D.1.3.1 – Survey's data and Geodatabase through webgis

Interreg

Co-funded by the European Union

Italy – Croatia

RESONANCE

LP-UNIURB

Document Control Sheet

Project number:	ITHR0200175
Project acronym	RESONANCE
Project Title	impRoving landslidE riSk preventiOn aNd mAnagement iN Coastal arEas
Start of the project	March 2024
Duration	30 months

Project activity	1.3 Development of geo-database/webgis platform
Deliverable number & name	D.1.3.1 – Survey's data and Geodatabase through webgis
Type of deliverable	Report
Language	English
Work Package Number and Title	WP1 - Project initiation and integrated coastal multitemporal survey methodology
Work Package Leader	PP2-CNR

Status	Final
Author(s)	Mirko Francioni, Paolo Stocchi, Stefano Morelli, Simone Galeotti, Giulio Pappafico – **LP-UNIURB**; Giovanni Leucci, Lara De Giorgi, Giuseppe Cavuoto, Daniela Tarallo, Michele Punzo, Maurizio Lazzari, Ivan Ferrari, Vincenzo Di Fiore, Francesco Giuri – **PP2-CNR**; Igor Ružić, Josip Peranić, Martina Vivoda Prodan, Željko Arbanas – **PP3-GRADRI**.
Version	1

Due date of deliverable	31/08/2024
Delivery date	30/08/2024

Index

Contents

1. INTRODUCTION

Landslides and erosion processes have an important impact on coastal areas of the Adriatic Region. These phenomena represent an important risk for humans and infrastructures and might also have negative impact for tourism, thus regional economy. Being controlled by many factors, the analysis of these processes is a complex task, especially considering the effect of climate changing. In this context, RESONANCE aims to decrease the risk for humans and infrastructures by improving the understanding about the factors controlling coastal landslides and erosion processes in the Adriatic region and, at the same time, the civil protection procedures/guidelines. The project will take advantage of the recent advancements on the fields of geophysics, remote sensing, computational analysis and virtual-mixed-augmented reality (VR, MR and AR), and will be developed through the following stages: i) Select four representative pilot case studies (two in the Italian and two in the Croatian coasts) to be used as pilot test sites where to develop a multidisciplinary and multitemporal survey system (the pilot areas will be selected in four regions of the Adriatic area commonly affected by landslides/erosional processes, Marche Region, Puglia Region, Primorje-Gorski Kotar County and Istrian County); ii) Perform numerical analysis of coastal behaviors to potentially predict the future processes in relation to climate variation and weathering processes and create a vulnerability and risk maps of the pilot areas; iii) Create a virtual database containing the research results e define new guidelines for managing hydrogeological risk in Adriatic coastal area.
The objective of the present deliverable is to describe the geodatabase that has been created during the first phase of the project. In particular, the geo-database/webgis (A 1.3) has been developed simultaneously with the first survey activities, and will be continuously updated during project progresses. The geodatabase has been developed through free-were GIS/webGIS platforms and shared among the partners and, in the near future, with authorities dealing with risk management.

2. DEVELOPING THE GEODATABASE

The geo-database has been developed in the QGIS platform. QGIS is a geographic information system (GIS) software that is free and open-source. It supports Windows, macOS, and Linux and it allows for the viewing, editing, printing, and analysis of geospatial data in a range of data formats. Being one of the most used free and open-source GIS software, QGIS allows for an easy and rapid sharing of data.

In this phase, we have put together all the data available about the four case studies (Conero, IT, Roca, IT, Brovinje, HR, Havisce, HR) and included in QGIS. In particular, for each case study we have retrieved aerial and/or satellite photographs, the most resolute available Digital Elevation Model (DEM) or Digital Terrain Model (DTM) and geological maps. From the available DEM we have extracted thematic maps for the initial geomorphological interpretation of the sites, such as Hillshade map, Slope map and Aspect map.

The hillshade is a grayscale 3D representation of the terrain surface, the Slope map represents the steepness or degree of incline of the terrain while the Aspect Map the direction of the physical slope faces.

Figure 1 shows the initial development of the geodatabases in QGIS (with satellite photographs) for the 4 case studies, Conero, IT, Roca, IT, Brovinje, HR, Havisce, HR.

For a simpler representation of the following steps, the Conero Regional Park will be taken as example for illustrating the extracted thematic maps.

Figure 2 shows the satellite photograph of the Monte Conero.

Figure 3 shows the DTM of the Conero coastal area, gathered from LiDAR survey carried by the Marche Region in 2012 and with a resolution of 2x2 metres.

Figure 4 shows the geological map, georeferenced and overlapped with the satellite photograph.

Figure 5, 6 and 7 show the Hillshade, Slope and Aspect maps, extracted from 2x2 metres DTM.

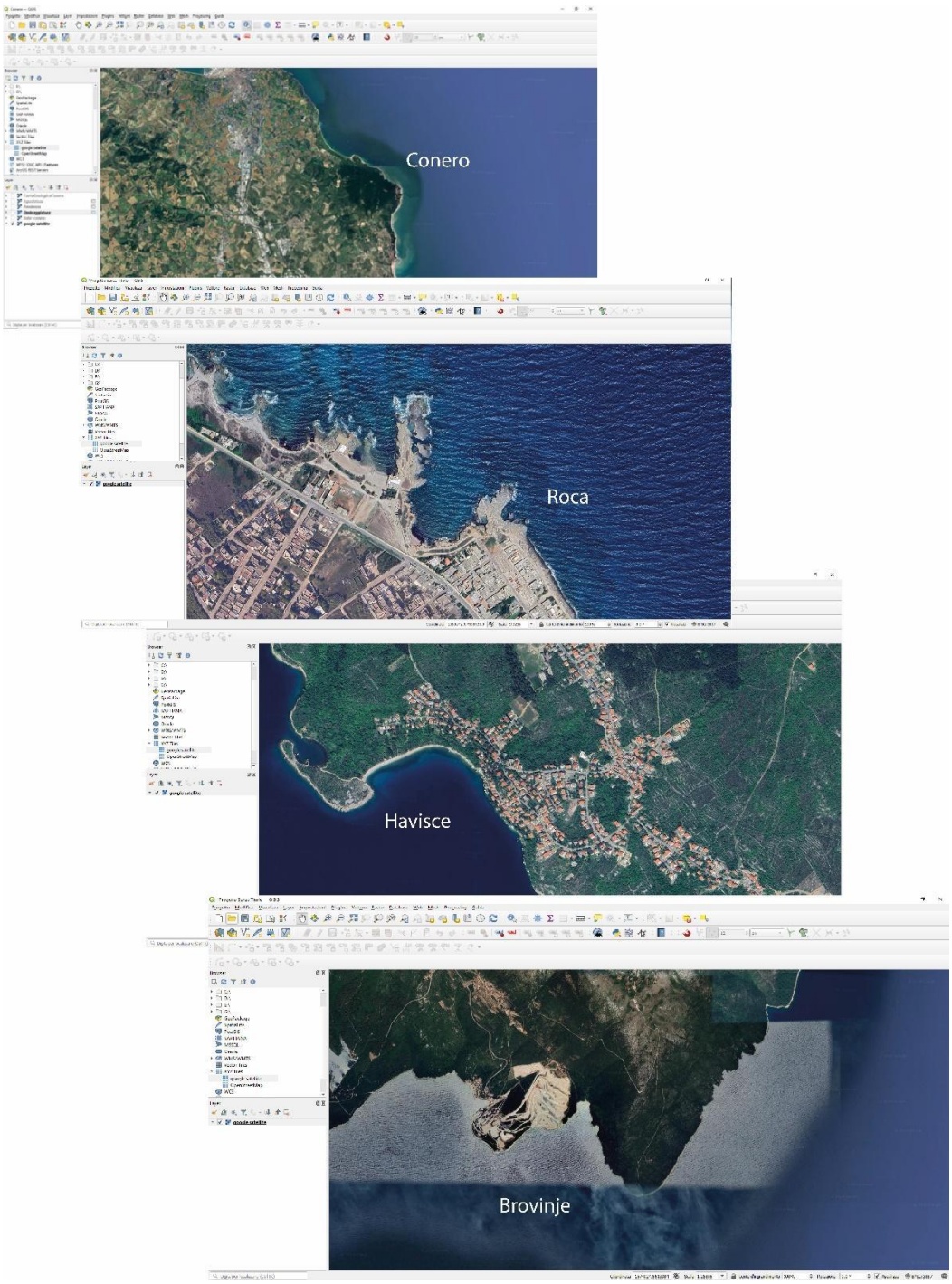

Figure 1. Initial development of the geodatabases in QGIS (with satellite photographs) for the 4 case studies Conero (IT), Roca (IT), Brovinje (HR) and Havisce (HR).

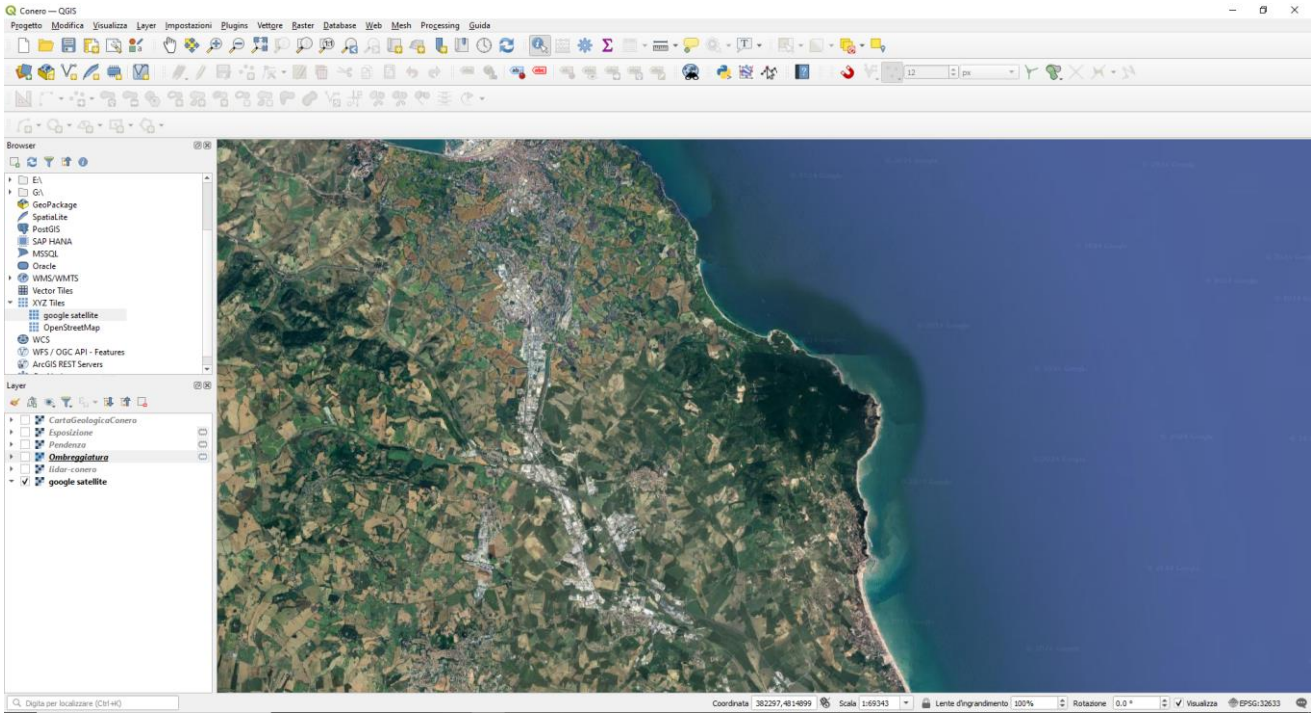

Figure 2. Satellite photograph of the Conero area.

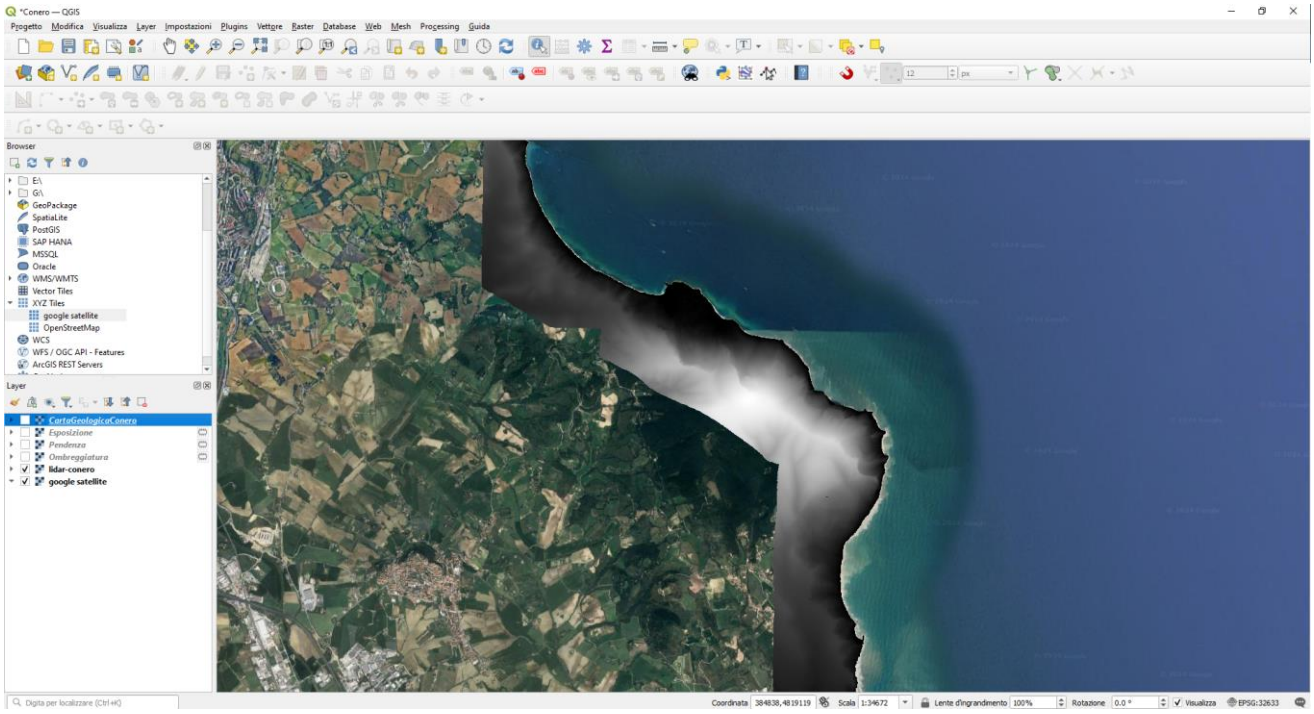

Figure 3. DTM of the Conero coast with a resolution of 2x2 meters.

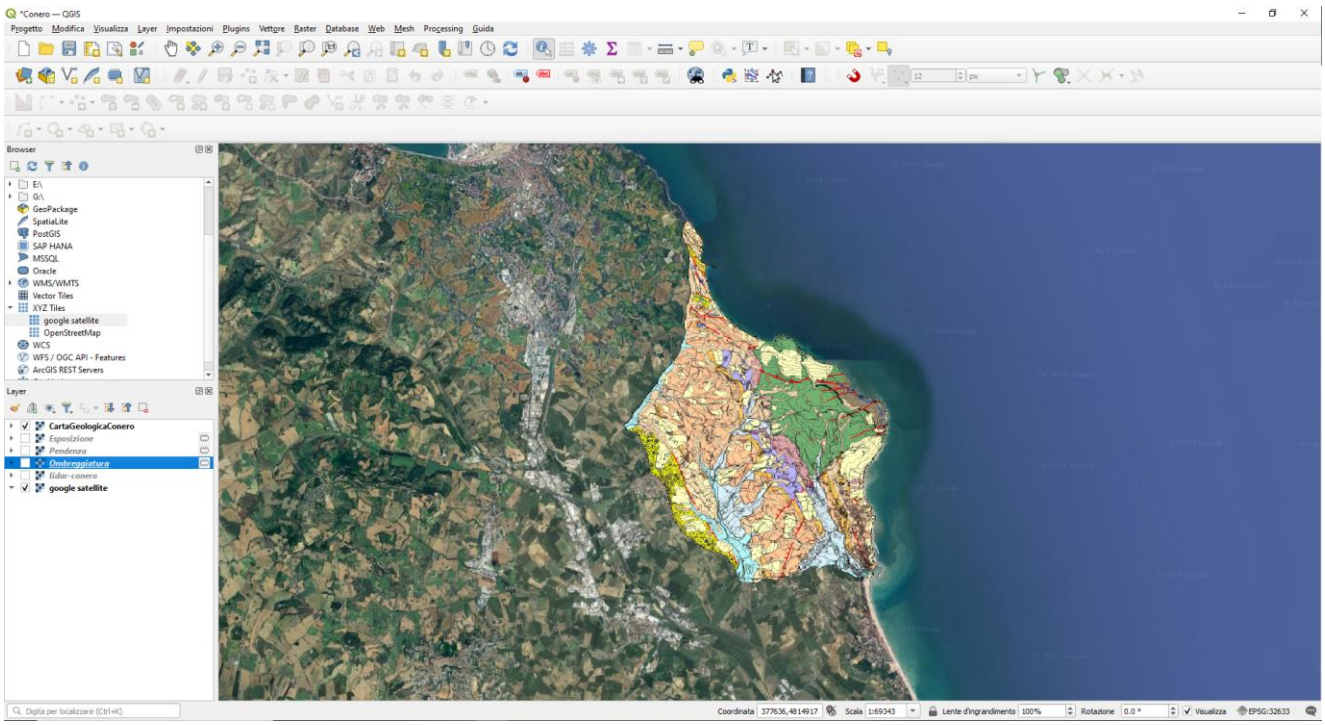

Figure 4. Geological map of Conero Regional Park, georeferenced and overlapped to the satellite photograph.

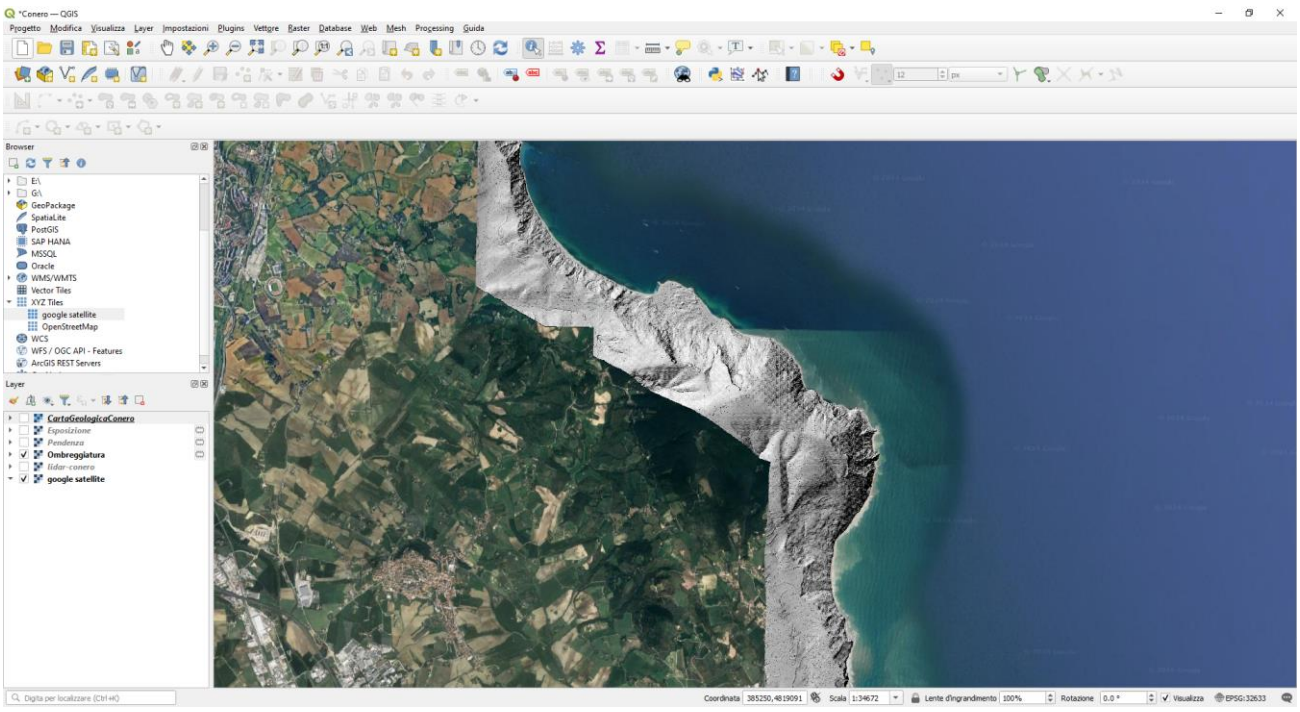

Figure 5. Hillshade map extracted from 2x2 meters DTM.

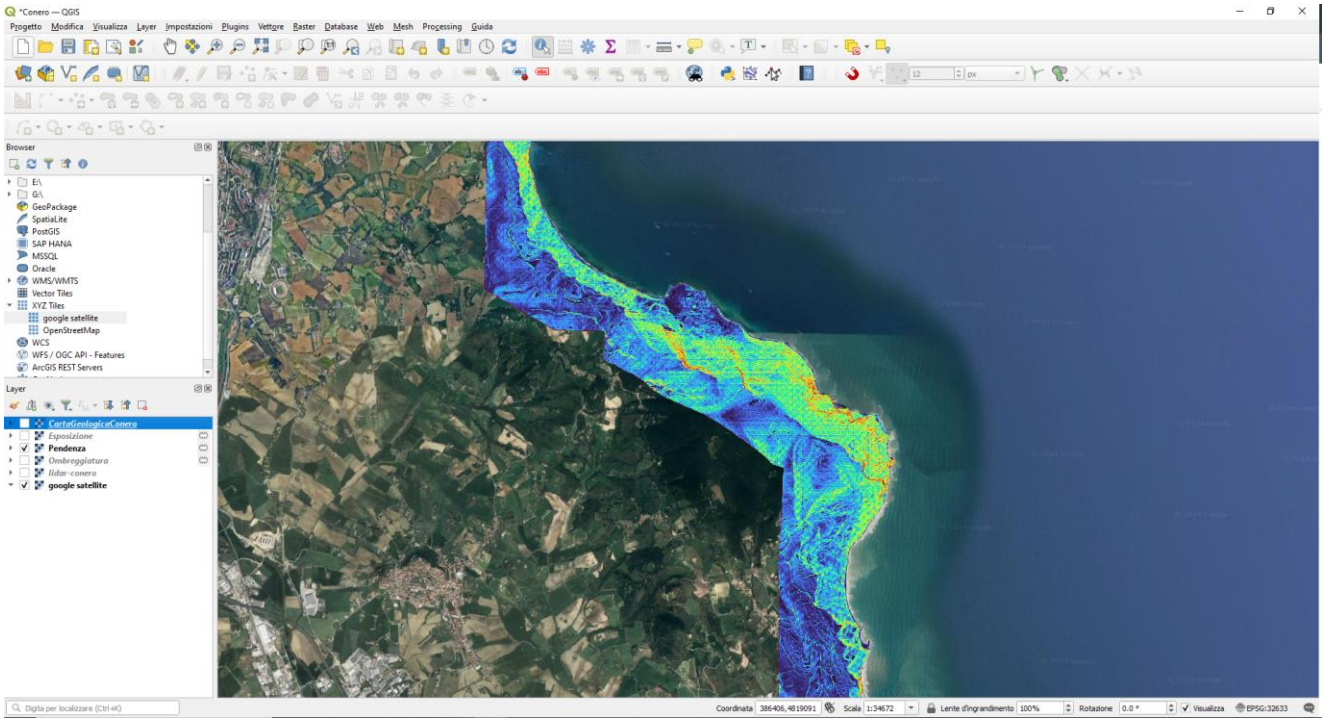

Figure 6. Slope map extracted from 2x2 meters DTM.

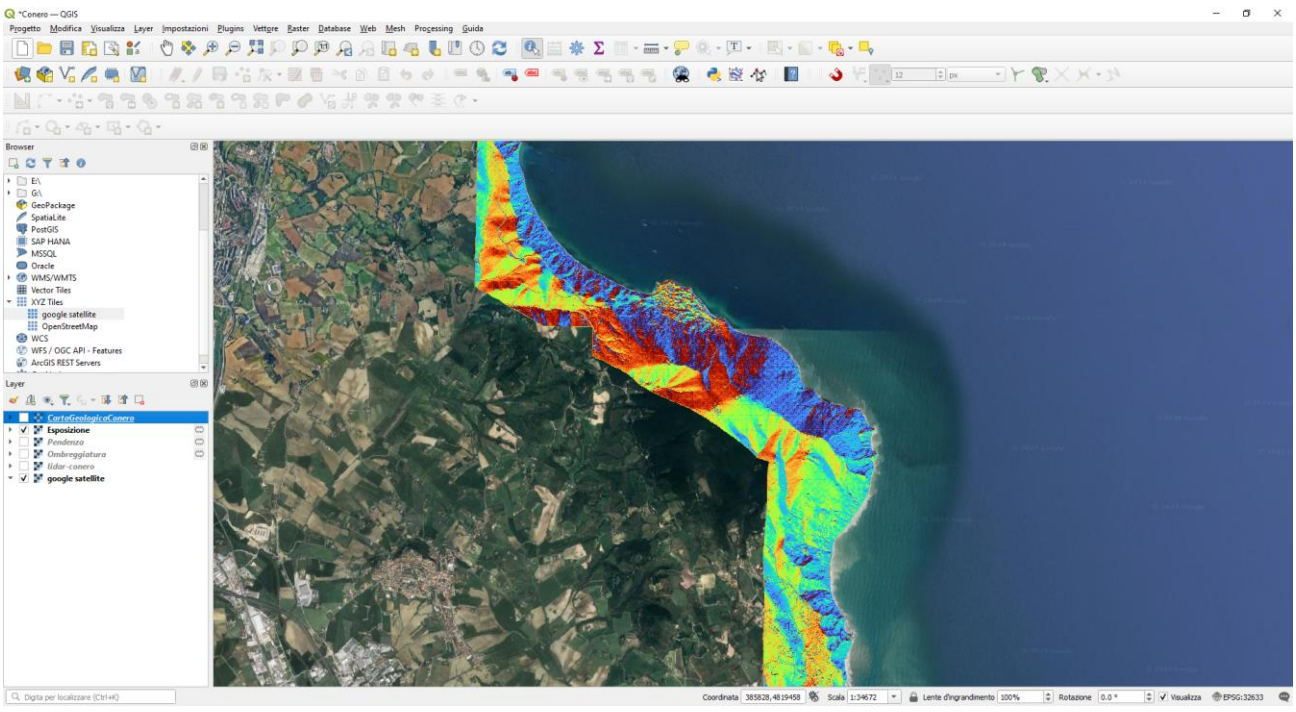

Figure 7. Aspect map extracted from 2x2 meters DTM.

When more detailed or specific data were available, this was included in the geo-database, improving the existing data. An example is the Unmanned aerial Vehicle (UAV) data available for a specific sector of the Conero Park (From Portonovo to Mezzavalle). Figure 8 shows the UAV extracted orthophoto, with resolution of 10 cm, overlapped to the hillshade map.

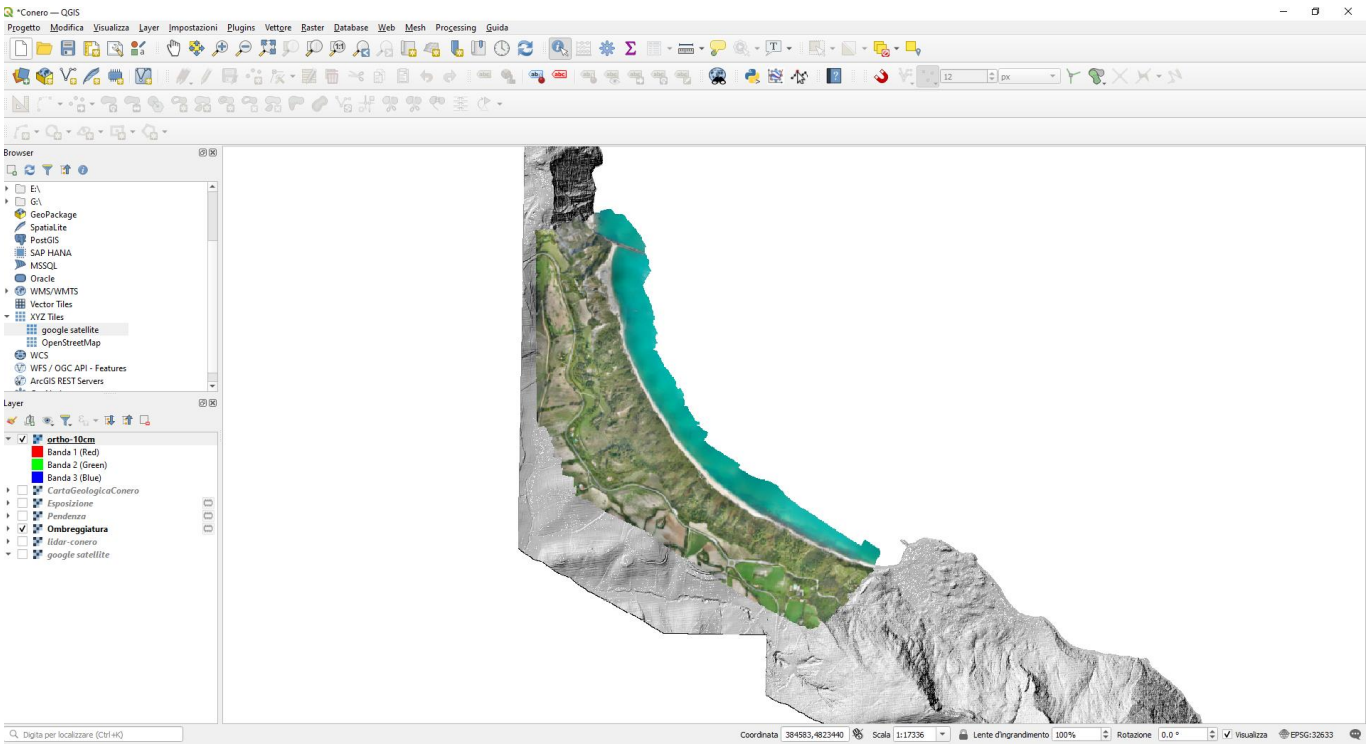

Figure 8. UAV extracted orthophoto with resolution of 10 cm, overlapped to the hillshade map.

3. DEVELOPING WEBGIS

All the information included in the Geo-database will be shared through the use of WebGis platforms.
It is important to highlight that, in this report, as a case example and for simplicity, we have illustrated the data related to the Conero Regional Park. However, the Geo-database has been developed for the four case studies using the same data and procedure showed for the Conero Regional Park. The Geo-database (and consequently the WebGis platform) will be updated with the new surveys and analyses data for the entire duration of RESONANCE.

We have implemented a WebGIS for the four Resonance case studies using Google Earth Web platform. In this webgis, maps of DEM, Slope, Exposure, Hillshade and, where available, Geology have been included.

A link is provided for each of the four projects to access the area of interest.

- Conero Regional Park
https://earth.google.com/earth/d/1o6Xz9kck0dL6Nbp-NvT_s-5TCtcV28Ur?usp=sharing

- Roca
https://earth.google.com/earth/d/11f-AG_5ynvGsJXKsATCyx64vqUfUUWWE?usp=sharing

- Brovinje
https://earth.google.com/earth/d/10sT9p3tOxiq689h57FUD_CyMw-tFdrbw?usp=sharing

- Havishe
https://earth.google.com/earth/d/15TQxlVhXeAGcN309GaEZ7RozYNBo7CI8?usp=sharing

When opening the link, it is possible to immediately see the Hillshade map on the top of Google Earth satellite image. Using the white arrow in the top left of the screen it is possible to visualize the legend (Figure 9) with all available layers. Through the legend the users can show and hide the different maps (Figure 10).

During the next stage of the project, a further WebGis will be developed using the University of Urbino Web Server. In this server we will install a freewere software(like the web app Apache Tomcat, Geoserver and the OpenLayers libraries) for managing and customizing the webgis outputs.

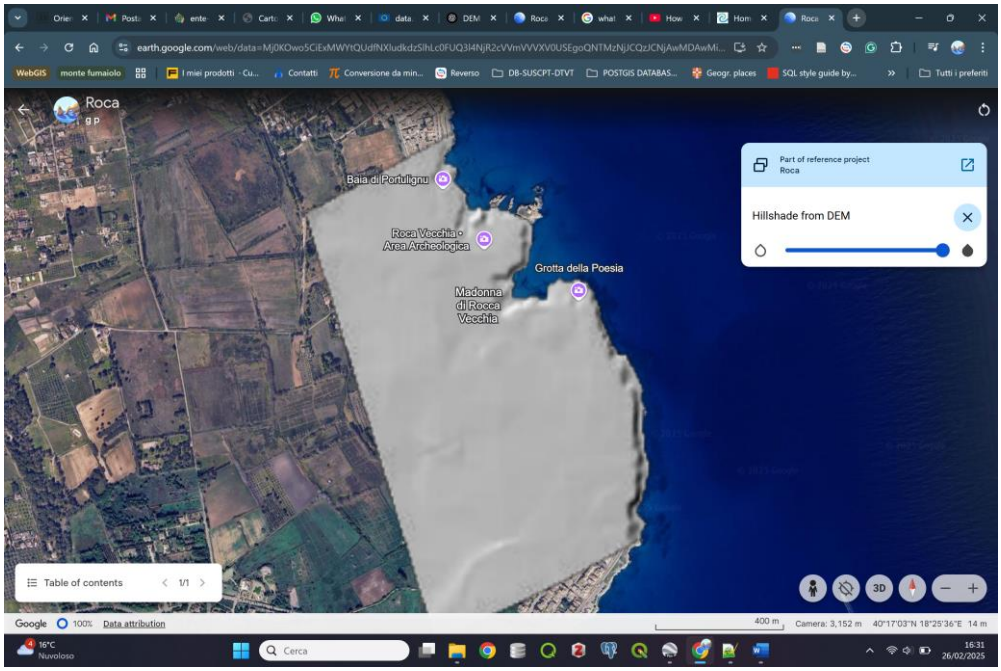

Figure 9. Hillshade map on the top of Google Earth satellite image. On the top left the white arrow allows for the opening of the legend.

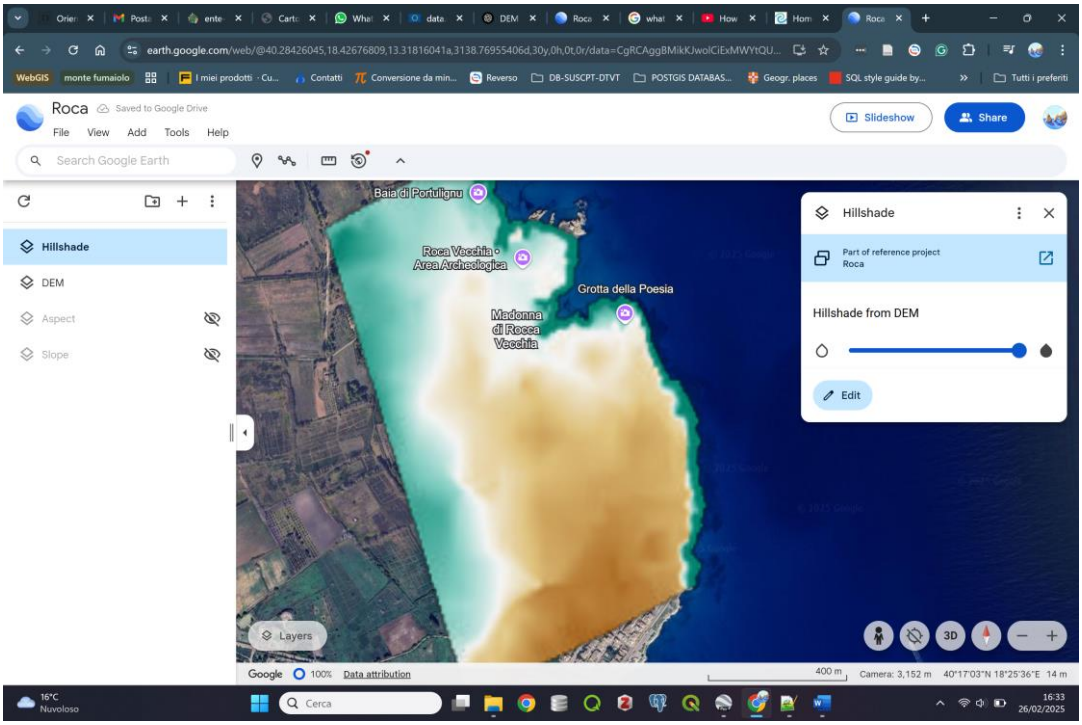

Figure 10. Digital Elevation Model on the top of Google Earth satellite image. Using the legend on the left the users can show and hide the different maps.