OUR HERITAGE: WHERE THE PAST MEETS THE FUTURE

2018 EUROPEAN YEAR OF CULTURAL HERITAGE #EuropeForCulture

The **RESCULT project**

Increasing Resilience of Cultural heritage: a supporting decision tool for the safeguarding of cultural assets

Massimo Migliorini

Istituto Superiore sui Sistemi Territoriali per l'Innovazione

migliorini@siti.polito.it | +39 339 57 32 462

Version: 24 October 2018

Presentation Summary

ResCult

www.rescult-project.eu

Cultural Heritage Resilience against Disasters

A complex multidisciplinary problem

European Commission

Istituto Superiore sui Sistemi Territoriali per l'Innovazione

UNISDR United Nations Office for Disaster Risk Reduction

POLITECNICO DI TORINO

CORILA

SDIS ALPES DE HAUTE-PROVENCE

Technische Universität Berlin

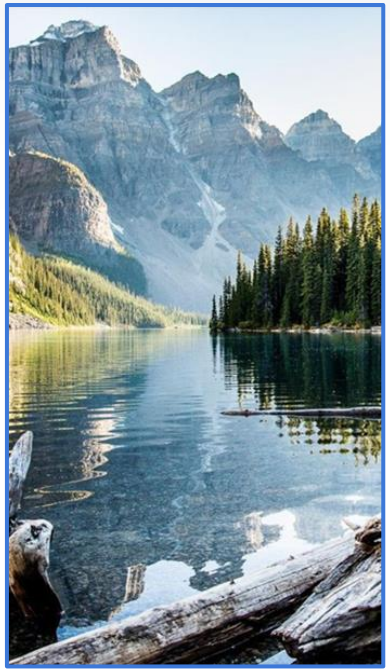
IUAV

Cultural Heritage: a inestimable value for human kind

"History is the witness that testifies to the passing of time; it illumines reality, vitalizes memory, provides guidance in daily life and brings us tidings of antiquity."

Marcus Tullius Cicero

Parks and Reserves

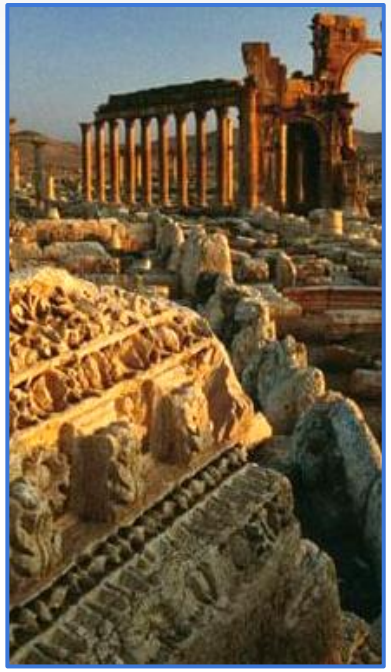


Religious Symbols

Libraries and Archives

Historical Monuments

Archaeological Sites



Architecture

The need to protect Cultural Heritage

Universal value and heritage of Mankind

Witnesses of people's history

Religious symbols

Cultural Heritage

Investment assets

Material catalysts of culture

High market value

What can threaten a cultural heritage

A growing need for **security** in cultural heritage domain, which are **constantly *threatened***

Disasters, including:

Floodings

Earthquakes

Fires

Man-made Threats, including:

Terrorism

Vandalism

Armed Conflicts

ResCult

www.rescult-project.eu

The **RESCULT** Project

European Commission

Istituto Superiore sui Sistemi Territoriali per l'Innovazione

UNISDR United Nations Office for Disaster Risk Reduction

POLITECNICO DI TORINO

CORILA

SDIS ALPES DE HAUTE-PROVENCE

Technische Universität Berlin

IUAV

Partners

UNISDR

United Nations Office for Disaster Risk Reduction

UNISDR

The United Nations Office for Disaster Risk Reduction

Technische Universität Berlin

TUB

Technische Universität Berlin

POLITECNICO DI TORINO

POLITO

Politecnico di Torino

PROJECT COORDINATOR

SITI

Istituto Superiore sui Sistemi Territoriali per l'Innovazione

SITI

Istituto Superiore sui Sistemi Territoriali per l'Innovazione

SDIS ALPES DE HAUTE-PROVENCE

SDIS 04

Service Départemental d'Incendie et de Secours des Alpes de Haute-Provence

CORILA

CORILA

Consortium for managing research activities in the Venice Lagoon system

IUAV

IUAV

International University of Venice (affiliated partner)

Objectives

Enhancement of the capability of Emergency Management Bodies and Operators to understand/prevent/mitigate disasters impacts on Cultural Heritage.

Improvement of Disaster Risk Management, policies and behaviors (for prevention and resilience), according to the principles of **Sendai Framework**.

Increase cooperation and interoperability between EU member states for the sake of protecting Cultural Heritage (*information sharing, interoperable protocols, best practices dissemination, alignment with EU policies/standards*).

Features

EID

European Interoperable Database

- European Heritage Map
- Disaster Information Archive
- 3D models
- Risk analysis
- Advice-seeking
- Crowd-data acquiring

Beneficiaries

National and local authorities

Emergency operators

CH protection and management entities

Citizens & local communities

Research centres

Case Studies

The Santa Maria dei Miracoli Church

is a major touristic site in the city of Venice, Italy and of great religious importance. Dating back to the late 15th century the church is not only architecturally significant but contains a number of important artworks as well. Their vulnerability especially to flooding will be studied.

The Prehistoric Museum of Quinson

aims at retracing the human adventure in Provence, restoring the results acquired for several decades by the scientists. It contains large amount of archaeological furniture collections dated from the Paleolithic, Neolithic and Bronze Age.

The Convent of San Nicola a Tolentino

in the Marche region of Italy contains architectural heritage such as the Basilica of St. Nicolas and numerous artworks from the 14th to the 17th century. The vulnerability of the complex especially to earthquakes will be assessed.

Events

RESCULT FIRST USER FORUM

International meeting for Cultural Heritage Stakeholders to collect feedback on the EID

(Venezia, Italy, 29 November 2017)

Meeting with Marche Region

Centre-Italy Earthquake case study

(Tolentino, Italy, 3 October 2017)

World Reconstruction Conference 3

Event Organised by World Bank and Global Facility for Disaster Reduction and Recovery (GFDRR)

(Bruxelles, Belgium, 6-8 June 2017)

Cultural Heritage in the Digital Era

Closed-door event, invitation by the European Commission

(Bruxelles, Belgium, 25 October 2017))

Innovation in the intelligent management of Heritage Buildings

COST ACTION TD 1406, 4th MC meeting

(Valletta, Malta, 26 September 2017)

Global Platform for Disaster Risk Reduction Conference

Event Organised by United Nation Office for Disaster Risk Reduction (UNISDR)

(Cancun, Mexico, 22-26 May 2017)

Events

FINAL CONFERENCE

RESCULT final conference will be held inside the ***European Forum for Disaster Risk Reduction (EFDRR)***

(Rome, Italy, 21 November 2018)

EUROPEAN FORUM FOR DISASTER RISK REDUCTION
ROME, ITALY 21-23 November 2018

Discussion about RESCULT project and disaster data management relevance with the European Scientific Technology Advisory Group

(Sofia, Bulgaria, 25 April 2018)

Digital Technologies for Cultural Heritage - Training School

Event Organised by the COST ACTION TD1406, where RESCULT was presented as a best practice

(Podcetrtek, Slovenia, 4-6 April 2018)

Colloque international Musées Résilients Inondations

Event Organised by AVEC
(Alliance de Villes Européennes de Culture)

(Arles, France, 20 June 2018)

6 TRAINING SESSIONS and Third User Forum

Series of events to present the final release of the EID

Training Sessions: September – October 2018
THIRD USER FORUM: 9 November 2018

RISK SIMULATION DISASTER SESSION

Simulation of crisis management operations on Quinson Prehistoric Museum organised by French Civil Protection

(Quinson, France, 11 – 13 June 2018)

Second User Forum

A series of events to collect feedback on the EID from stakeholders:

- 1 March 2018, Tolentino (Italy)
- 8 March 2018, Digne Les Bains (France)
- 15 March 2018, Manosque (France)
- 22 March 2018, Quinson (France)
- 11 April 2018 Venice (italy

Networking and liaising

Institutions

- *UNESCO CHAIR on Bio-Cultural Landscape management*
- *UNESCO CHAIR on Water-related Disaster Risk Reduction*
- *UNESCO CHAIR on Digital Cultural Heritage*
- *DG ECHO*
- *DG JRC*
- *ERA CHAIR on Digital Heritage*

Soprintendenza Archeologia, belle arti e paesaggio per il Comune di Venezia e Laguna

Cultural heritage in digital-era event

Research project and initiatives

COST TD 1406: Innovation in Intelligent Management of Heritage Buildings

The EUROPEAN INTEROPERABLE DATABASE (EID)

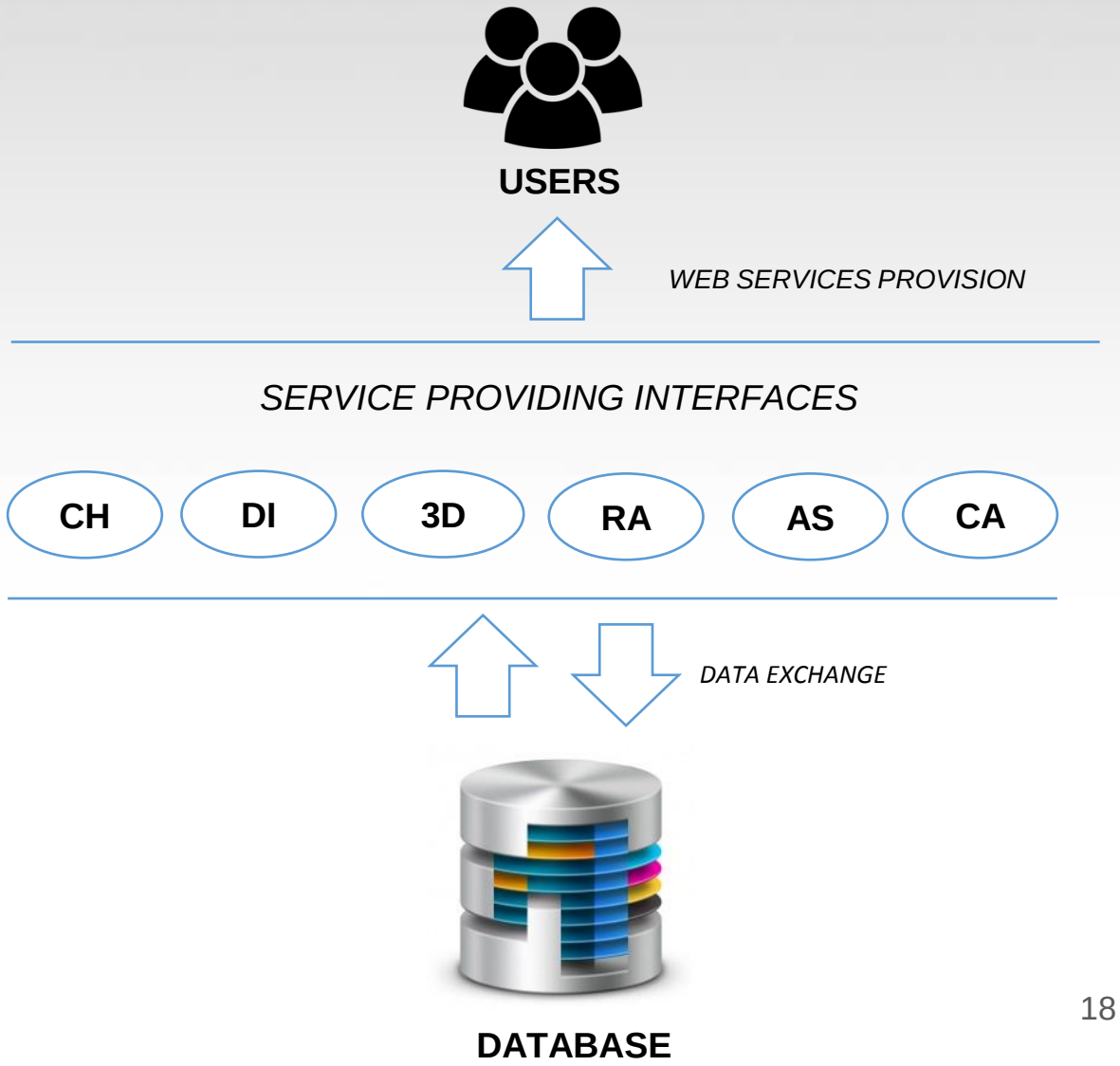
EID Summary

What is the EID

The European Interoperabile Database (EID) is a **webservice-providing tool** composed by seven different elements:

- 1 database

- 6 web service-providing interfaces:
  - **CH** - CULTURAL HERITAGE
  - **DI** - DISASTERS INFORMATION
  - **3D** - 3D MODELS
  - **RA** - RISK ANALYSIS
  - **AS** - ADVICE-SEEKING
  - **CA** - CROWD ACQUIRING



Main Features

1 Compliance with several international standards

GIS data sharing

CityGML

INSPIRE · Infrastructure for Spatial Information in Europe

The EID structure contains an extension of the INSPIRE data model for CULTURAL HERITAGE!!

Cultural Heritage Classification

UNESCO
United Nations Educational, Scientific and Cultural Organization · World Heritage Convention

ARCHITECTURE & PATRIMOINE
FRANCE

Ministero dei beni e delle attività culturali e del turismo
MIBACT

Joconde

europeana collections

icccd
Istituto Centrale per il Catalogo e la Documentazione

Main Features

2 Hosting different cultural heritage types:

- Either tangible or intangible
- Either movable or unmovable
- A structural part of another Cultural Heritage (ex: inlaid roof as a part of an historical building)
- A Cultural Heritage “inside” another Cultural Heritage (ex: an artwork inside an historical museum)
- A spatially extended area (ex: natural landscape)
- A progressively detailed scale based on 3D geometry (CITYGML LOD 1-2-3-4)

ALL Cultural heritage types can be stored and properly represented!!

3 Other existing datasets can be automatically integrated in the EID

An SQL scripts library was created to enable the automate integration of other existing cultural heritage databases (after exported in excel format)

No effort from Public or Private Bodies to align their cultural heritage datasets!!

Currently tested for:
- *Europeana Database*
- *Joconde Database*
- *SIRPAC Database*

4 Support to the *Sendai Framework for Disaster Risk reduction* implementation monitoring through the collection of disaster loss data for improved risk understanding

Indicators to monitor Sendai Framework target C (Estimate Direct Economic Loss) are integrated in the structure of the EID

The EID format can be used to facilitate the data collection from Member States to fill Sendai TARGET C indicators!!

***Reference**:s Technical Guidance for Monitoring and Reporting on Progress in Achieving the Global Targets of the Sendai Framework for Disaster Risk Reduction, UNISDR*

5 Interest gathering from Authoritative Bodies

- Private companies with proven experience in CH data management
- Emergency Operators
- Public Entities (Regions, Municipalities)

Signed letters and official communications of interest for supporting the diffusion of the EID!!

6 Risk analysis for Cultural Heritage

A risk analysis method for unmovable ("*Asset Risk Evaluation Cards - AREC"*) and movable ("*Methods of Analysis for Safeguarding Artworks - MASA*) cultural heritage was developed and integrated in the EID to support emergency operators in identifying Cultural Heritage vulnerabilities to natural disasters (in particular Flood, Fire, Earthquake).

The EID can support decision-makers!!

References:

- *UNI EN 13501-1:2009.*
- *UNI EN 1998 1/2/3/4/5/6 (2005-2009)*
- GODIN et Al («Comment garantir la sauvegarde des œuvres patrimoniales»)

7 Hub for knowledge sharing

Best Practices can be hosted and uploaded by external users in the EID, on a dedicated repository. The EID can support knowledge exchange and cultural heritage resilience increasing

Transboundary dimension and capacity to support multilateral cooperation!!

Structure and Interfaces

USER PC with Quantum Gis (Open-source software)

INTERNET CONNECTION

RESCULT SERVER

USER NAME and PASSWORD

USER TYPE 1

USER TYPE 2

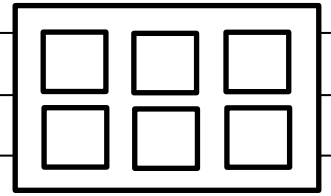
USER TYPE 3

Different USER TYPE with different PRIVILEGES

EID SERVICE PROVIDING INTERFACES

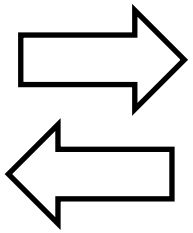
- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA** - CROWD ACQUIRING

DASHBOARD



DATABASE

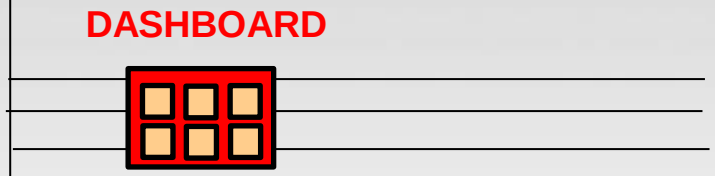
DATA EXCHANGE



Interface 0 -- The Dashboard

DASHBOARD OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING



TECHNICAL

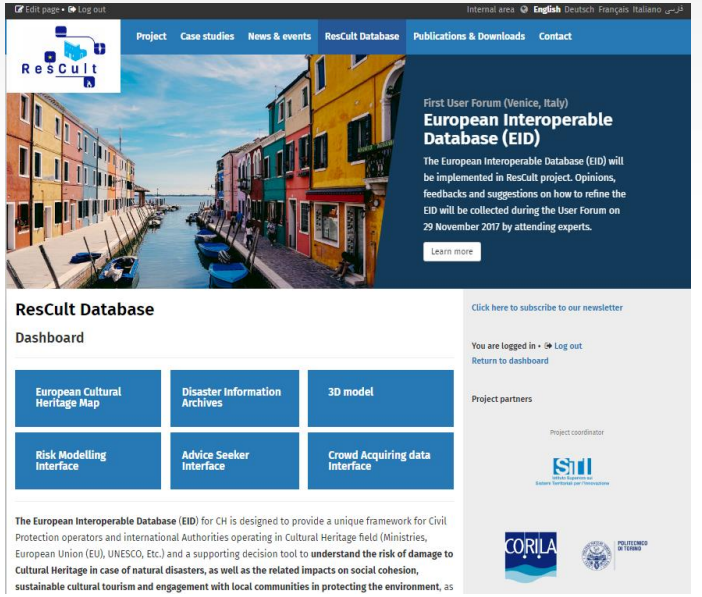
PURPOSE: Provide a centralized common access to all the EID Interfaces.

DESCRIPTION: A web page with a general description of the EID and a Dashboard with 6 blue buttons linking to the different interfaces.

FEATURES: the web page can access any EID interface. Depending on your user account type, you can have different privileges and see different data and or features.

HOW to ACCESS: Download and install Quantum GIS on your PC, at the following link: https://www.qgis.org/it/site/forusers/download.html.
Open a Web Browser and go to RESCULT website (www.rescult-project.eu). Click «EID» on the menu. Log in with your username and password.

VISUAL



Interface 1 – CULTURAL HERITAGE

CH Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING

DASHBOARD

TECHNICAL

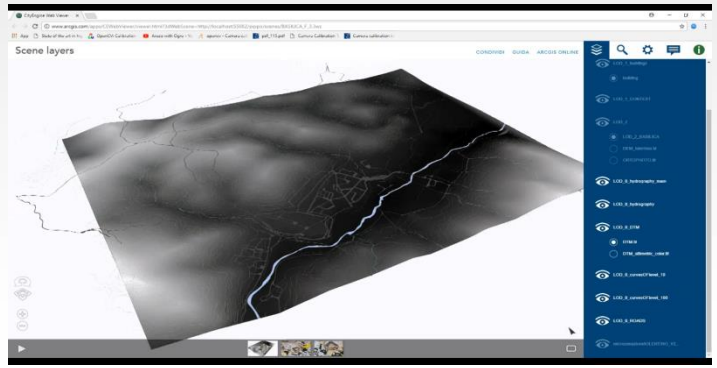
PURPOSE: to share GIS-based information about Cultural Heritage including data which are relevant to support local authorities and emergency operatoris in increasing Cultural Heritage resilience against natural hazards.

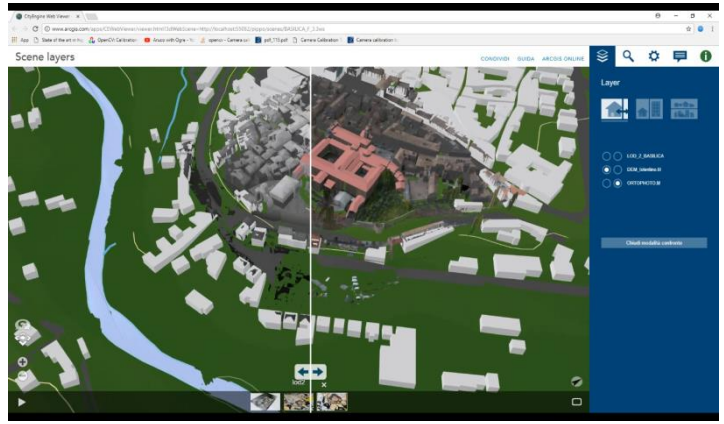
DESCRIPTION: A GIS-based interface connected to the EID to visualise the Cultural Heritage related data with different layers and geometries.

FEATURES: The Cultural Heritage can be showed with different geometries, parametrised according to CITYGML standards:
LOD 0 – regional, landscape
LOD 1 – city, region
LOD 2 – city districts, projects
LOD 3 – architectural models (outside), landmarks
LOD 4 – architectural models (interior)

.

VISUAL

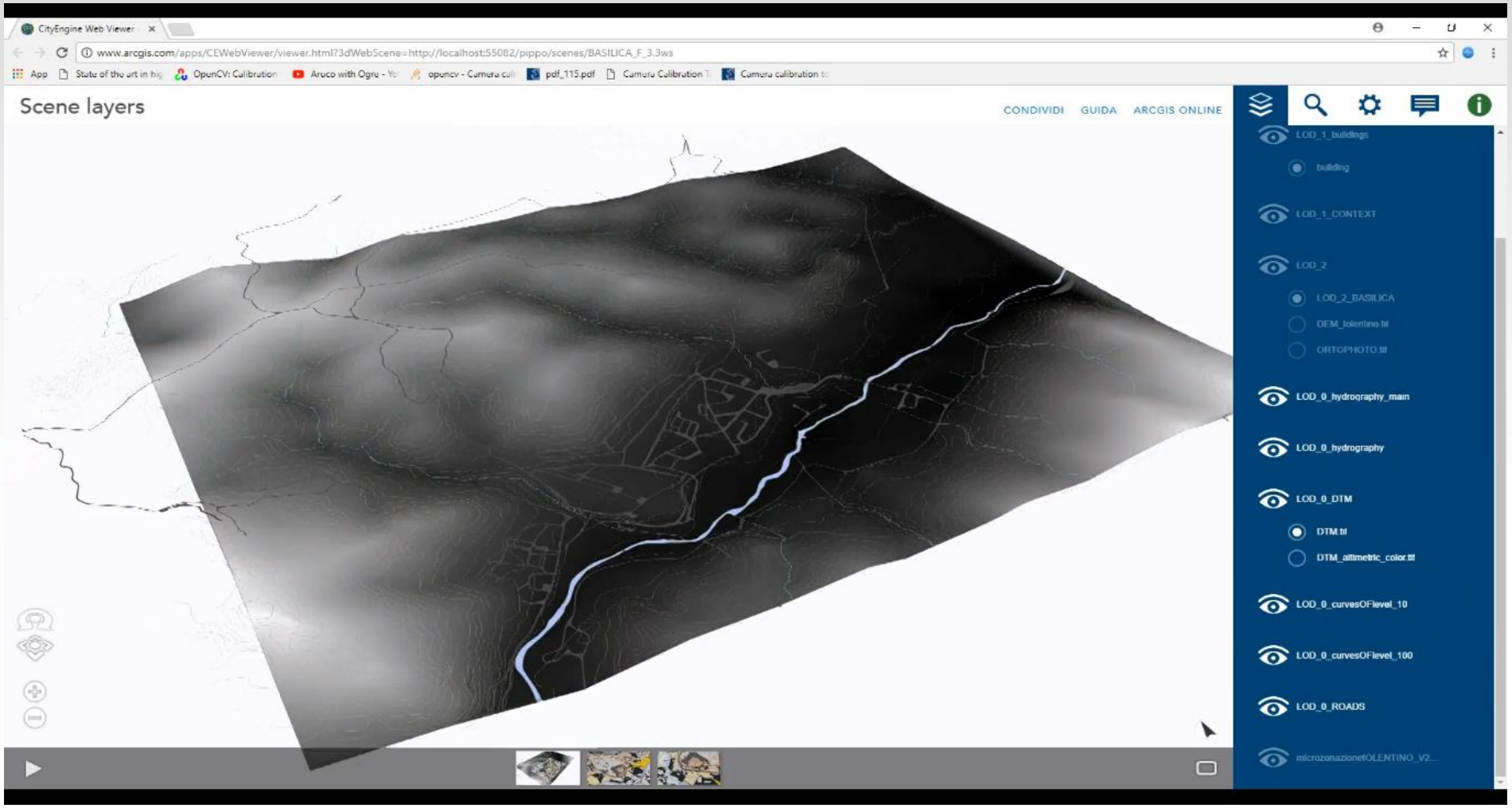


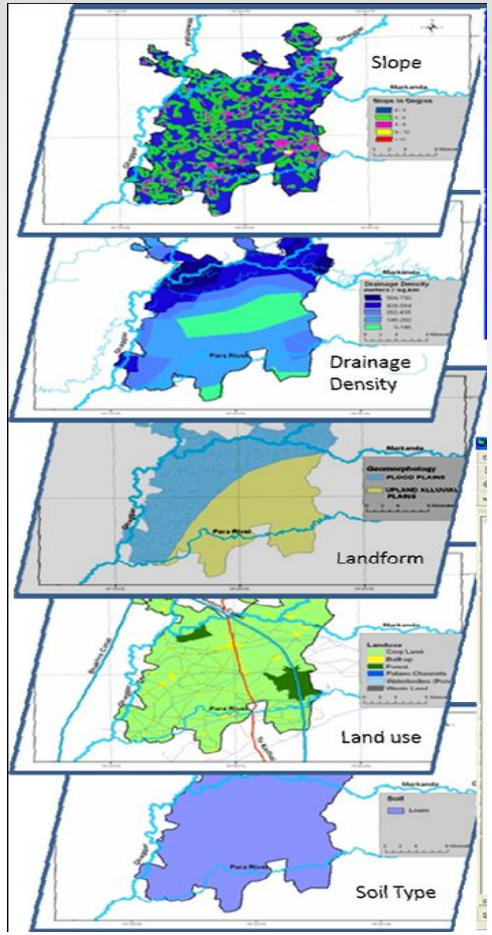


Link to Video: https://www.youtube.com/watch?v=mqxi-WalyTo

Interface 1 – CULTURAL HERITAGE

SAMPLE SCREEN 1: Digital Terrain Model and other plane layers



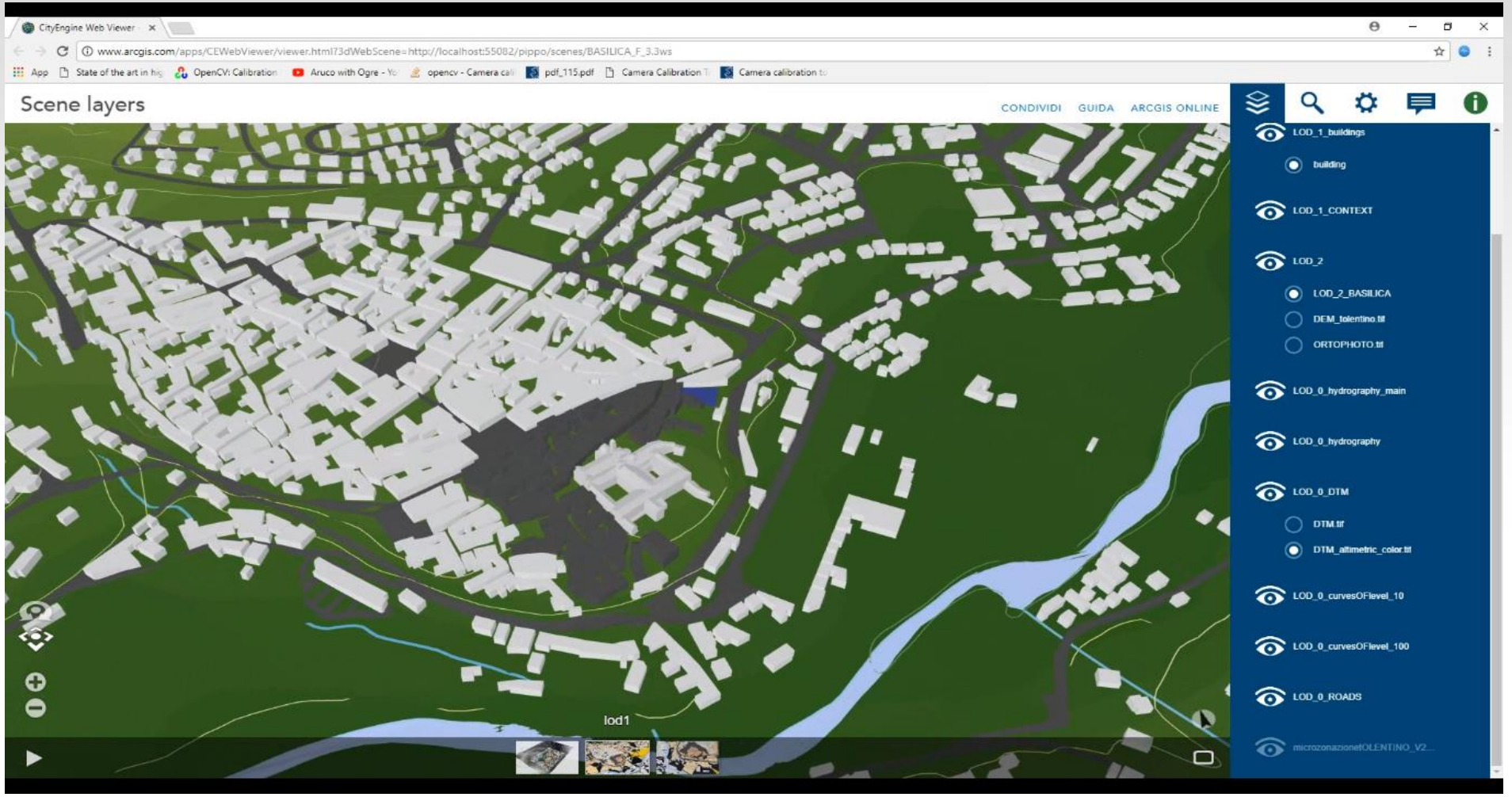


CITYGML Geometry: Level of Details 0 (regional, landscape)

Link to Video: https://www.youtube.com/watch?v=kAcwCM4sT-0

Interface 1 – CULTURAL HERITAGE

SAMPLE SCREEN 2: Heritage Building Theme

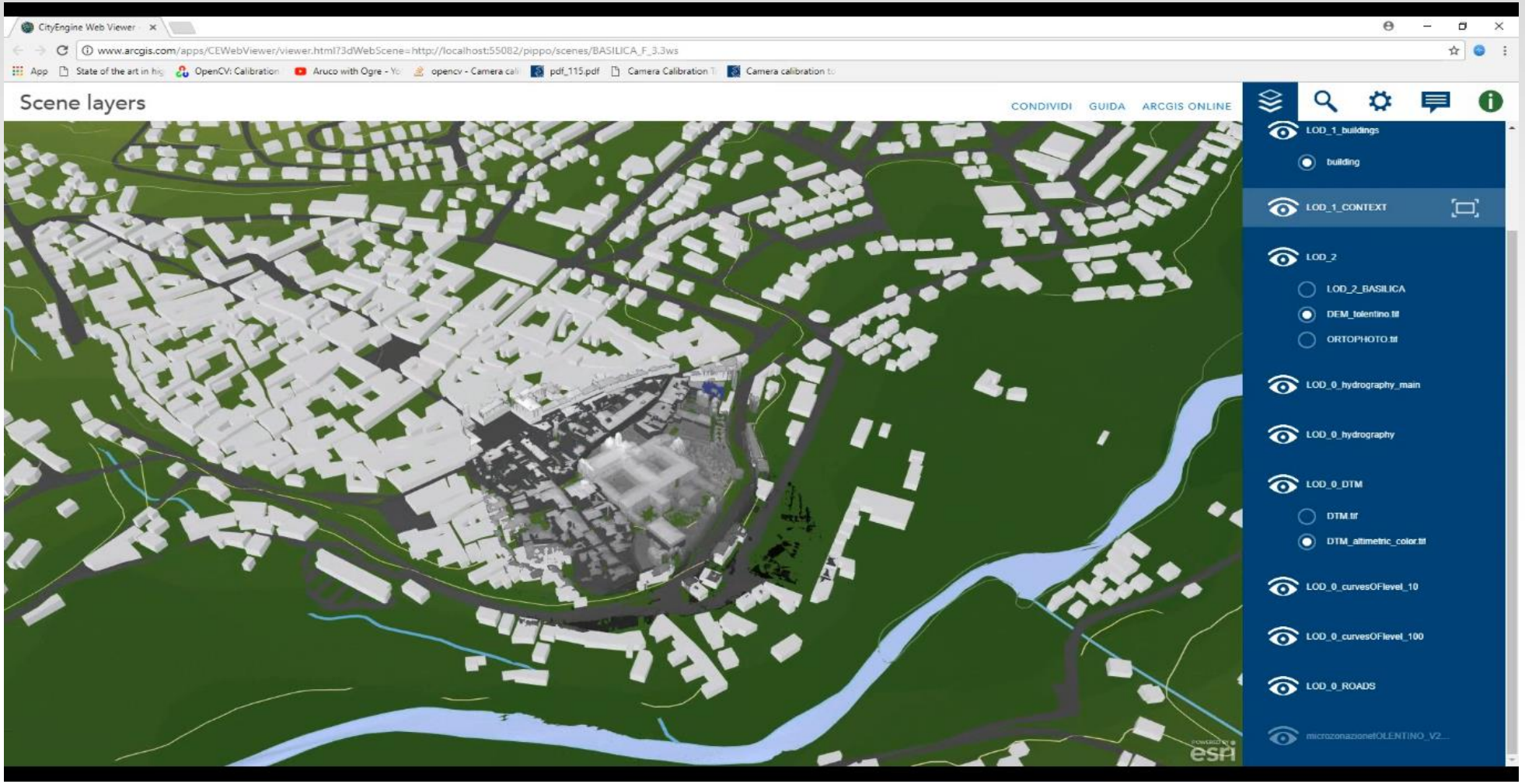


CITYGML Geometry: Level of Details 1 (city, region) and 2 (city districts, projects)

Link to Video: https://www.youtube.com/watch?v=kAcwCM4sT-0

Interface 1 – CULTURAL HERITAGE

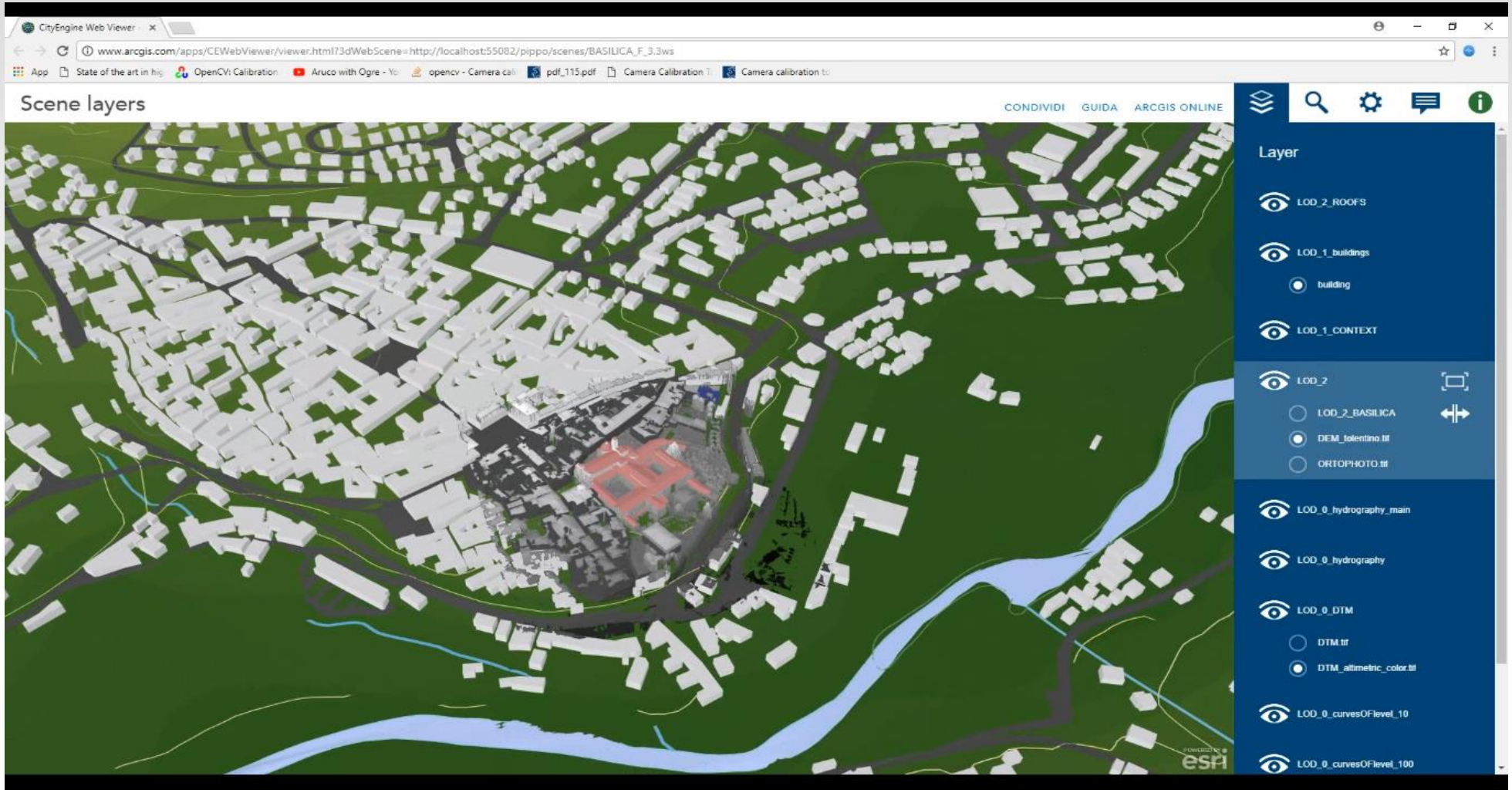
SAMPLE SCREEN 3: Heritage Building Theme



CITYGML Geometry: Level of Details 2 (city districts, projects), and Digital Elevation Model

Interface 1 – CULTURAL HERITAGE

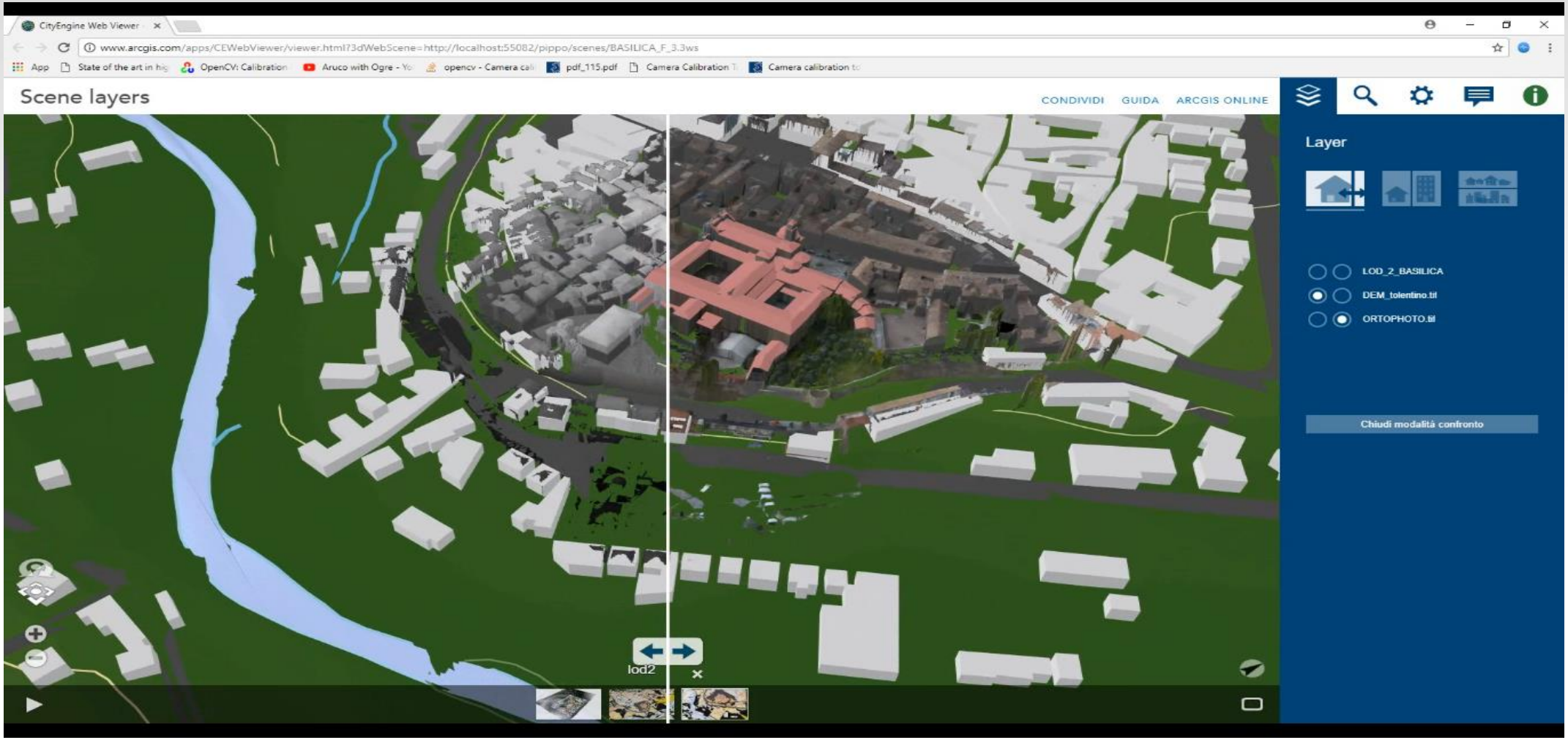
SAMPLE SCREEN 4: Heritage Building Theme



CITYGML Geometry: Digital Elevation Model with roofs details

Interface 1 – CULTURAL HERITAGE

SAMPLE SCREEN 5: Heritage Building Theme



CITYGML Geometry: Level of Details 2 (city districts, projects) with Ortophoto

Interface 2 – DISASTERS INFORMATION

DI Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING

DASHBOARD

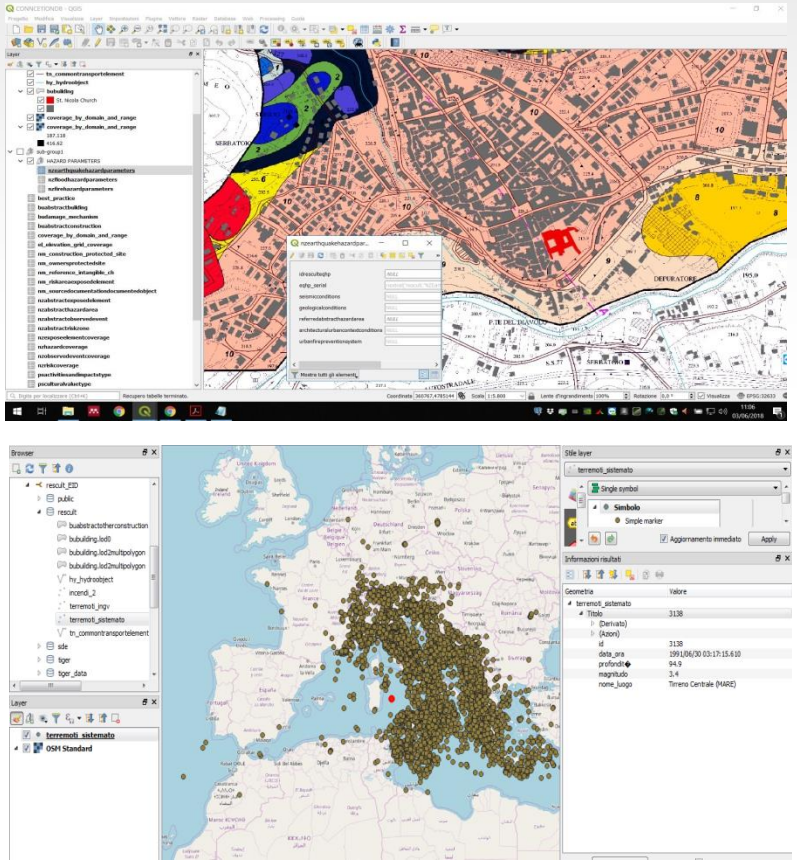
TECHNICAL

PURPOSE: to share GIS-based information about Natural Hazards (with focus on Flood, Fires, and Earthquakes) including data which are relevant to support the monitoring process of the Sendai Framework implementation.

DESCRIPTION: A GIS-based interface connected to the EID to visualise Natural Disasters related-data.

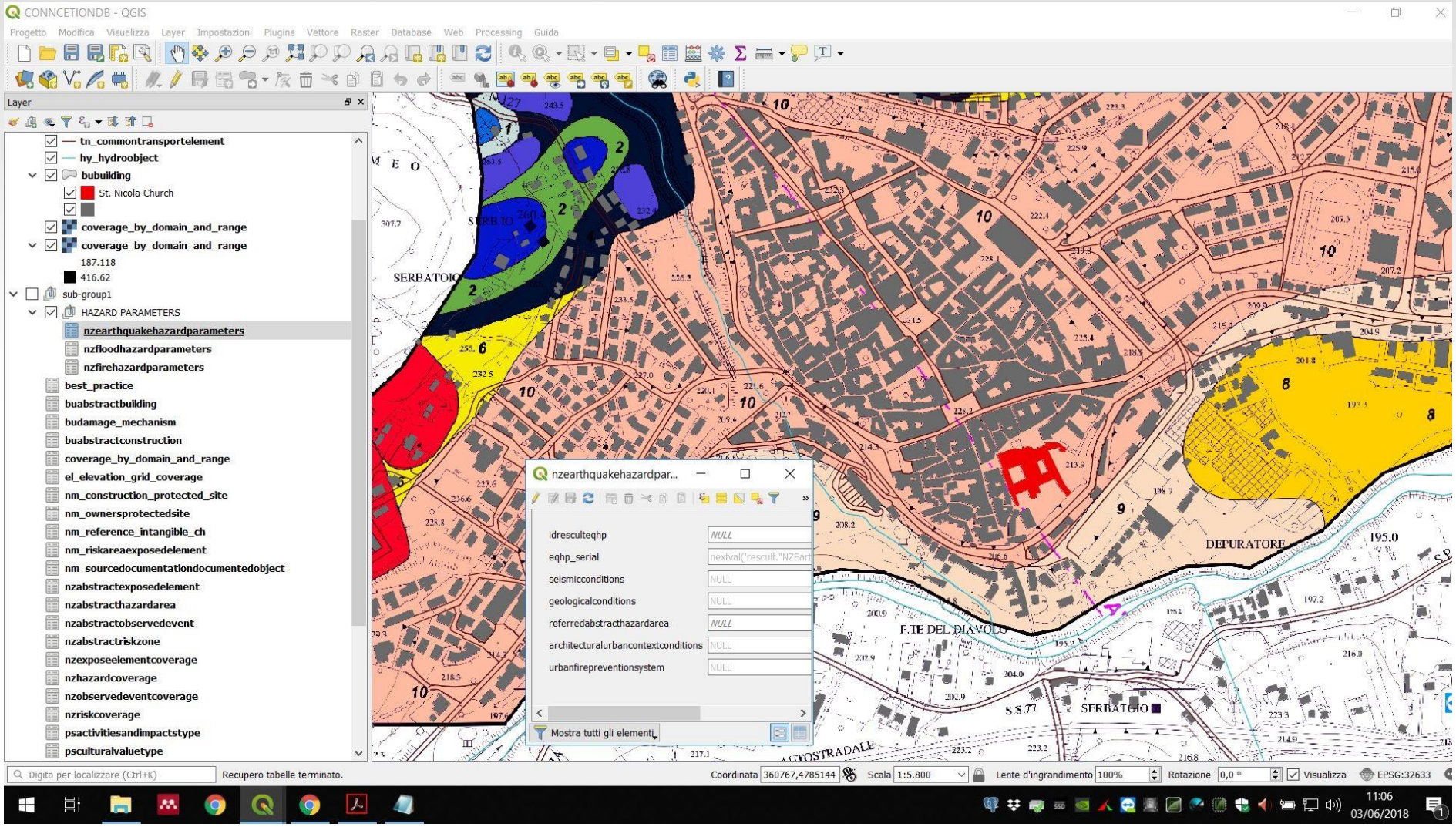
FEATURES: Data includes Sendai Framework Indicators from Target C (*Estimate Direct Economic Loss*), in particular C6 Group (*Direct economic loss to cultural heritage damaged or destroyed attributed to disasters*).
The indicators have been reported according to the Technical guidance for monitoring and reporting on progress in achieving the global targets of the Sendai Framework for Disaster Risk Reduction, published by UNISDR in 2018.

VISUAL



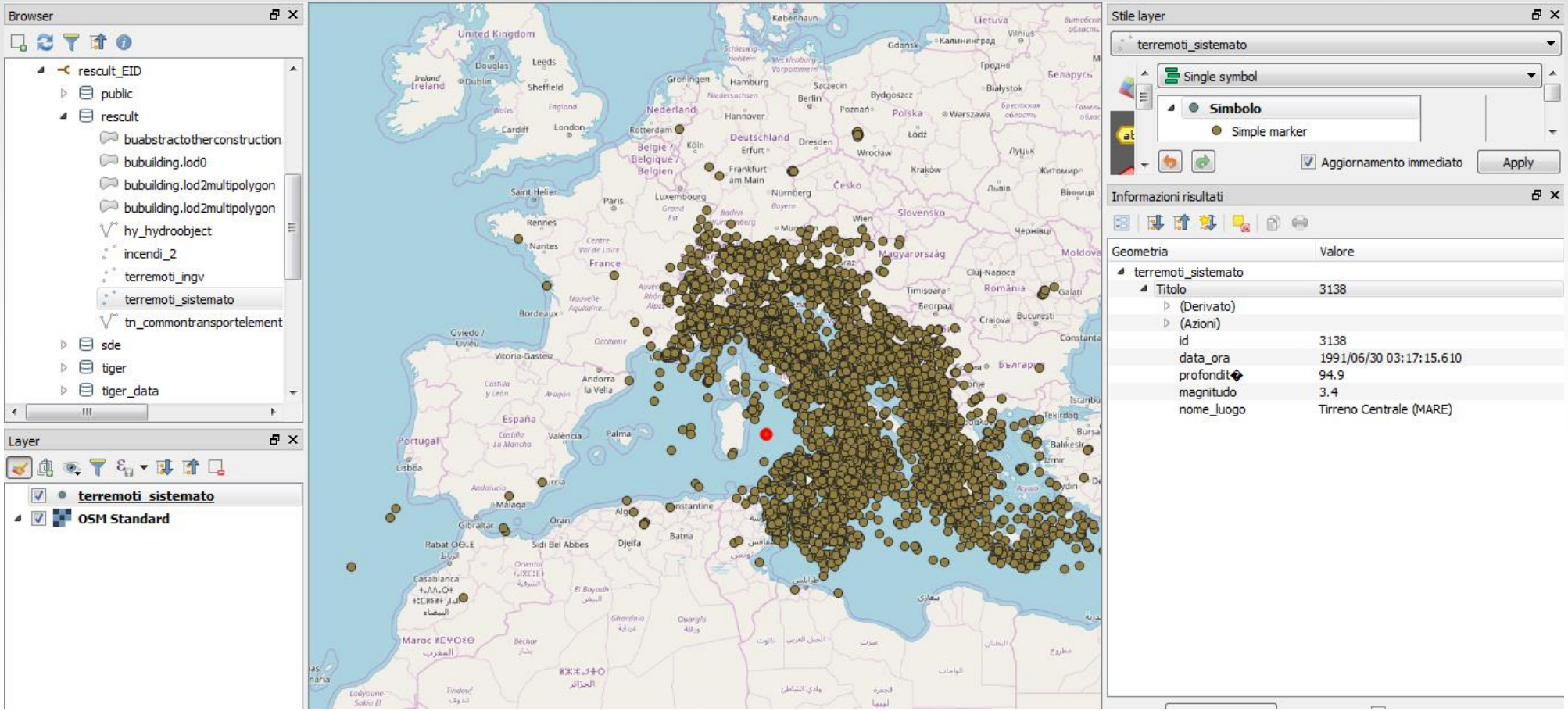
Interface 2 – DISASTERS INFORMATION

SAMPLE SCREEN 1: Earthquake, spatial representation --- Seismic zones in Marche Region (Italy) (SOURCE: INGV)



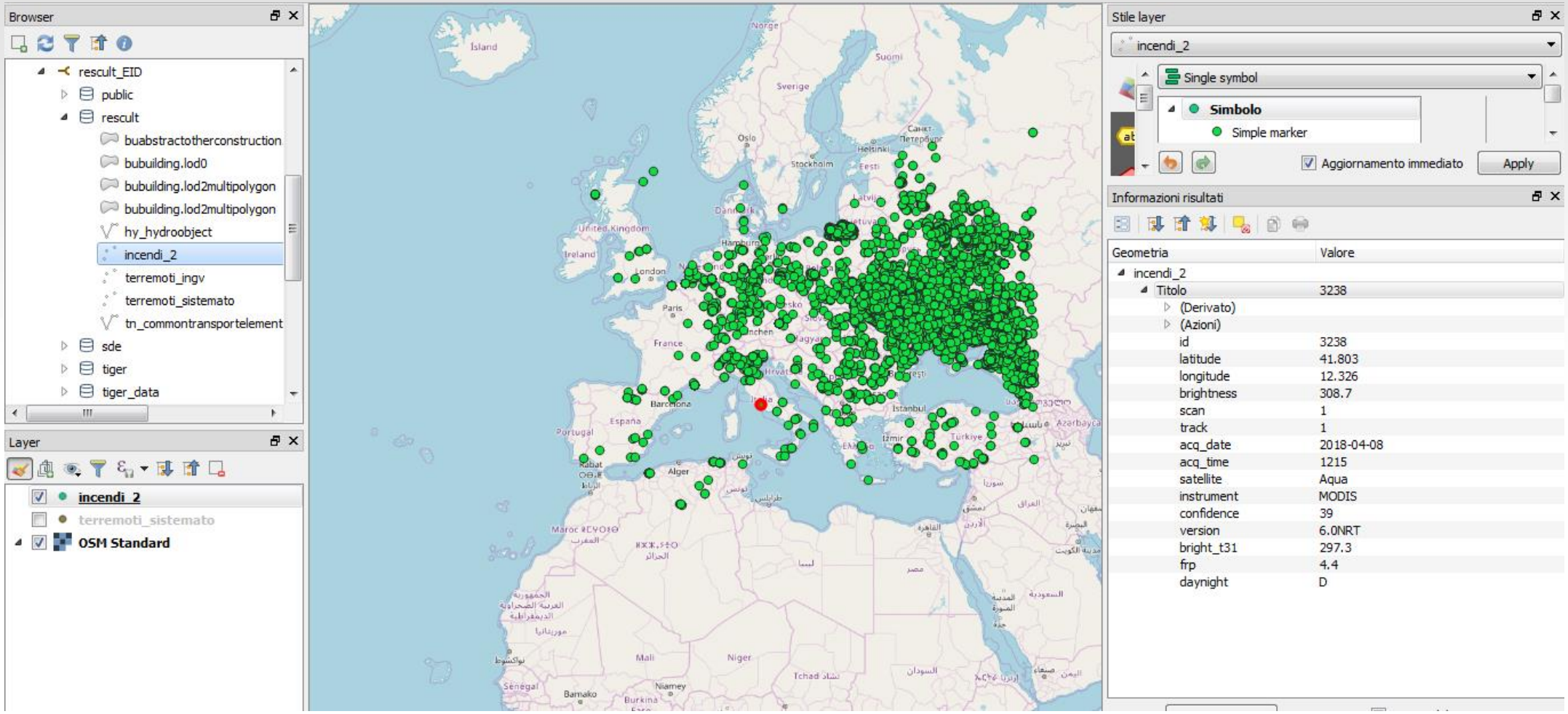
Interface 2 – DISASTERS INFORMATION

SAMPLE SCREEN 2: Earthquake, punctual representation --- Epicenters distribution, 1989-2018, European area (SOURCE: INGV)



Interface 2 – DISASTERS INFORMATION

SAMPLE SCREEN 3: Fire, punctual representation --- Ignition zones , 2010-2018, European area (SOURCE: NASA FIRMS)



Interface 3 – 3D MODELS

3D Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING

DASHBOARD

TECHNICAL

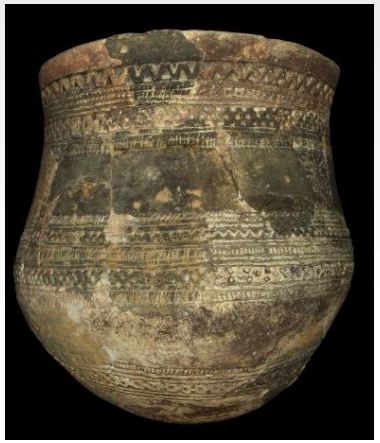
PURPOSE: Cultural heritage 3D models are fundamental for more than one reason:

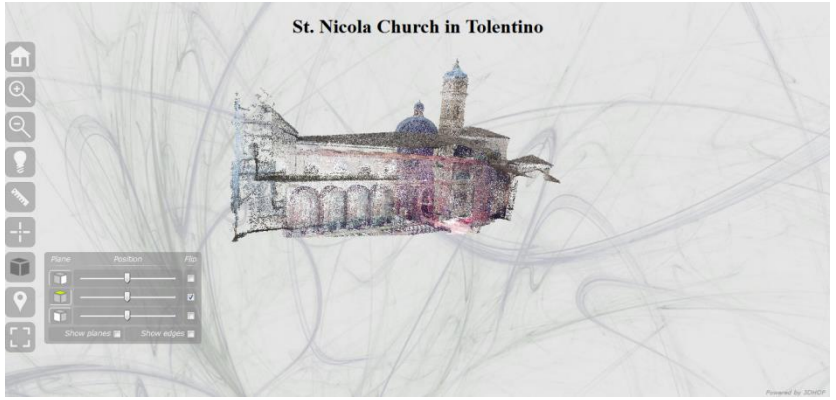
- they can support the restoring operations of artworks and buildings;
- they can be used to feed virtual reality scenarios, in order to make cultural heritage virtually accessible to all citizens (including disabled people who cannot travel);
- they can preserve the historical memory of destroyed or irreparably damaged cultural heritage.

DESCRIPTION: A web platform connected to the EID to visualise cultural heritage 3D models.

FEATURES: 3D models in the EID are visualised with the support of an open-Source web platform (3DHOP) which allows a number of functions, including integrations of “hotspots” (focal points) with additional information, lights shifting, planes cutting, etc.

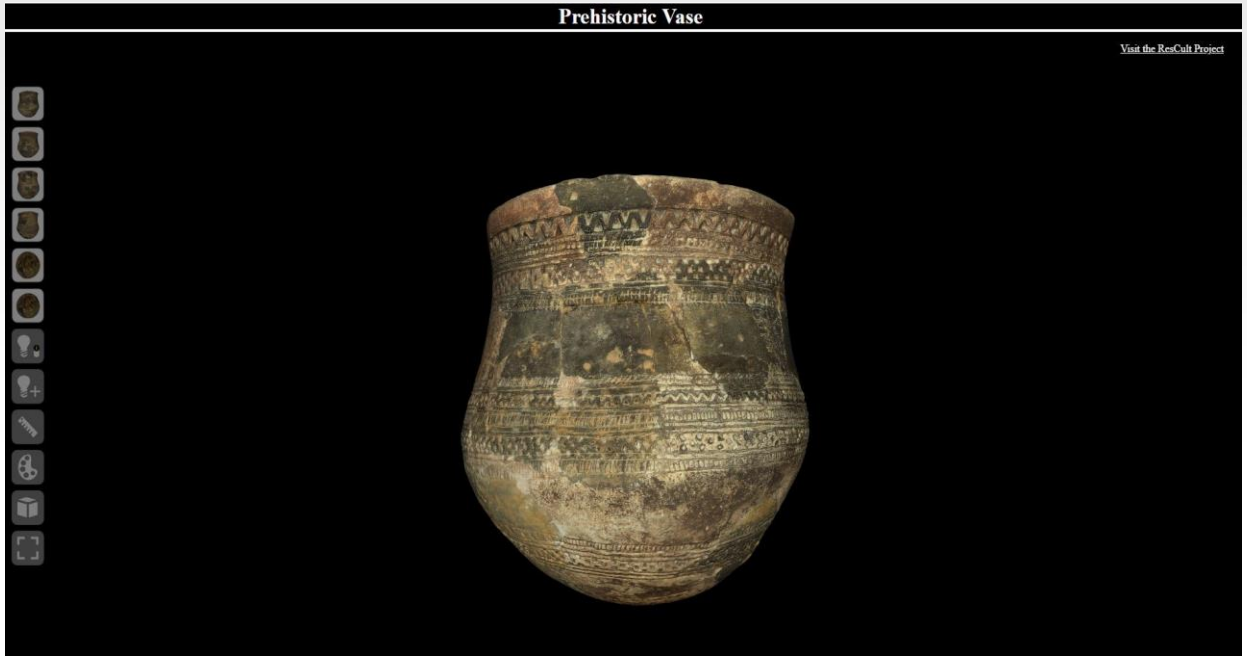
VISUAL





Interface 3 – 3D MODELS

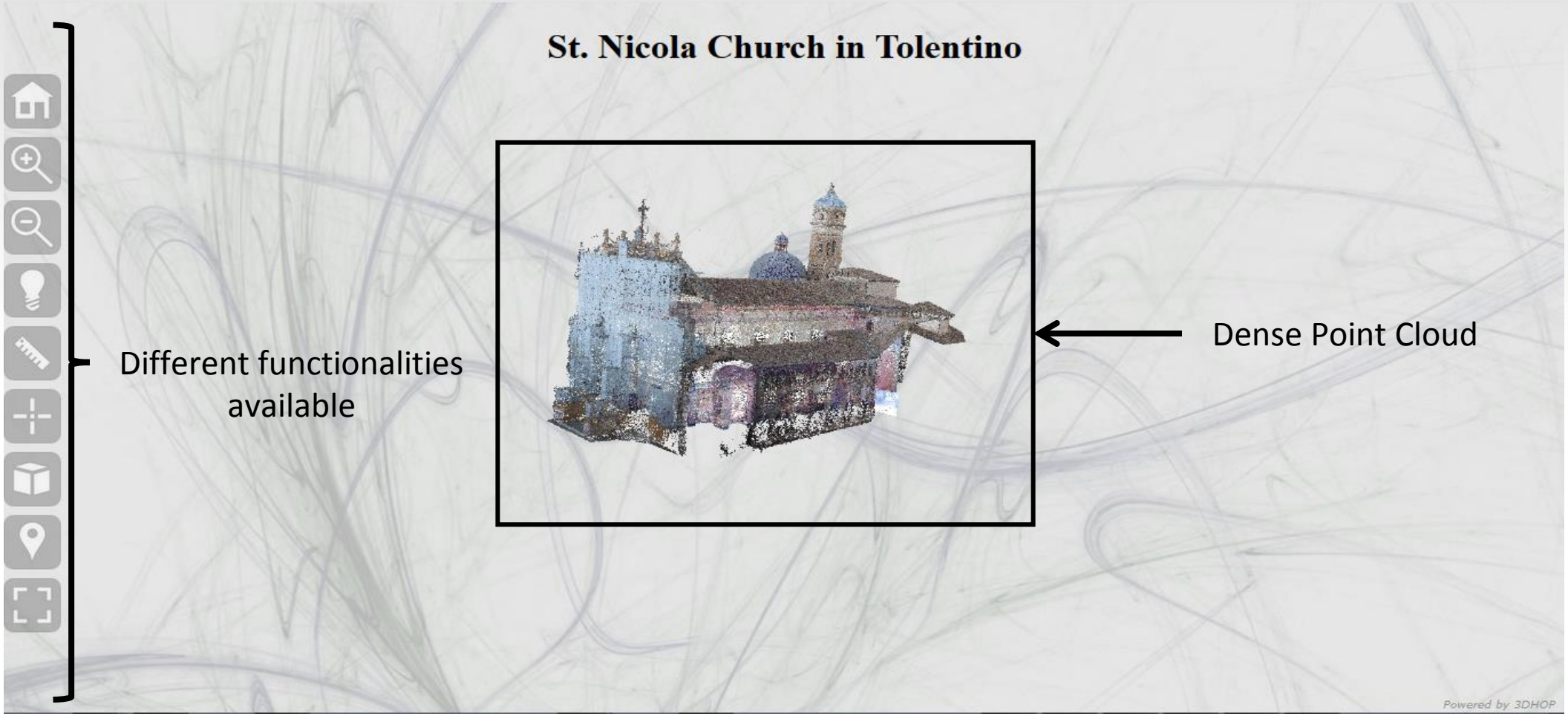
SAMPLE SCREEN 1: Examples of digitalised artworks (3D models)



Link to sample

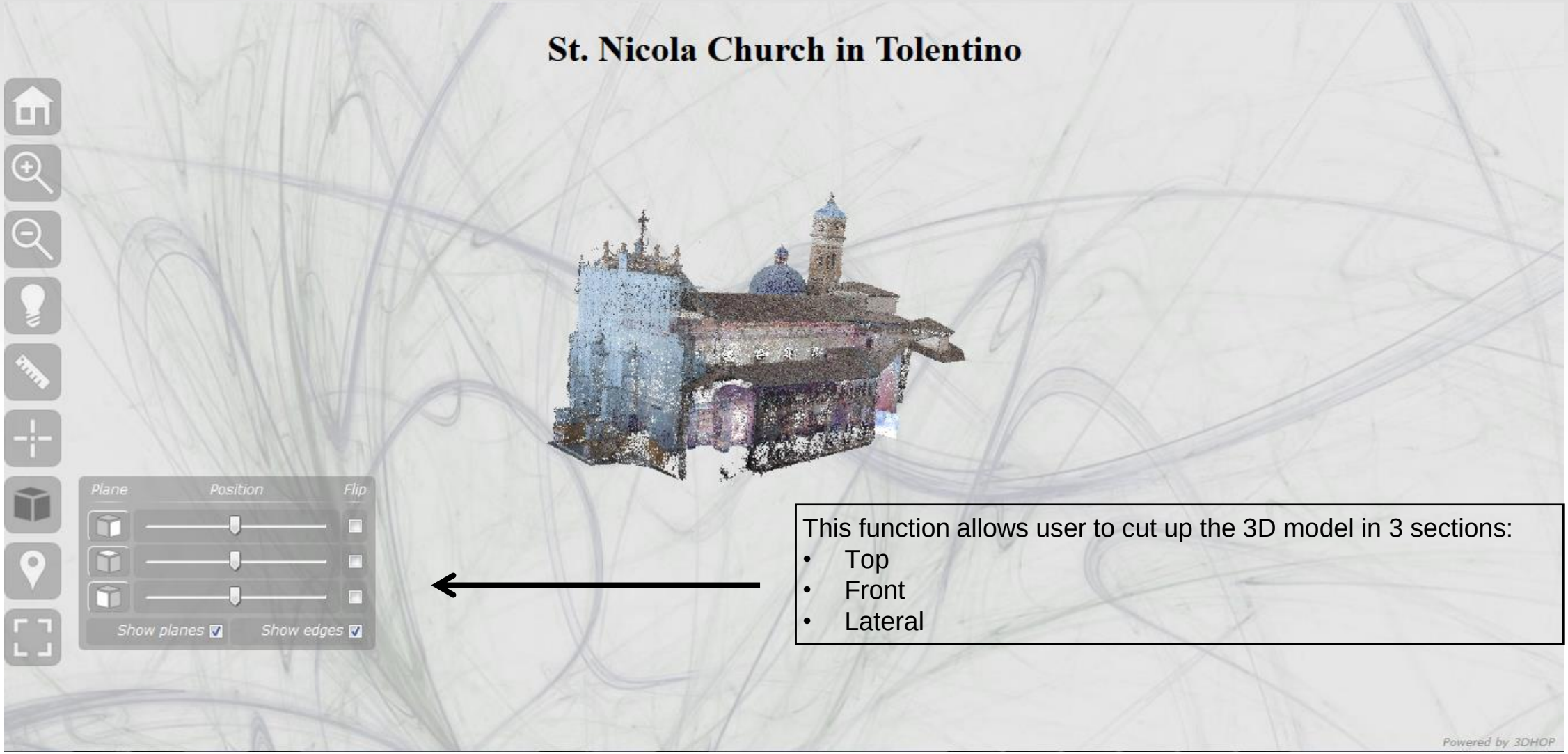
Interface 3 – 3D MODELS

SAMPLE SCREEN 2: St. Nicola Church in Tolentino, point cloud (general view)



Interface 3 – 3D MODELS

SAMPLE SCREEN 3: St. Nicola Church in Tolentino, point cloud (plane views)

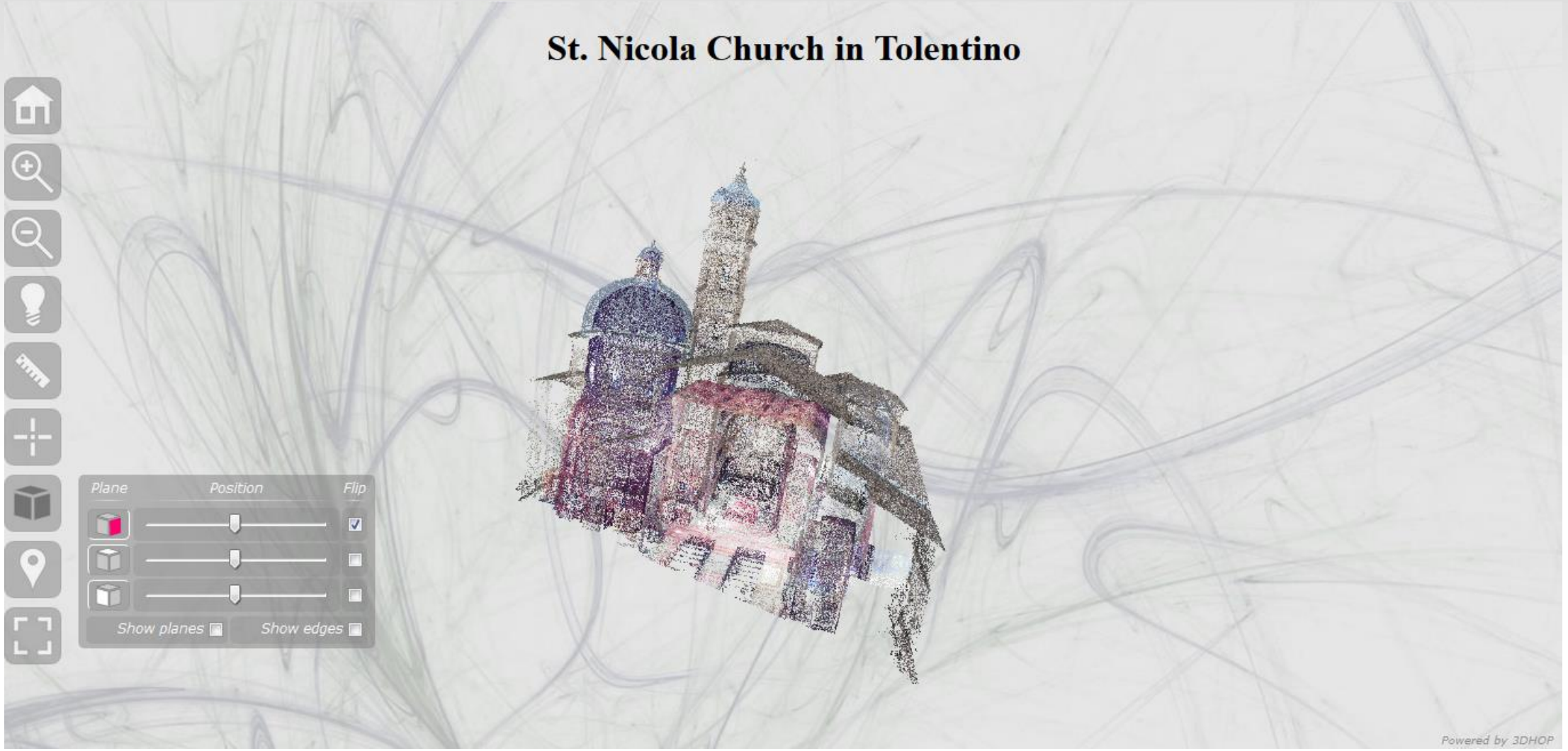


This function allows user to cut up the 3D model in 3 sections:

- Top
- Front
- Lateral

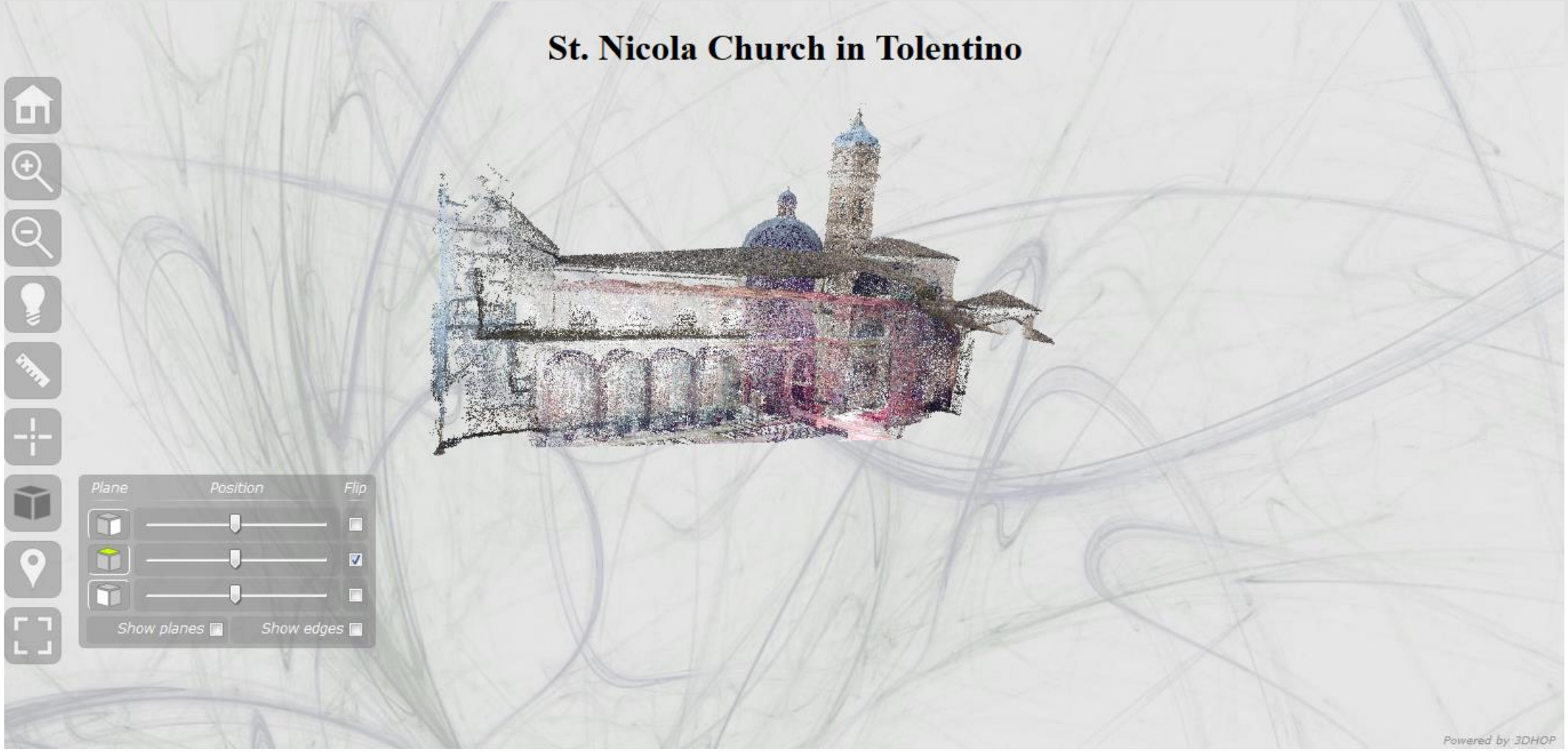
Interface 3 – 3D MODELS

SAMPLE SCREEN 4: St. Nicola Church in Tolentino, frontal view



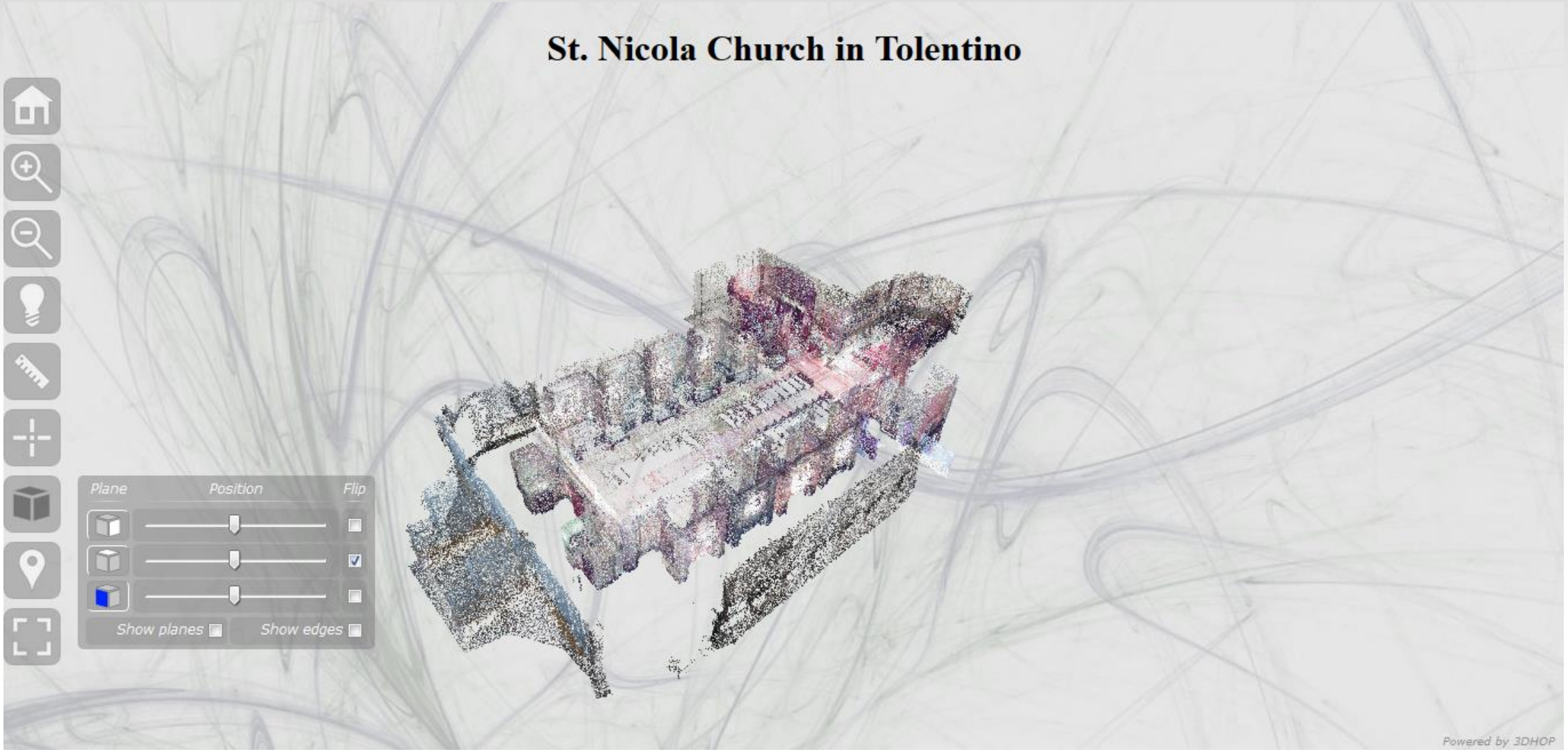
Interface 3 – 3D MODELS

SAMPLE SCREEN 5: St. Nicola Church in Tolentino, lateral view



Interface 3 – 3D MODELS

SAMPLE SCREEN 6: St. Nicola Church in Tolentino, top view



Interface 3 – 3D MODELS

SAMPLE SCREEN 7: St. Nicola Church in Tolentino, hotspot (local points with additional information)

Interface 3 – 3D MODELS

SAMPLE SCREEN 8: St. Nicola Church in Tolentino, hotspot (example of hotspot information)

St. Nicola Church in Tolentino

Basilica Facade

Today it is not known the architectural composition of the Primitivo prospect of the medieval church dedicated to Sant'Agostino, whose title - starting from 1354 â€“ was joined by that of St. Nicholas, remaining then the definitely one. The gothic-style portal that stands out in the faÃ§ade was erected in Istrian stone on the design of the Florentine sculptor Nanni di Bartolo called il Rosso, between 1432 and 1435. The fifteenth-century portal remained in the bare brick facade for about two centuries , while in 1519 the square in front of the basilica was paved, until the munificence of Giambattista Visconti, bishop of Teramo, already religious of the Congregation of Lombardy, did not allow to resume completion work. For the completion of the faÃ§ade it is be necessary to wait more than a century when, on 4 June 1757, a contract will be signed with the stonemason Giovanni Andrea Ascani from Sant'Ippolito who undertook the restoration of the pre-existing and completion of the unfinished superior order of the prospect: "everything conforms to the design", as the document states, suggesting the existence of an overall project, probably in the hands of the Augustinians. At the beginning of the twentieth century the faÃ§ade appeared in very poor conditions of degradation and unsafe in some parts, to the point of having to decide the global restoration in concomitance with the celebrations of the VI Centenary of the death of St. Nicholas. It intervened then in 1905, under the direction of architect Viviani, director of the Regional Office of Perugia for the conservation of monuments, and by the hand of the stonemason Francesco Nicoletti of Sant'Ippolito. Recently (1986-1989) we proceeded to clean and consolidate the marble of the faÃ§ade under the direction of the Superintendency of the Marche monuments.

Hotspot information related to the external facade

St. Nicola Church in Tolentino

Interior of the basilica towards the counter-facade

Various decorations and decoration works of the temple follow throughout the seventeenth century. From 1632 to 1634 the Augustinians decided to build the internal chapels by enlarging the sides of the church, even at the expense of the northern portico of the medieval cloister, which was thus reduced by a span. Starting from April 1608, upon request and at the expense of the Municipality of Tolentino, the construction of a new rich and spacious chapel on the north side of the transept began, with the initial intention of placing the Holy Arms of St. Nicholas there, then dedicated to the Blessed Sacrament when it was preferred to place the relics on the other side of the church, expanding the fifteenth-century sacristy. Work on the chapel, which was then made with a spherical dome and lantern on a octagon lantern - were interrupted, then resumed in 1642 and then extended over time; it was finally restored and decorated in today's forms by the architect Giovan Battista Carducci in 1858.

Hotspot information related to the internal facade

Interface 4 – RISK ANALYSIS

RA Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING

DASHBOARD

TECHNICAL

PURPOSE: to provide a model of analysis of cultural heritage vulnerabilities to disasters, to support the implementation of resilience recovery measures.

DESCRIPTION: A GIS-based interface connected to the EID to visualise risk indicators related to different cultural heritage and disaster types.

FEATURES: You can access 2 different methods to perform risk analysis:
- **Unmovable cultural heritage** (“*Asset Risk Evaluation Cards - AREC*”)
- **Movable cultural heritage** (“*Methods of Analysis for Safeguarding Artworks - MASA*)

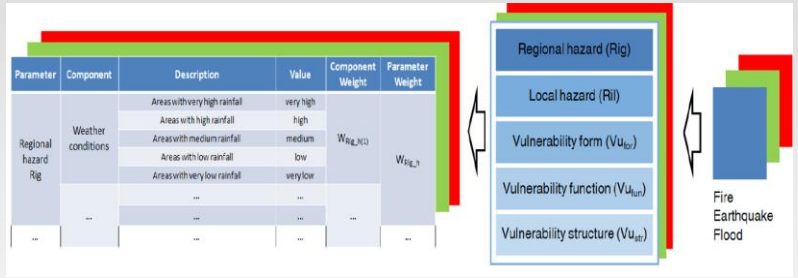
Each method can produce either single-distasters risk indicators (Fire, Flood, Earthquake), or global indicators.

VISUAL

Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 1: AREC, “Asset Risk Evaluation Cards” (unmovable Cultural Heritage risk analysis) - Concept

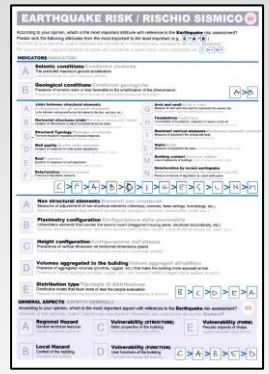
Implementation of AREcs in FACTSHEETS



AREC - Asset Risk Evaluation Cards

Attribution of weights to the indicators of hazard and vulnerability

S M A R T E R Simple Multi-Attribute Rating Technique Extended to Ranking

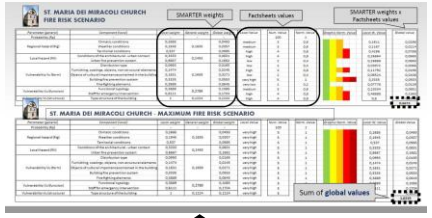


Hazard and vulnerability indicator evaluation questionnaire

Experts

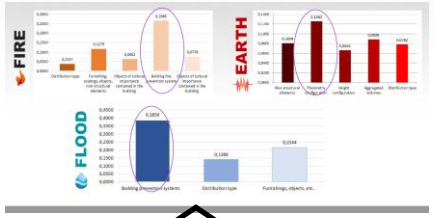
Analysis of the hazard and vulnerability of the building - compilation of the FACTSHEETS

Phase 1



calculation of **weighed indicators** of hazard and vulnerability

Phase 2



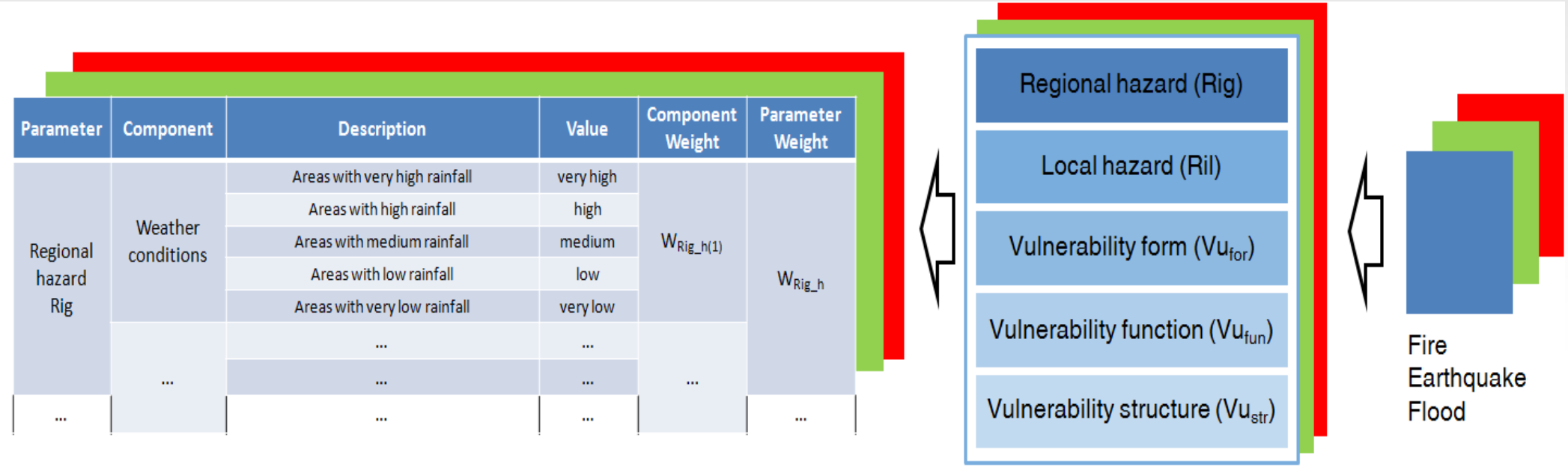
calculation of **syntesis indicators** of hazard and vulnerability

Phase 3

Evaluation model of the vulnerability of buildings

Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 2: AREC, “Asset Risk Evaluation Cards” (unmovable Cultural Heritage risk analysis).



Parameter	Component	Description	Value	Component Weight	Parameter Weight
Regional hazard Rig	Weather conditions	Areas with very high rainfall	very high	$W_{Rig\_h(1)}$	W_{Rig_h}
		Areas with high rainfall	high		
		Areas with medium rainfall	medium		
		Areas with low rainfall	low		
		Areas with very low rainfall	very low		
	...	...	...	...	
		...	...		
...		...	...		...

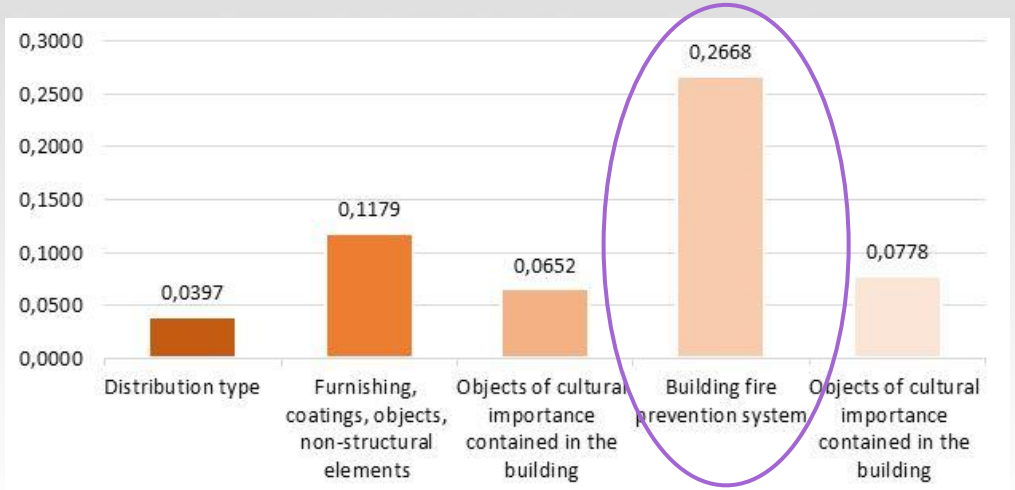
Methodology

- Ranking of the importance of each indicator for the three typologies of Risk;
- Conversion of the rank order into a set of weights provided by the SMARTER methodology;
- Calculation of the average weights of the cultural heritage indicators;
- Calculation of the final global weights;

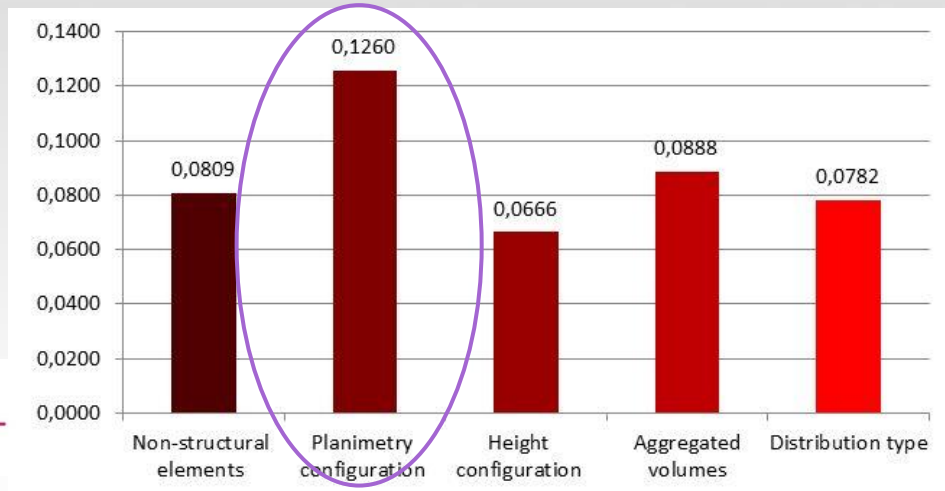
Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 3: Results from AREC Method applied to the Santa Maria dei Miracoli Church (Venice)

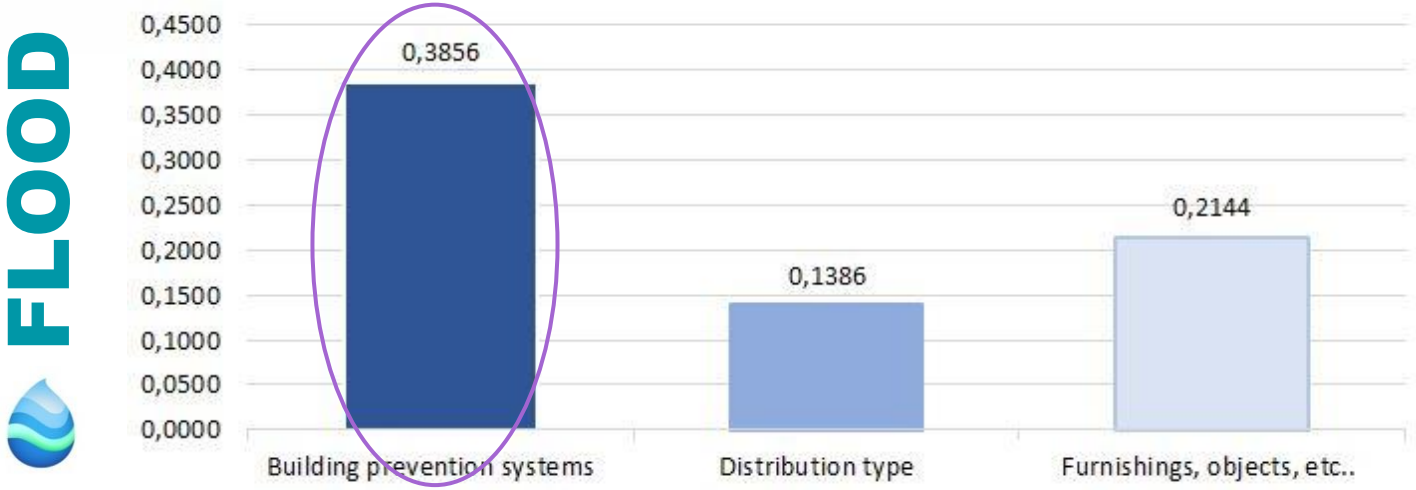
FIRE



EARTH



FLOOD



Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 4: Indicators and weights combination algorithm from AREC method

ST. MARIA DEI MIRACOLI CHURCH FIRE RISK SCENARIO

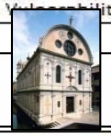
SMARTER weights

Factsheets values

SMARTER weights x Factsheets values

Parameter (general)	Component (local)	Local weight	General weight	Global weight	Local Value	Num. Value	Norm. Value	Graphic Norm. Value	Local W. Value	Global value
Probability (Rp)	-	-	-	-		100	1			
Regional hazard (Rig)	Climatic conditions	0,2685	0,1835	0,0493	medium	3	0,6		0,1611	0,0296
	Weather conditions	0,1945		0,0357	medium	3	0,6		0,1167	0,0214
	Territorial conditions	0,537		0,0985	high	4	0,8		0,4296	0,0788
Local hazard (Ril)	Conditions of the architectural - urban context	0,3333	0,2493	0,0831	high	4	0,8		0,26664	0,0665
	Urban fire prevention system	0,6667		0,1662	low	2	0,4		0,26668	0,0665
Vulnerability Vu (form)	Distribution type	0,0993	0,1659	0,0165	low	2	0,4		0,03972	0,0066
	Furnishing, coatings, objects, non-structural elements	0,1474		0,0245	high	4	0,8		0,11792	0,0196
	Objects of cultural importancecontained in the building	0,1631		0,0271	low	2	0,4		0,06524	0,0108
	Building fire prevention system	0,3335		0,0553	very high	5	1		0,3335	0,0553
	Fire-fighting elements	0,3889		0,0645	very low	1	0,2		0,07778	0,0129
Vulnerability Vu (function)	Functional typology	0,3889	0,2789	0,1085	medium	3	0,6		0,23334	0,0651
	Staff for emergency intervention	0,6111		0,1704	high	4	0,8		0,48888	0,1363
Vulnerability Vu (structure)	Type structure of the building	1	0,1224	0,1224	high	4	0,8		0,8	0,0979

0,6673



ST. MARIA DEI MIRACOLI CHURCH - MAXIMUM FIRE RISK SCENARIO

Parameter (general)	Component (local)	Local weight	General weight	Global weight	Local Value	Num. Value	Norm. Value	Graphic Norm. Value	Local W. Value	Global Value
Probability (Rp)	-	-	-	-		100	1			
Regional hazard (Rig)	Climatic conditions	0,2685	0,1835	0,0493	very high	5	1		0,2685	0,0493
	Weather conditions	0,1945		0,0357	very high	5	1		0,1945	0,0357
	Territorial conditions	0,537		0,0985	very high	5	1		0,537	0,0985
Local hazard (Ril)	Conditions of the architectural - urban context	0,3333	0,2493	0,0831	very high	5	1		0,3333	0,0831
	Urban fire prevention system	0,6667		0,1662	very high	5	1		0,6667	0,1662
Vulnerability Vu (form)	Distribution type	0,0993	0,1659	0,0165	very high	5	1		0,0993	0,0165
	Furnishing, coatings, objects, non-structural elements	0,1474		0,0245	very high	5	1		0,1474	0,0245
	Objects of cultural importancecontained in the building	0,1631		0,0271	very high	5	1		0,1631	0,0271
	Building fire prevention system	0,3335		0,0553	very high	5	1		0,3335	0,0553
	Fire-fighting elements	0,3889		0,0645	very high	5	1		0,3889	0,0645
Vulnerability Vu (function)	Functional typology	0,3889	0,2789	0,1085	very high	5	1		0,3889	0,1085
	Staff for emergency intervention	0,6111		0,1704	very high	5	1		0,6111	0,1704
Vulnerability Vu (structure)	Type structure of the building	1	0,1224	0,1224	very high	5	1		1	0,1224

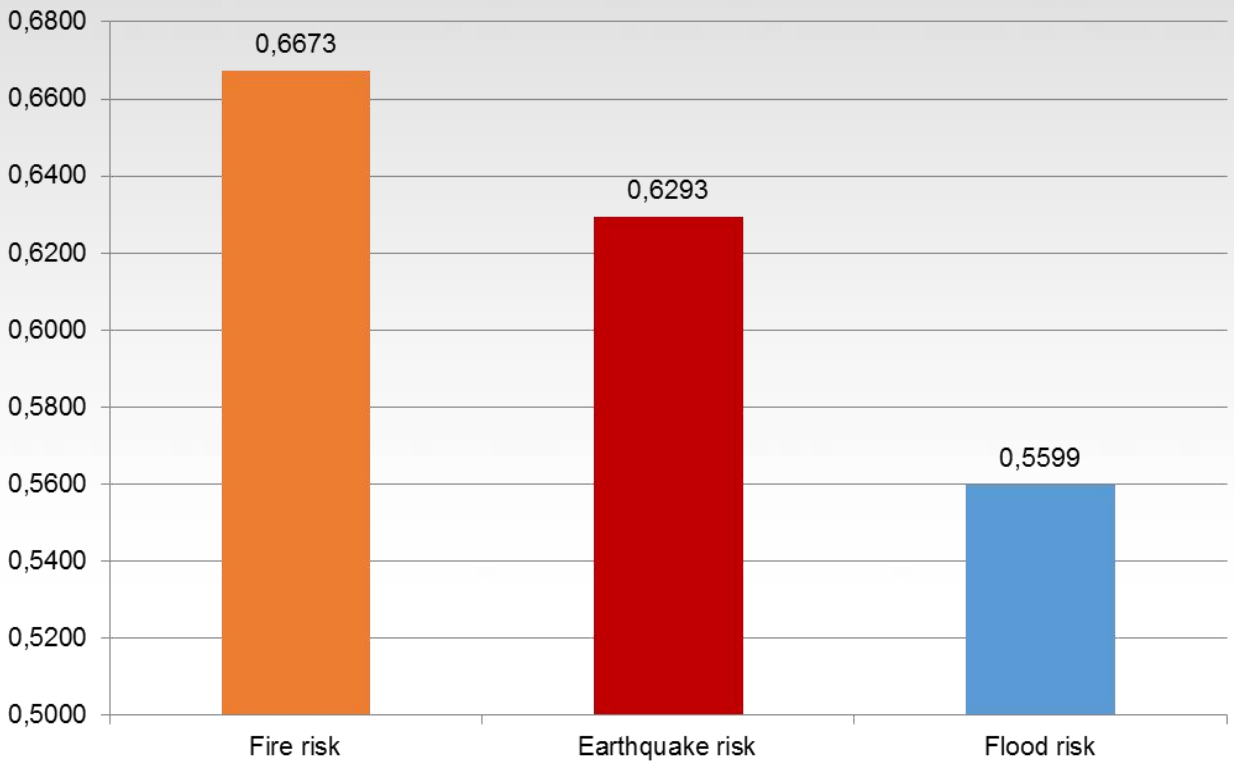
Sum of **global values**

1,0219

Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 5: Results from AREC Method applied to the Santa Maria dei Miracoli Church (Venice)

ST. MARIA DEI MIRACOLI CHURCH (VENICE)



FIRE RISK	0,6673	THE MOST RISKY PARAMETER
FLOOD RISK	0,5599	THE LESS RISKY PARAMETER

Interface 4 – RISK ANALYSIS

SAMPLE SCREEN 6: Indicators and weights combination algorithm from MASA method (movable Cultural Heritage risk analysis)

PS = Priority of Safeguarding for a set of works of a same entity

Begin by the higher

270

From 0 to 52488

IS = Interest of the Safeguarding = LC x DDS

54

From 0 to 5832

The higher is the index, the greater is the interest

IA = classification of the Interest of the Artwork to be saved = a x b				4	From 0 to 9					
	3	2	1							
a. Fame of the artwork	International	National	Local	2						
b. Artistic interest of the artwork	Major	Significant	Minor	2						

LC: Level of Criticality = (A x a) + (B x b) + (C x c) + (D x d) + (E x e) + (F x f)					4,5	From 0 to 12					
	2	1	0				0	0,5	1		
* Sensitivity of the Artwork							* Effectiveness of the protection				
a. Sensitivity of the Artwork to smoke	High	Middle	Null	1	0,0	0,0	100%	50 %	0%	A. Effectiveness of protection against smoke	
b. Sensitivity of the Artwork to heat	High	Middle	Null	2	1,0	0,5	100%	50 %	0%	B. Effectiveness of protection against heat	
c. Sensitivity of the Artwork to flames	High	Middle	Null	2	1,0	0,5	100%	50 %	0%	C. Effectiveness of protection against flames	
d. Sensitivity of the Artwork to combustion gases	High	Middle	Null	1	0,0	0,0	100%	50 %	0%	D. A. Effectiveness of protection against combustion gases	
e. Sensitivity of the Artwork to splashes	High	Middle	Null	1	0,5	0,5	100%	50 %	0%	E. Effectiveness of protection against splashes	
f. Sensitivity of the Artwork to immersion	High	Middle	Null	2	2,0	1,0	100%	50 %	0%	F. Effectiveness of protection against immersion	

DDS = Degree of difficulty of safeguarding = a x b x c x d				12	From 1 to 486
a. Artwork mobility (place of protection)	1	1	2		
Type of handling	Not movable	Staff	Lifting means	1	
b. Equipment = A x B	1	2	3	3	
A. Required level of equipment	Standard	Specialized	Specific to the work	3	
B. Availability of Equipment	Immediate	at 1 hour	> 1 hour	1	
c. Staff = A x B	1	2	3	2	
A. Required level of staff competence	None	sensitized	Specific training	1	
B. Number of people required	1	3	>3	2	
d. Implementation time	1	2	3		
Required time for safeguarding	< 15 mn	from 15 mn to 1 hour	> 1 hour	2	

IS = LC x DDS =
Interest of the Safeguarding

PS = IS x IA =
Priority of the Safeguarding for a set of works of the same tipology

Interface 5 – ADVICE-SEEKING

AS Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA -** CROWD ACQUIRING

DASHBOARD

TECHNICAL

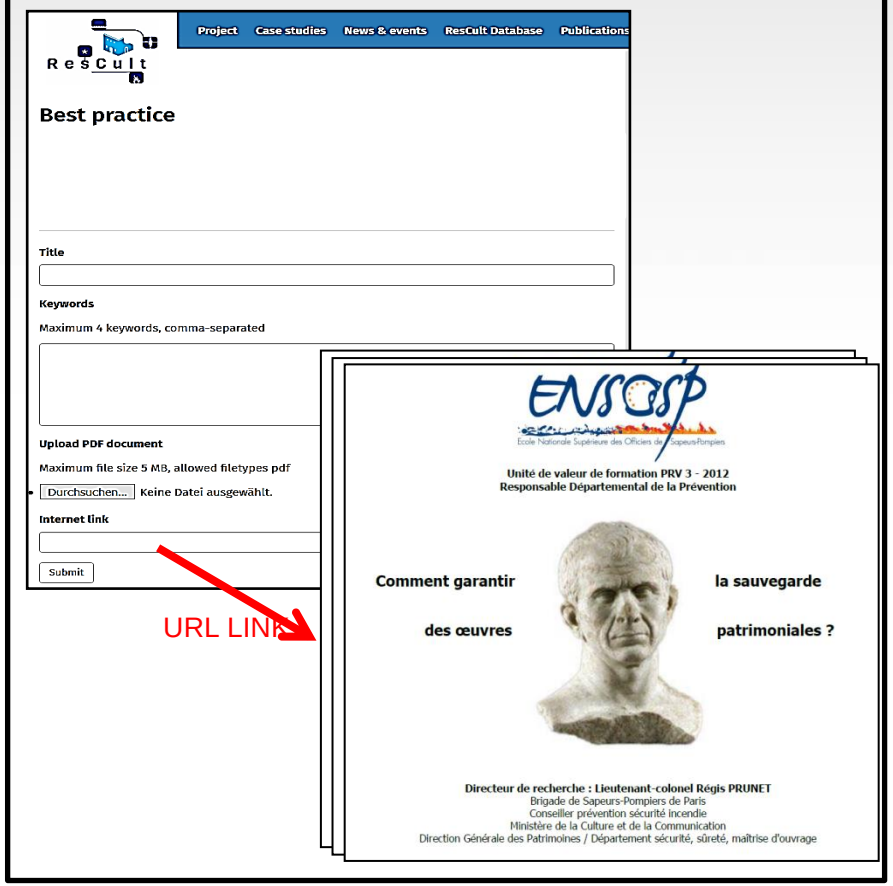
PURPOSE: to diffuse knowledge and best practices related to the protection and resilience increasing of Cultural Heritage against natural disasters.

DESCRIPTION: A web interface making the user able to search best practices depending on the related disaster and on the desided keyword(s).

FEATURES: For each best practice the EID can report a detailed description and can link further material (such as documents, image, etc.) available on web. Also, each best practice can be linked (or not) to a specific disaster type.

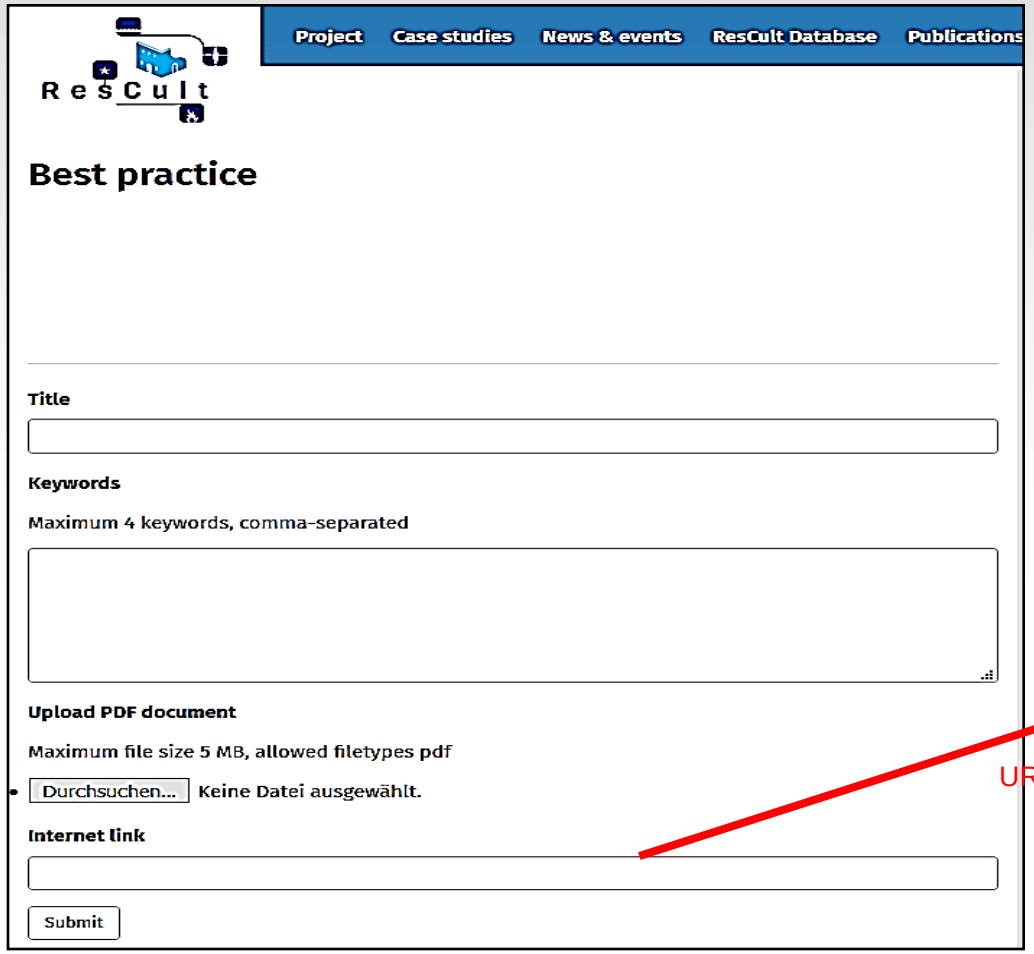
HOW to ACCESS: From the Dashboard, click on the fifth blue button (lower row, second from left). You will access to a dedicated web page reporting a series of instructions. Open Quantum GIS, and follow the instructions to connect Quantum GIS to the RESCULT Database. Once connected, follow the instructions to access the Best Practice repository.

VISUAL

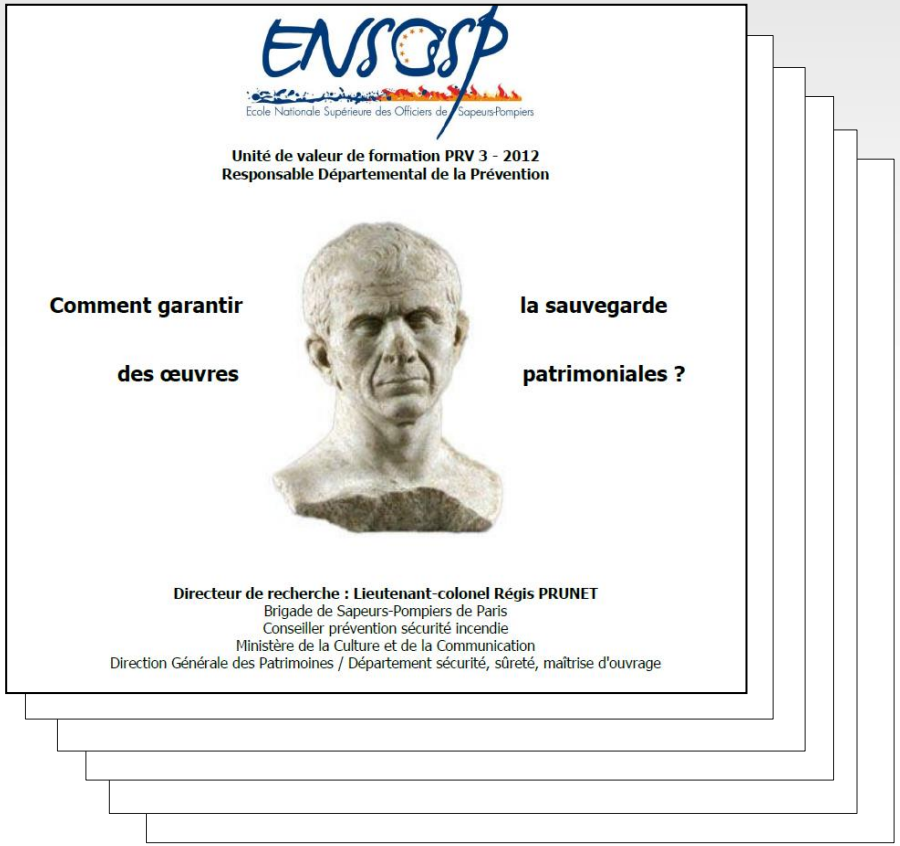


Interface 5 – ADVICE-SEEKING

SAMPLE SCREEN 1: BEST PRACTICE TABLE: Title, Keywords, URL link to integrating material (images, documents, website, etc.)



URL LINK



Interface 6 – CROWD ACQUIRING

CA Interface OVERVIEW

- ❑ **CH** - CULTURAL HERITAGE
- ❑ **DI** - DISASTERS INFORMATION
- ❑ **3D** - 3D MODELS
- ❑ **RA** - RISK ANALYSIS
- ❑ **AS** - ADVICE-SEEKING
- ❑ **CA** - CROWD ACQUIRING

DASHBOARD

TECHNICAL

PURPOSE: to allow users to upload information including cultural heritage data, best practices and even entire databases.

DESCRIPTION: A web interface making the user able to upload data.

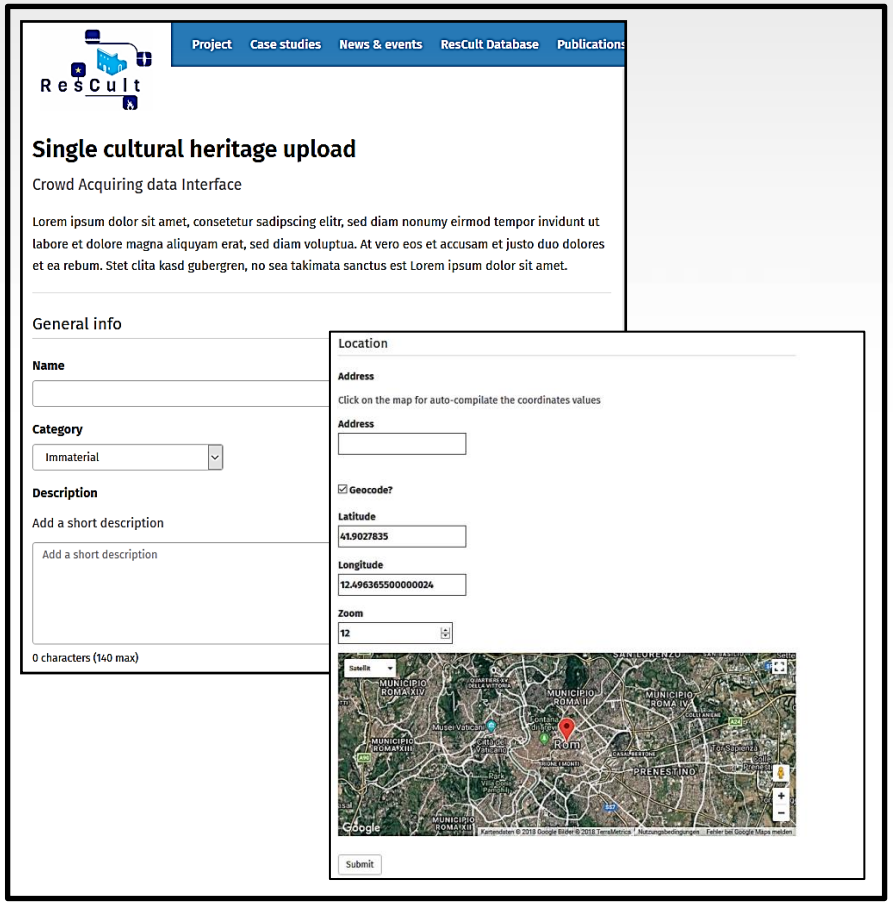
FEATURES: Three different upload can be done:

- **single cultural heritage** (name, type, location, etc.)
- **single best practice data** (related disaster, description, URL link, etc.)
- **cultural heritage database**: a library of SQL script was created to allow the automatic integration of external databases in the EID (starting from the exported excel file). The upload is currently been tested with three databases: EUROPEANA, JOCONDE and SIRPAC

Data are associated to different «reliability» levels, depending on the uploading user account type. Any data uploaded through this interface is always filtered by a manual validation step before becoming part of the EID.

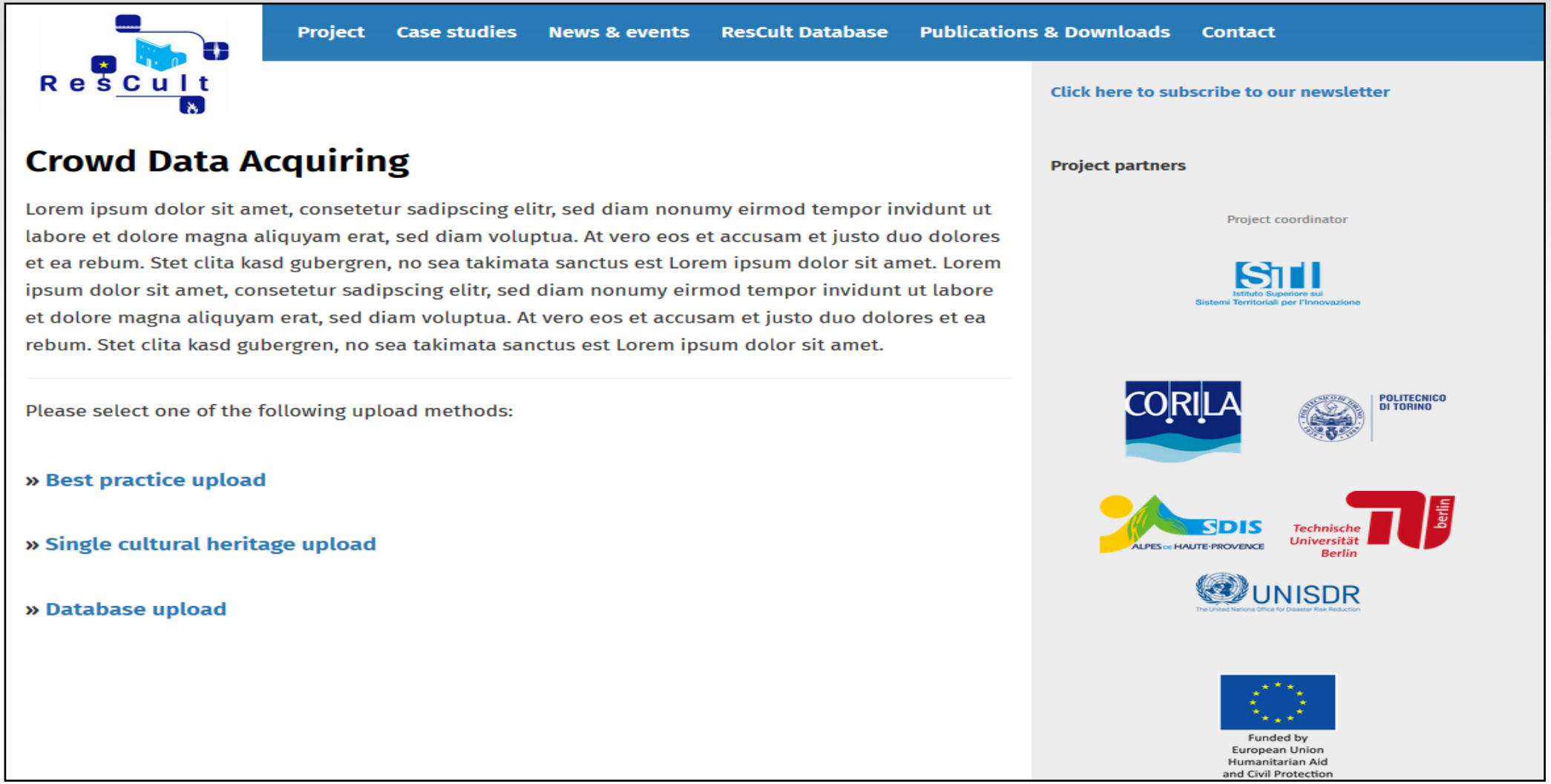
HOW to ACCESS: From the Dashboard, click on the sixth blue button (lower row, third from left).

VISUAL



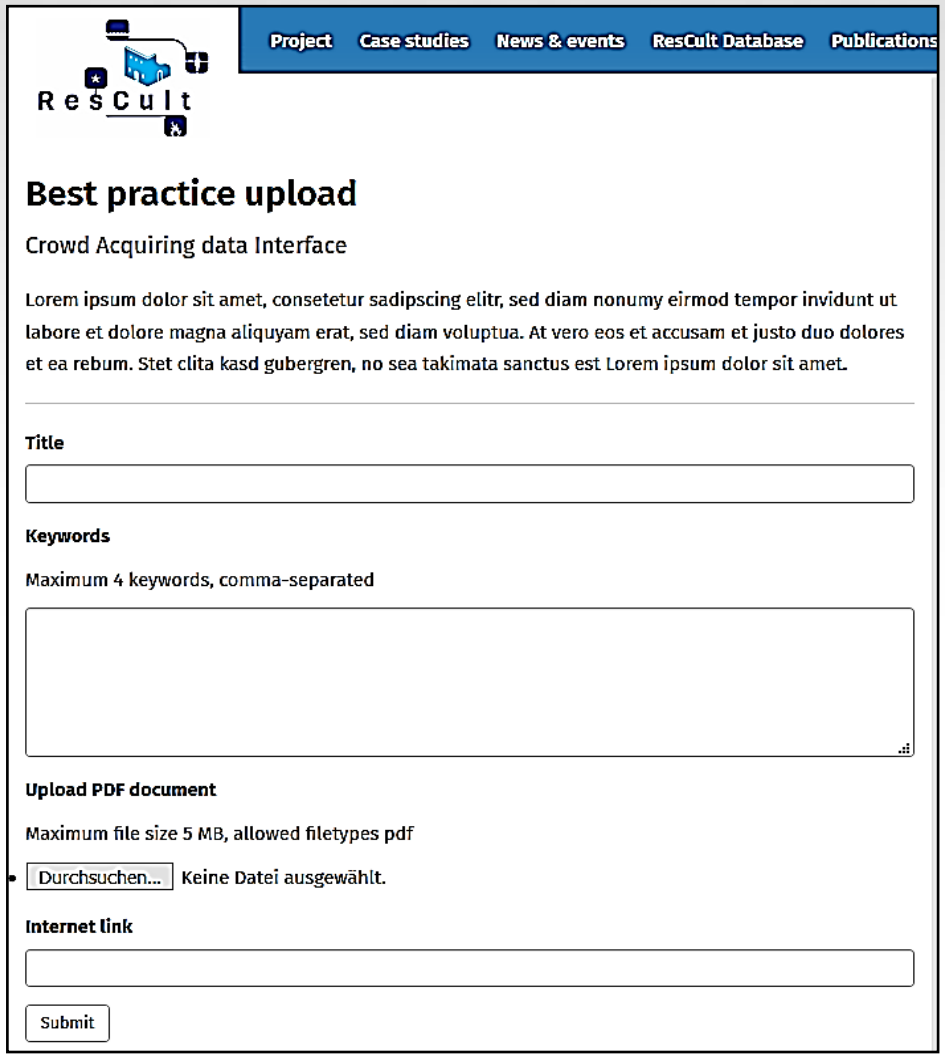
Interface 6 – CROWD ACQUIRING

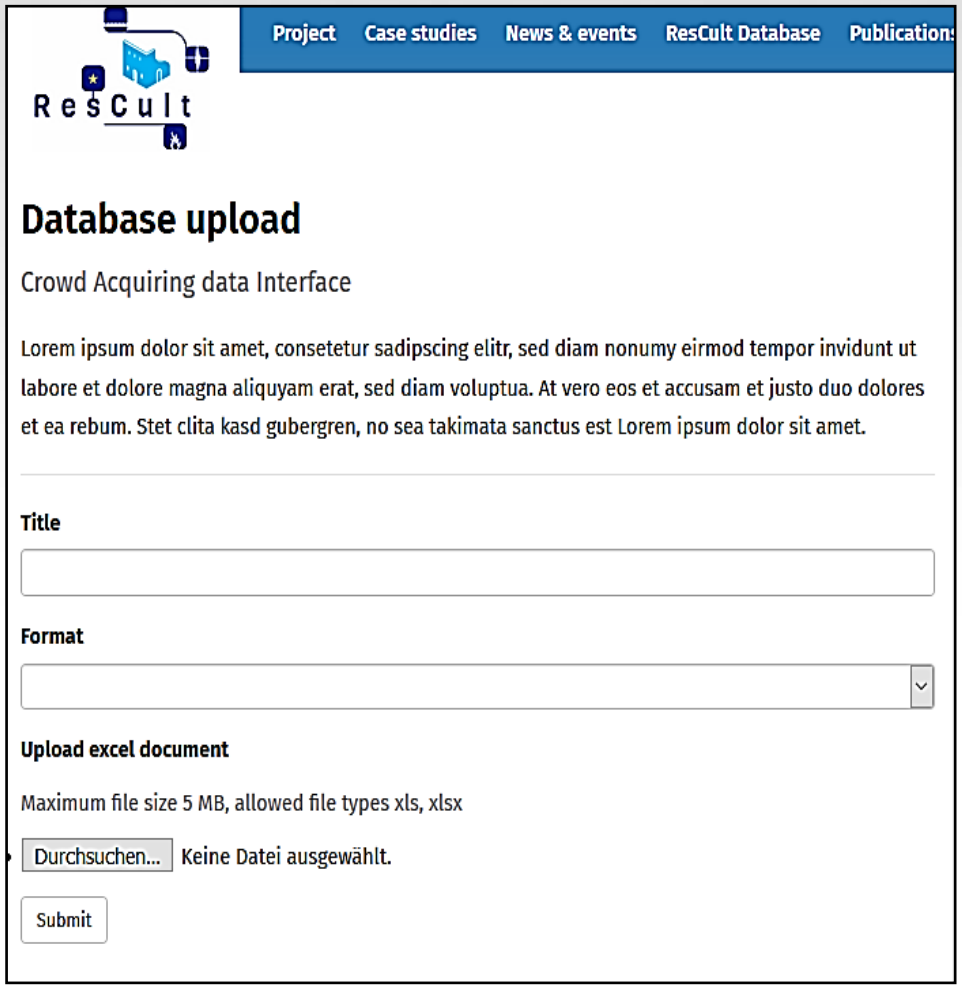
SAMPLE SCREEN 1: Crowd acquiring interface – home page



Interface 6 – CROWD ACQUIRING

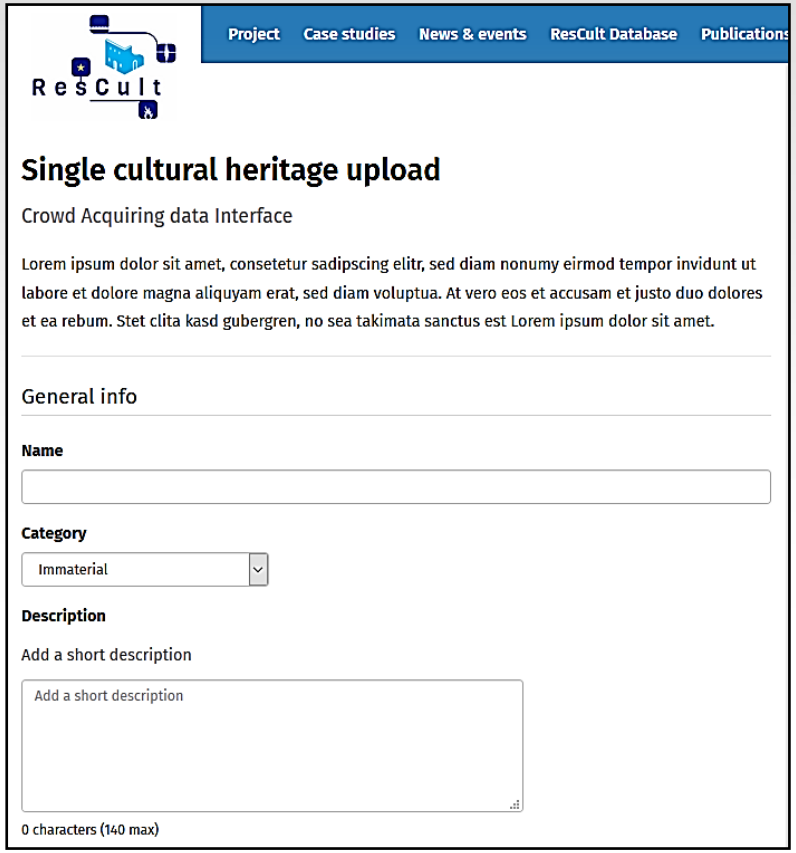
SAMPLE SCREEN 2: Crowd acquiring interface – Best Practice and Database upload forms

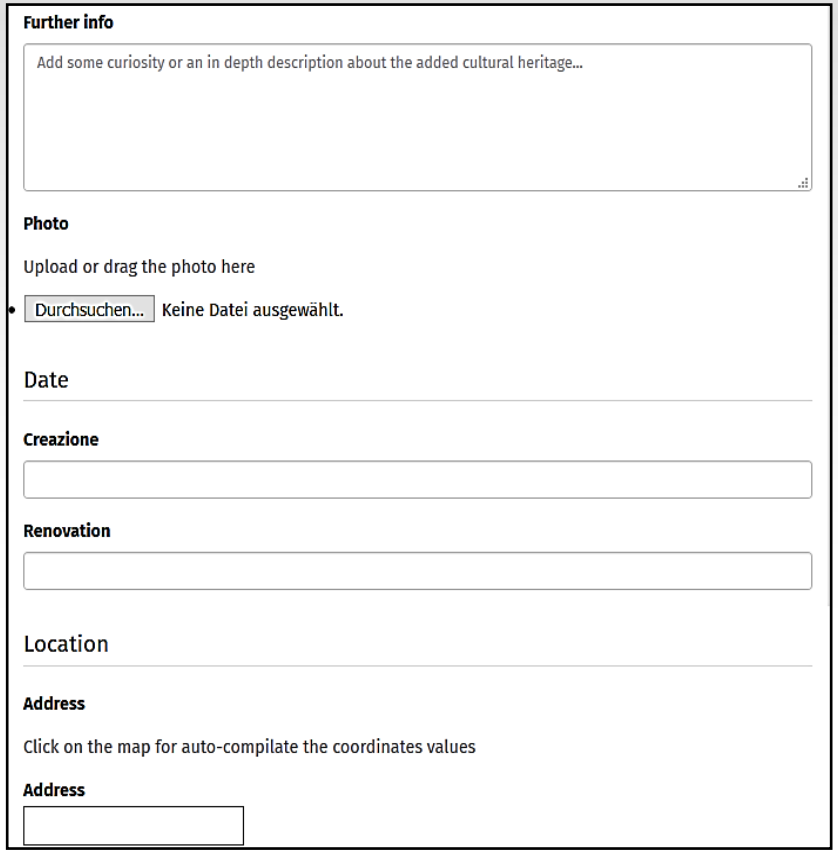


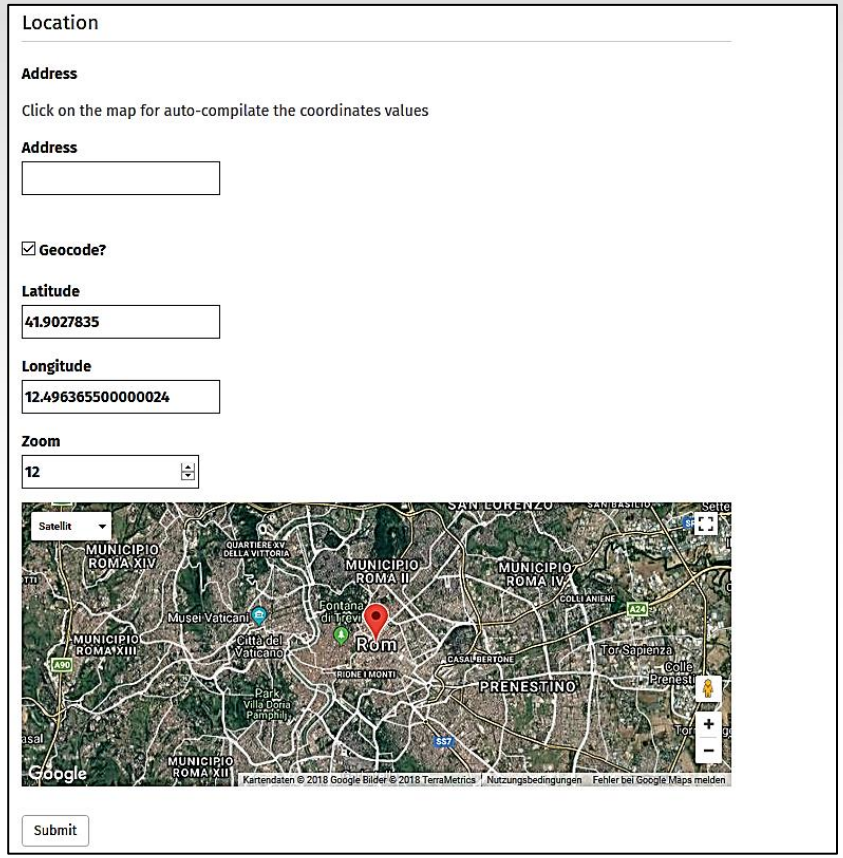


Interface 6 – CROWD ACQUIRING

SAMPLE SCREEN 3: Crowd acquiring interface – Cultural heritage upload forms







THANK YOU FOR YOUR ATTENTION

Massimo Migliorini

Security and Business Models for Energy Networks and Infrastructures

SiTI – Higher Institute on Territorial Systems for Innovation
Via Pier Carlo Boggio 61
10138 Torino
Italy
Tel +39 011 1975 1558
Mobile: +39 339 57 32 462

Email: migliorini@siti.polito.it

www.siti.polito.it