D 4.2.1 DOCUMENTATION ON CAPACITY BUILDING

3D AND VIRTUAL REALITY

Following its work at the Museo del Mare in Caorle, PP1, documented roman and modern submerged archaeological sites in the sea and in the lagoons with 3D automatic photogrammetry, to obtain a significant number of data sets. These were processed into precise and attractive 3D models that formed the basis for virtual reality environments (Real Time Render technology). This technology, developed with the support of University's digital technicians, enables also very young or old people and people with disability to access the sites. By sharing information between participating museums, virtual tours of each other's site can be accessed, virtually travelling far from the local underwater sites.

The Virtual Reality of Brick's wreck (https://drive.google.com/file/d/1dycbmntqupBJ2-OlHZeYV1NQYE9PY8gF/view), in the sea of Venice was realised and presented in Caorle, together with preliminary UnderwaterMuse map (http://mizar.unive.it/underwatermusemap/), in June 2021. Then, the Virtual Reality has been realized also for Grado 2 shipwreck (https://drive.google.com/file/d/1uTwFL-7WFnbRTukoc8hW0qIfxCB_ehMN/view).

The project UnderwaterMuse, through virtual reality application on two different shipwrecks and an interactive map with almost all the underwater archaeological sites of the regions and countries involved in the project, wants to promote this new kind of accessibility of some shipwrecks in the Adriatic Sea.

The project aims at applying a methodological and technological protocol based on research/ knowledge and development/communication of underwater archaeological sites on three sample areas in Italy, in Veneto, Puglia and Friuli Venezia Giulia, and one in Croatia, in the region of Split.

The project promotes a new kind of accessibility to a wider public through a digital approach to the underwater archaeological sites of the Adriatic Sea. The project objective is to transform the sites into underwater archaeological parks or a digital-museums through innovative and experimental methodologies and techniques in order to try to reduce the loss of important cultural heritages as well as to guarantee a tourist-cultural promotion.

The involvement of Ca' Foscari University in this project concern the digital processing of archaeological data through two different methods: the realization of the virtual reality in two different shipwreck and the creation of an interactive map of the archaeological sites of the countries involved.

The first work has been conducted between August and September 2021 and have seen *the in situ* enhancement of Grado 2, a cargo of wine amphorae, dated at the second half of the third century BC.

The pilot action made it possible to highlight the entire site, document it perfectly and protect it with metal grids allowing divers to visit it, creating a real underwater museum.

During the excavation campaigns, the surveys of the archaeological sites were carried out using the photogrammetric technique in order to create a three-dimensional model that is metrically precise and graphically equal to the real one thanks to the photographic textures used.

The second case study investigated is the so-called " Bricks Wreck", a large cargo of bricks dated to the 18th century and the virtual reality has been presented in the Museum in Caorle and will be uploaded on the web.

The creation of the 3D model also allows those who cannot or do not want to dive to use it remotely, thanks to an application that perfectly simulates a virtual immersion on the sites. The first important phase of the process concerns the upload of the 3D photogrammetric model of the shipwreck and the reconstruction of the sea-bottom.

To highlight peculiar characteristics of the archaeological site and to make the virtual immersion on the wreck more interesting and educational, we have created some info points. The navigation has some written instruction to follow, both for the navigation, and for the opening of the infopoint.

So, in addition to on-site enhancement, as for the intervention on the Grado 2 wreck was also aimed at creating a virtual museum itinerary. The model is therefore doubly useful, both from a scientific point of view for research purposes, and from a disseminative point of view for involving the general public through virtual navigation.

In the same way as the previous one, the wreck has been the subject of a virtual navigation in order to make the maritime heritage accessible to the public in an interactive and digital way. Usually, in the dives and in particular in the North Adriatic where the visibility isn't good enough to see the bottom also in 22 meters of depth, you have to follow the chain of the boat to reach the shipwreck and we wanted to recreate this context.

The goal is to make the virtual underwater scenario more visually realistic, for this reason we had to add effects and in particular the visibility of the water that is close to the reality or the real speed and movement of the diver. Also the depth is really calculated in a perfect scale to give to the divers the real feelings of the dive.

The technology applied in both excavation sites and the UnderwaterMuse map were presented to partners, stakeholders and archaeological experts from Italy and Croatia at event in Caorle, at the Sea Archaeological Museum with a project workstation (June 2021), during the various project events (Thematic meetings and foreseen organised public events – see the minutes of the events) and at the Final Event in Lecce (June 2022), where was activated another fixed workstation at the Museo Castromediano. At the Kastela Archaeological Museum was activated (April 2022) a virtual workstation Oculus with individual screen to be used to surf in the Underwatermuse Map and in 3D mapping of the site of Resnik/Siculi and of the material found in previous excavations stored in the Kastela Museum, through the VR reconstruction of the site in the different historical periods (Neolithic, Roman, Hellenic). Videos have been produced in Italian, Croatian and English, that can also be seen on YouTube.

Sea Archaeological Museum, Caorle – UnderwaterMuse Map workstation (presentation, June 2021)

UnderwaterMuse project fixed workstation at the Castromediano Museum (Lecce, June 2022)

Virtual Reality 3D model presentation

Virtual Reality 3D model presentation

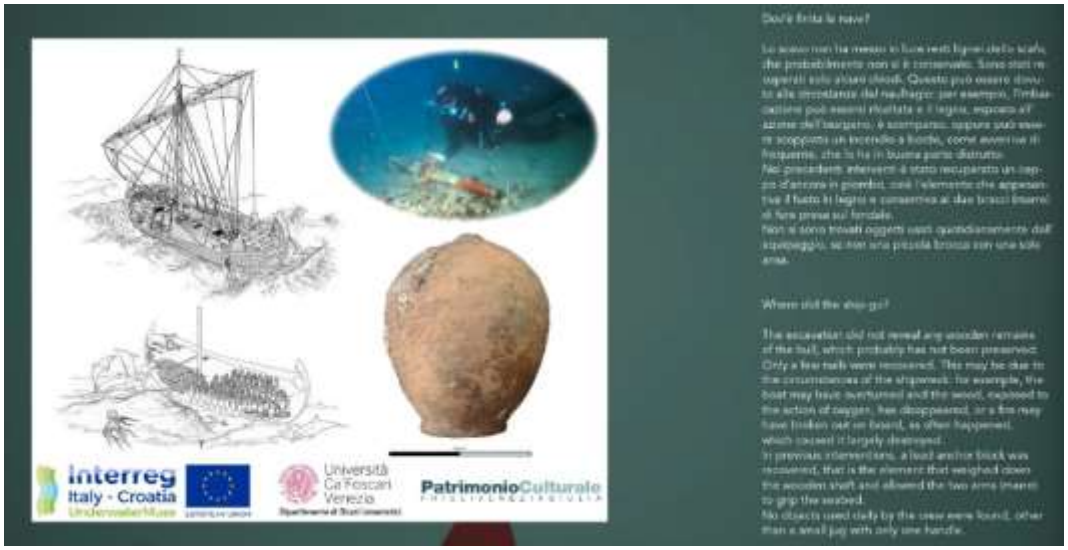
Virtual Reality 3D model presentation

Brick's wreck site – from the UnderwaterMuse Map

Grado 2 wreck site. Virtual reconstruction of the ship route – from the UnderwaterMuse Map

Photogrammetry documentation

Recovered Amphorae



Wreck sample

Underwater museum project