among others, by the **EU Expert Group on Digital Cultural Heritage and Europeana**, by the **Europeana task force on 3D** and in previous EU projects
- Supporting the definition of **shared solutions to still open questions** such as, for example, issues concerning
  - The efficient storage of, and access to 3D models, and systems to find them
  - Clear criteria about their overall quality and suitability for different uses, to make re-use a reliable option
- Promoting the adoption of **interoperable documentation systems**, especially for scientific and technical data
- Collaborating with other key actors to the creation of a **EU-wide cultural heritage common data space** built on cloud technology and cloud-to-edge services, where the **4CH data cloud and knowledge base** may fully integrate

The 4CH Knowledge Base

- A **Knowledge Base (KB)** is a repository where information is stored, organized, and shared

- Users can access the KB, search into it and navigate it

- Topics in the KB are related to each other because they are organized according to a **common ontology**. Any topic contains concepts that are also present in other topics: they work as links between the two. The whole KB may be represented as a **graph** as in the figure.

- The KB may also link to external information

- For example, documentation of a historic palace may state that "it has a wooden roof". This relates that document to "wood conservation" and to "roofs" as well as to other documents about that palace, e.g. 3D models

- Both humans and machines can access a KB

⑰

Some good news about the 4CH KB and its ontology

- The **4CH KB** will be organized according to a **standard ontology** called CIDOC CRM (an ISO standard), universally accepted in the Cultural Heritage domain. It already covers 80% of the documentation types relevant for 4CH: this means that we will just need to extend it to the remaining 20%

- The CRM_{4CH} is **fully compatible with EDM**, the Europeana data model. This will enable to grow the 4CH KB as a companion of Europeana on the scientific side

- The 4CH KB will use **aggregation**: the actual content will be stored in a distributed way. This will solve a number of issues:

  - **No massive data transfer** for all operations, only lightweight text files: efficiency, speed, and a smaller environmental footprint

  - Actual **data will reside at data owners** (e.g. national repositories), avoiding issues with copyright, licensing and so on, as well as any psychological resistance to "give our stuff away"

  - Most, if not all, **processing** (e.g. 3D models construction, AI applications, etc.) can be made **at the edges of the cloud** and not at a 'Big Brother' central point

What will go into the 4CH Knowledge Base

Everything. Or, better, the metadata of everything, linked to the actual data.

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Provisions for capacity building

- Shared across Europe in different national languages
- Covering technology, procedures and skills
- Including for example
    - Guides to good practices
    - Webinars, videos, presentations and more
    - Manuals and reference documentation
    - Support (e.g. didactic material) for courses
    - Up-to-date information on policies, regulations and opportunities
- Content to be created internally or in collaboration within our collaboration network
- Whenever suitable, re-using (or linking to) existing material developed by others
- **Included in our KB for easy retrieval**

Thank you!

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www.4ch-project.eu

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