



Country / City

Switzerland

University / School

Accademia di Architettura di Mendrisio (USI)

Academic year

2018

Title of the project

Building Bridges: a protective shelter from debris flow

Authors

Antonio Mazzolai



TECHNICAL DOSSIER

Title of the project	Building Bridges: a protective shelter from debris flow
Authors	Antonio Mazzolai
Title of the course	Atelier Nunes e Gomes da Silva - Lugano: <i>dalla Val Veleggio alla Val Cassarate</i>
Academic year	2018/2019
Teaching Staff	Prof. João Nunes, João Gomes da Silva, Asst. Teresa Figueiredo Marques, Angela Palmitessa
Department/Section/Program of belonging	Design studio - Architecture
University/School	Università della Svizzera Italiana - Accademia di Architettura di Mendrisio



Written statement, short description of the project in English, no more than 250 words

The project started from an analysis of the problems of the East side of Monte San Salvatore in Lugano (CH) and in particular the stretch of coast that goes from Capo San Martino to Melide. The rocky wall facing the North and the entire slope have a condition of strong geological instability. Being at the foot of a fault of fluvial origin, over forty collapses have been recorded in the area in the last twenty years, involving the repetitive invasion of the street below with detrital material.

The aim of the project is to provide a protective shelter for the road and the corresponding railway section with a tunnel-like roof with a curvilinear morphology designed to ensure the material fall back towards the lake shore. The structure is therefore in a sense more similar to a bridge - which connects the two sides of the slope, the upper and the lower part separated by the infrastructure - that to the type of snow shed, functional to hinder and stop the descent of material.

The idea is that the project evolves over time according to the natural debris flow of the mountain, accumulating and letting the materials slide until a new angle of repose is established at the foot of the mountain. Progressively covered by debris over the years, the structure could shape a low hill on it and could ideally become a new passage for the citizens to access the shore, until now completely inaccessible for the whole Paradiso-Melide tract.

For further information
Máster d'Arquitectura del Paisatge -DUOT - UPC

T: + 34 93 401 64 11 / +34 93 552 0842
Contact via email at: biennal.paisatge@upc.edu

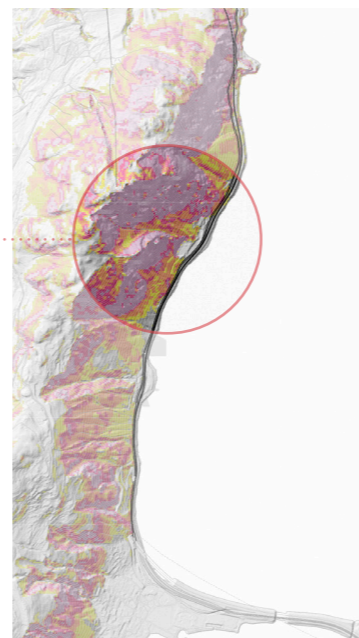
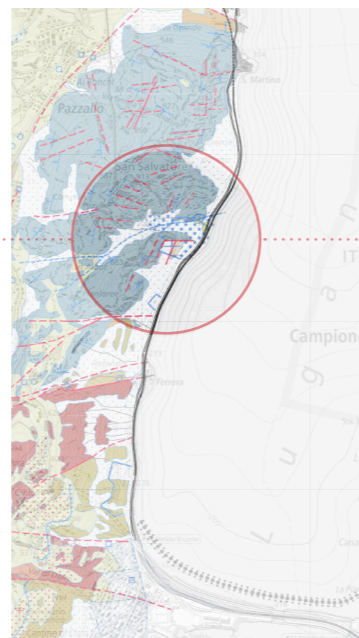
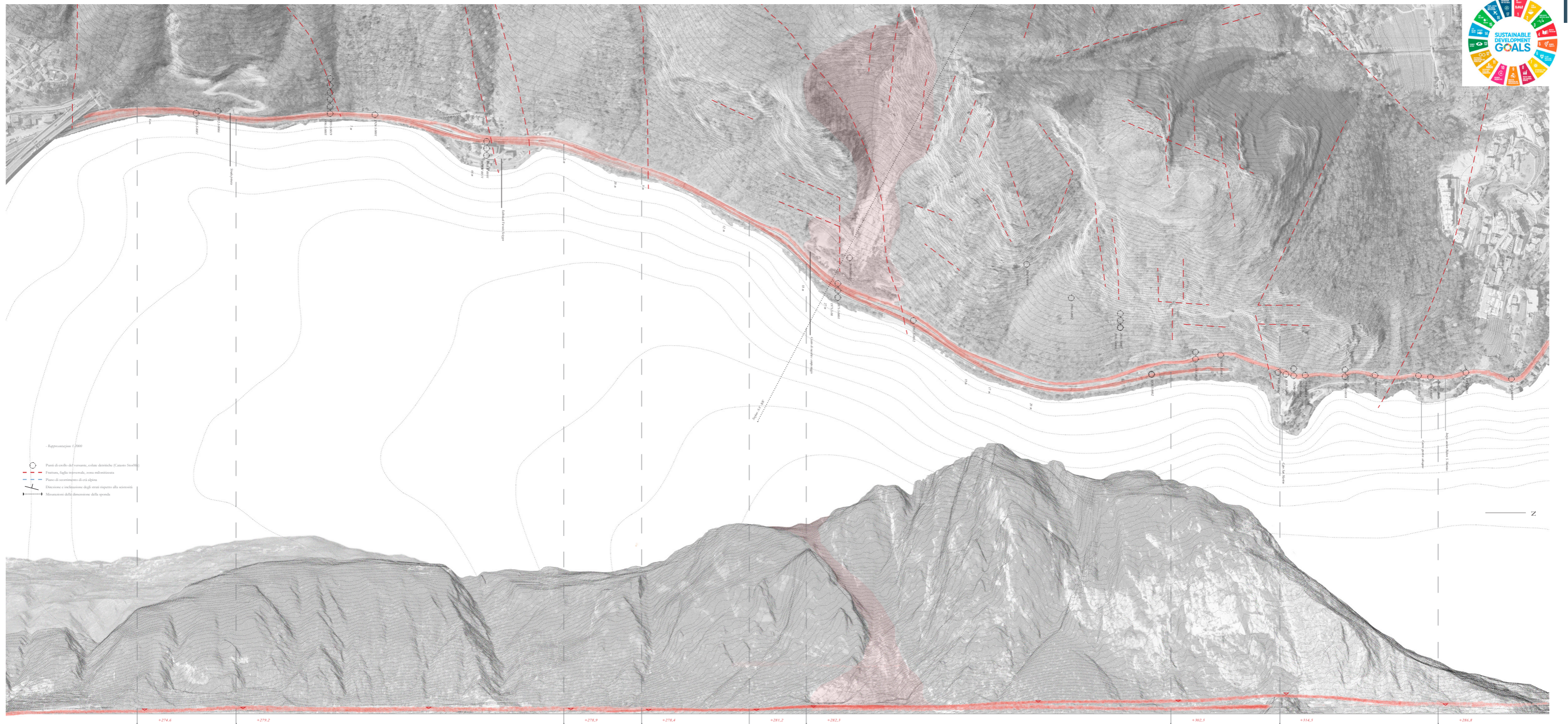
Máster d'Arquitectura del Paisatge -DUOT - UPC
ETSAB- Escola Tècnica Superior
d'Arquitectura de Barcelona
Avenida Diagonal, 649 piso 5
08028 Barcelona-Spain



CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020
SCHOOL PRIZE

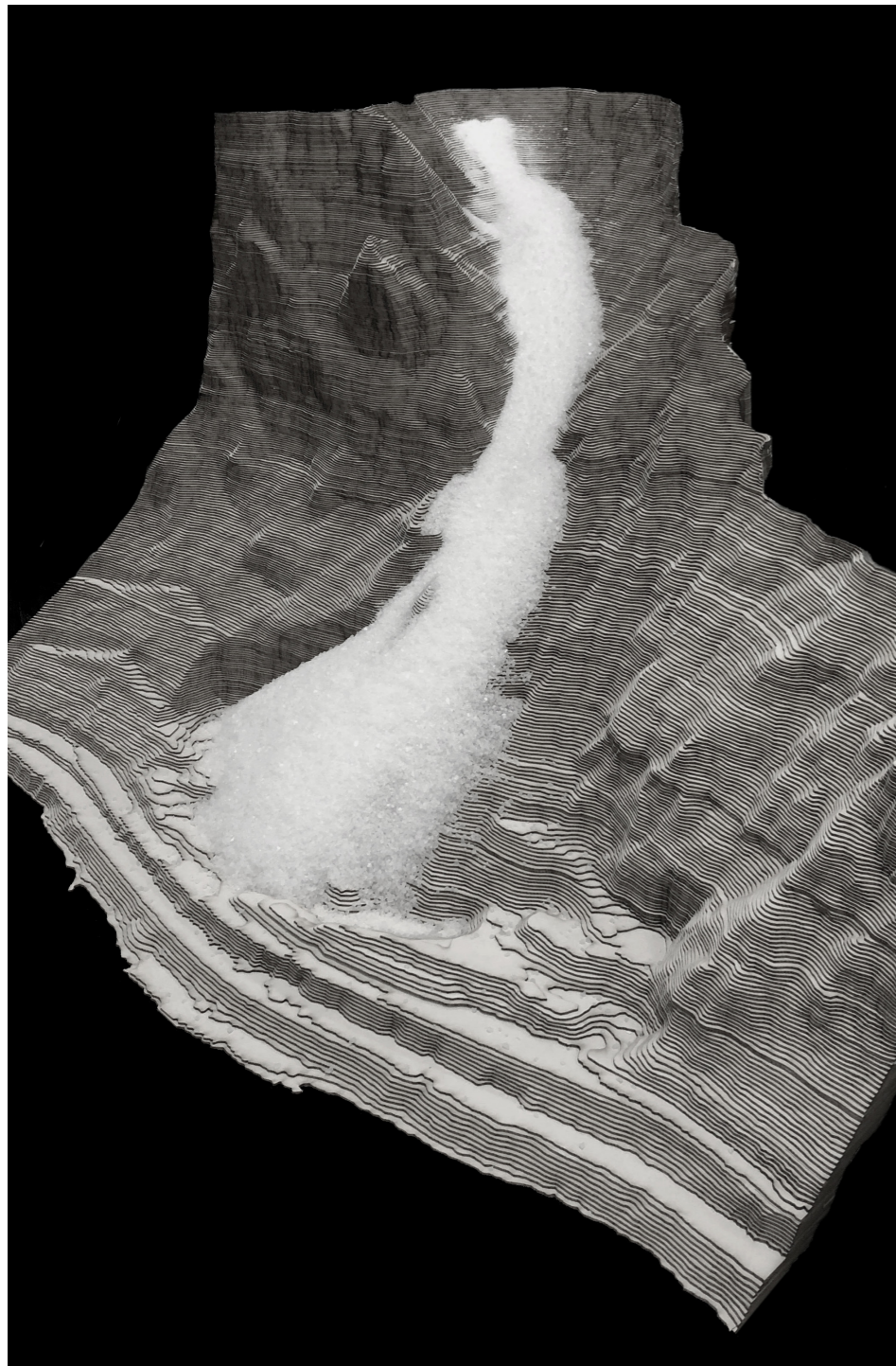


Above, a plan and an elevation of the stretch of coast between *Capo San Martino* and *Melide* (CH), with the *Cantonale A2* road, railway track and the area of the river fault investigated highlighted in red.
 From the left, general plan of the area; geological map; map with degree of slope of the rocky wall.

The project started from an analysis of the coast line of the city of *Lugano* (CH), today largely artificial and heavily defined by a road section that marks its perimeter, limiting access to the lakeshore in many places. Infrastructure works such as those of the *N2* motorway are certainly part of the cultural heritage of the place and are linked to a historical moment of particular interest for the growth of *Ticino*. Despite this, these same works today deserve an updated reflection and push us to think of strategies for a greater integration with the landscape. My area of investigation was the

coastal stretch between *Capo San Martino* and *Melide*, entirely crossed by the *Cantonale A2* road and the *Melide-Paradiso* railway section. In addition to provide a new accessibility to the shore, the intent of the project is also that of securing the road from the various collapses and debris flows caused by the geological instability of the above slope of *Monte San Salvatore*. The specific area of intervention, highlighted in the images, corresponds to the most unstable portion, due to a fault of fluvial origin that marks its passage.

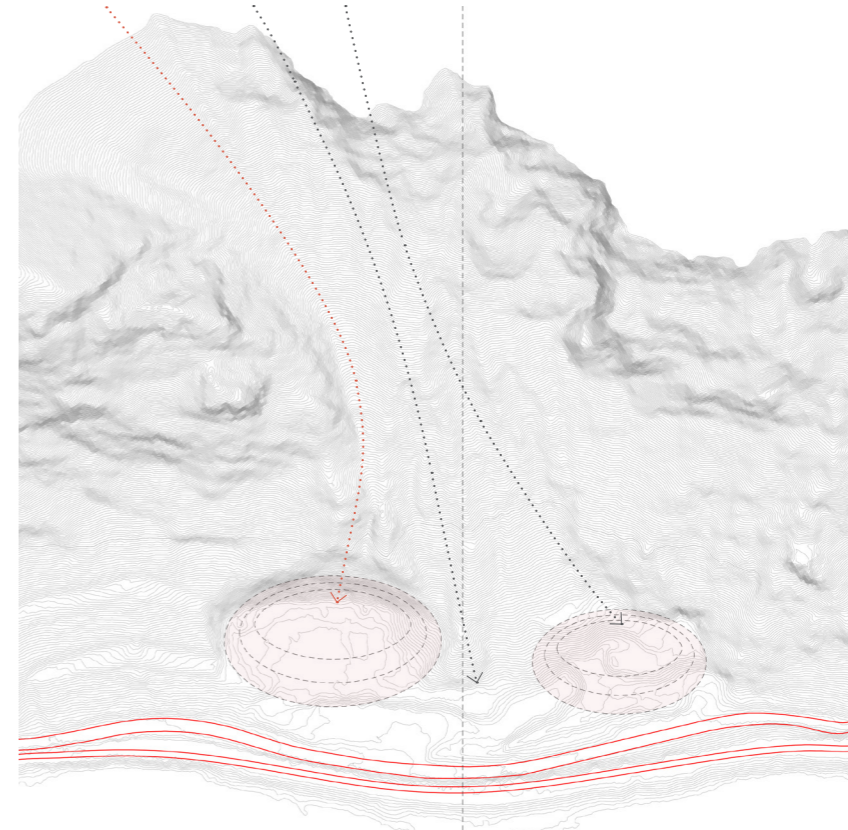
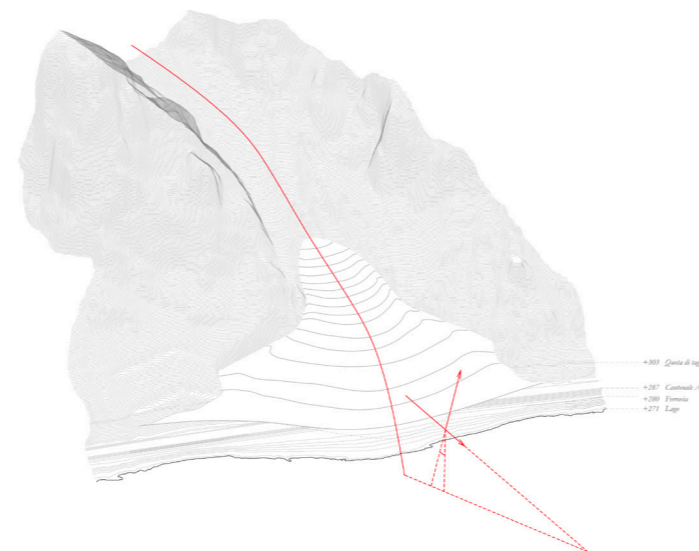
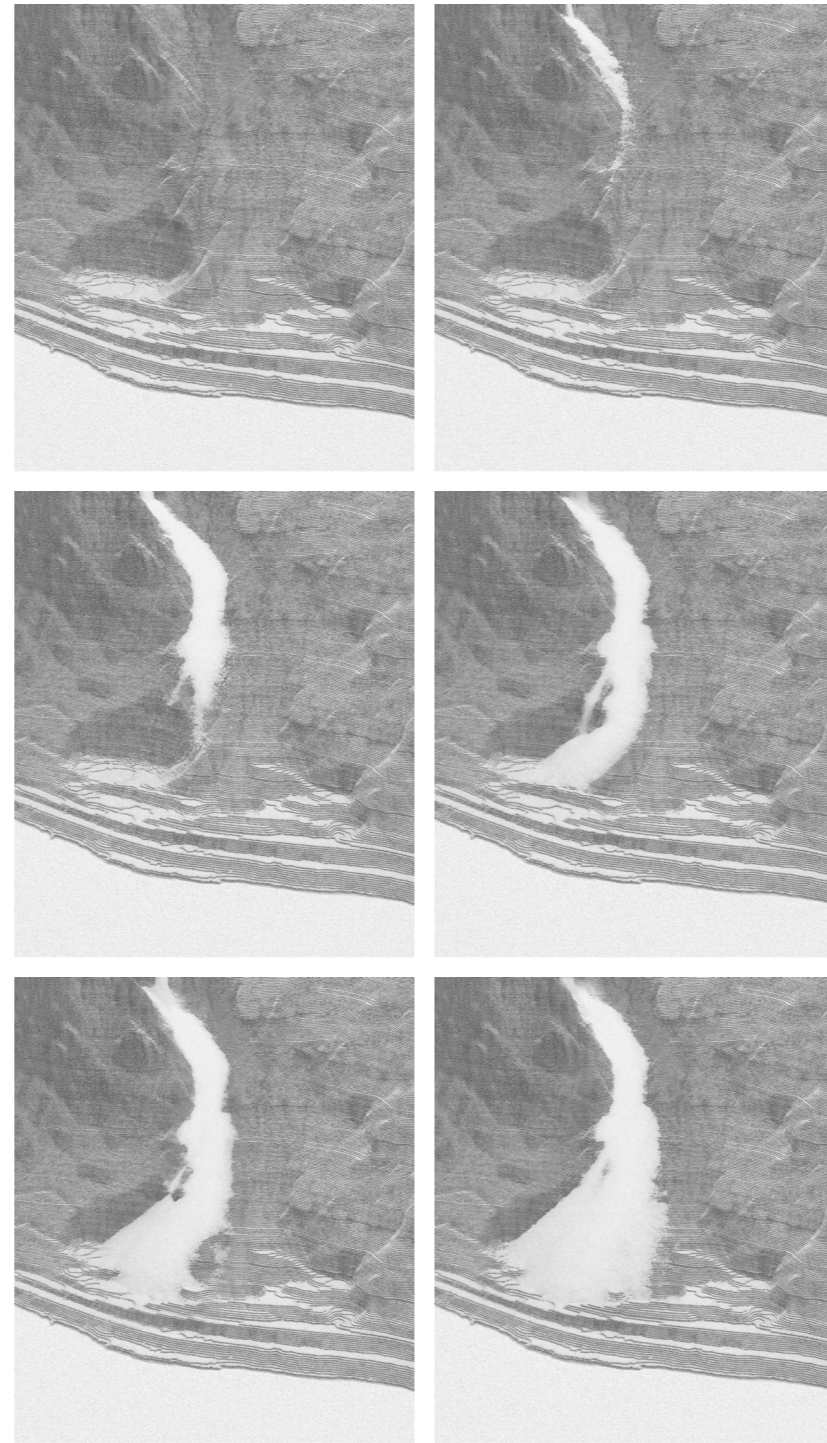




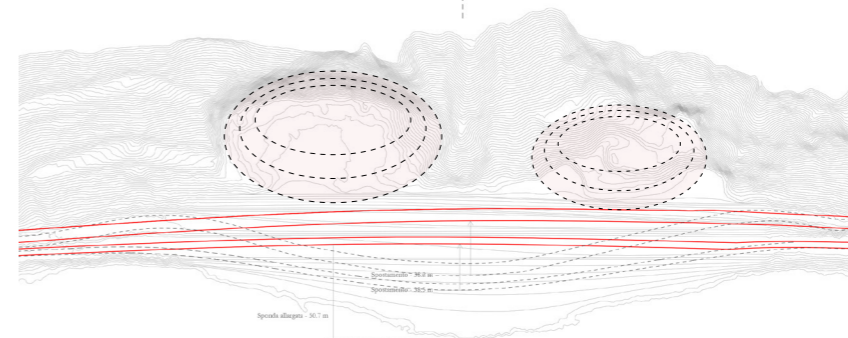
The study of the rocky slope and the road below had as a fundamental verification tool the construction of a large 1:50 scale model, shown in the photos above. With this, the morphology of the slope and the behaviour of the detrital flow on its surface were tested empirically, simulating in a small scale the fall of material over time caused by a punctual landslide or by a constant fall downwards.

The proposed intervention was therefore that of a tunnel to protect the underlying road section and facilitate the descent of these debris towards the coast, studying through the various experiments conducted on the model, a particular asymmetrical curvature for the section of the structure. The intervention would thus favor a more stable accumulation of material at the foot of the mountain, defining a new angle of repose.

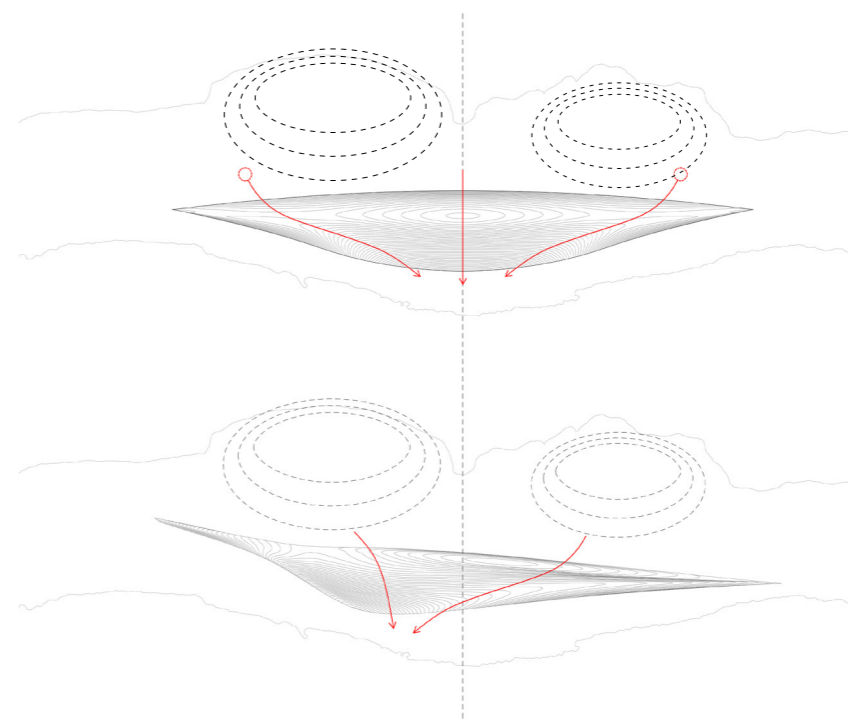
Above, a photo of the 1:50 scale model built for the analysis of the morphology of the slope and a sequence of shots showing the experiment of a debris fallout in the lower part of the mountain. On the right, the scheme of a hypothetical new angle of repose that could be created by stabilizing the accumulation of materials through a new structure.



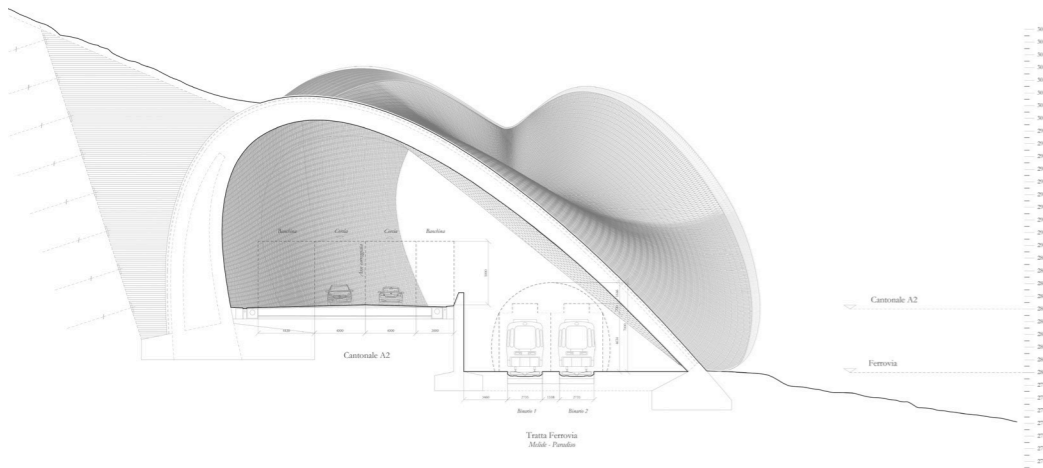
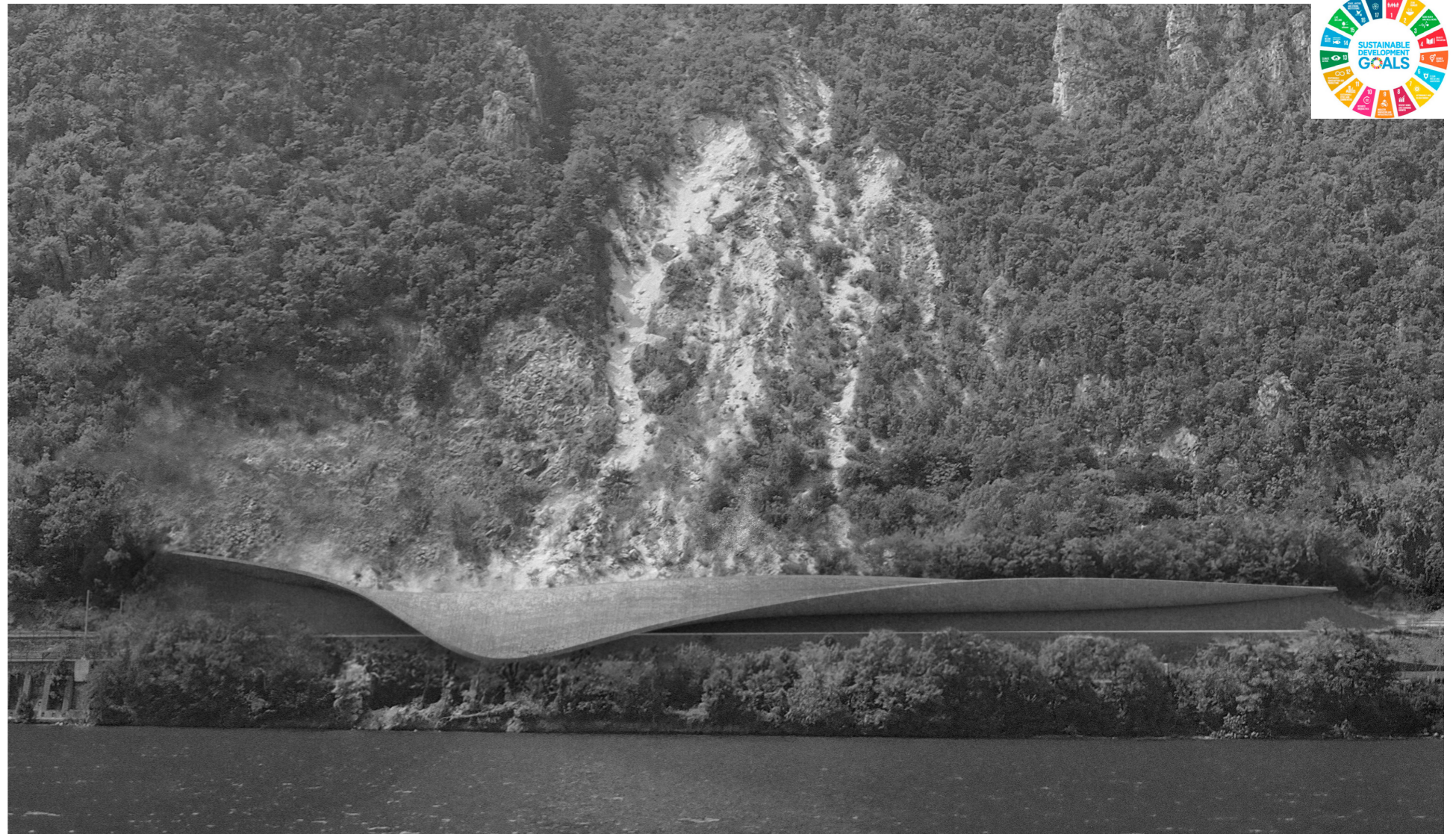
The analysis on the model led to the identification of two main debris collection basins, dangerously close to the road section of *Cantonale A2* and the corresponding railway section.



The first intervention provided by the project is to correct the road section near the fault by straightening its trajectory. The modification leads in this way to facilitate a continuity in section between the tunnel and the slope and at the same time to free up a large portion of the coast now cut by the road.

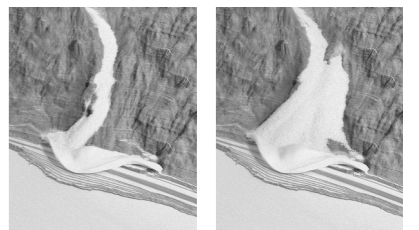
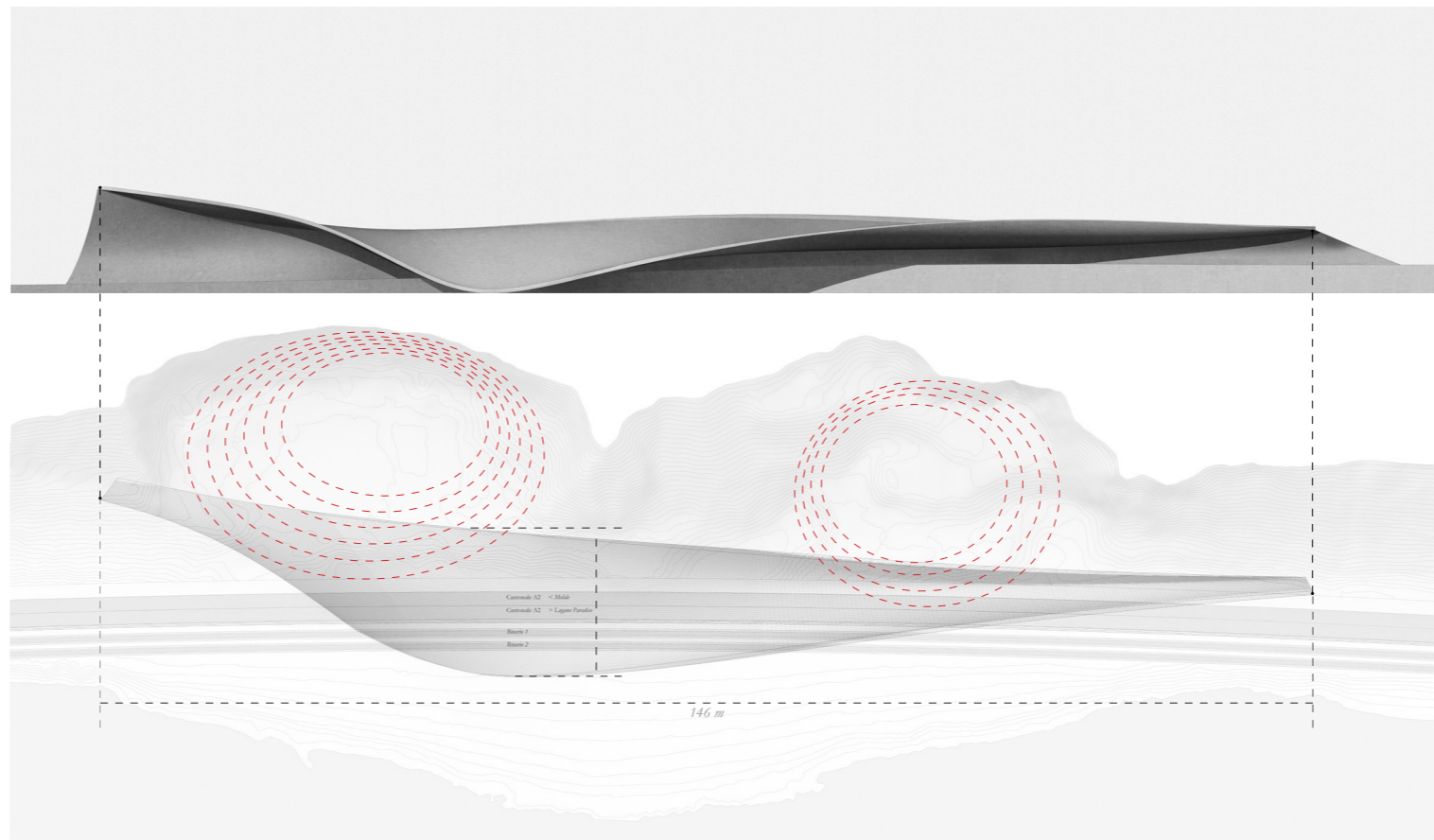


In relation to the different size of the debris collection basins and to the results of the experiments on the physical model that outlined a different accumulation on the two sides of the rocky wall, we went from the initial hypothesis of a tunnel with symmetrical coverage (*on the left*) to an evidently asymmetrical one (*bottom left*).



The proposed tunnel is characterized by an organic long-line shape designed to facilitate the descent of the material towards the shore. Below it, the new road and railway section take place, sheltered from possible landslides. Once progressively covered with debris, the hypothetical long-term result would be that of a structure completely integrated into the landscape, and the new angle of repose could in this way become a pedestrian crossing above the road and allow access to the lake shore hitherto inaccessible for the entire Capo San Martino-Melide stretch, acting therefore as a new "bridge".

Above, a render of the tunnel seen from the railway level, and to the side, a render of it in the landscape. Up here, a cross section of the tunnel highlighting the Cantonale A2 road and the corresponding railway portion.



Above, a test on the model with a plaster reproduction of the tunnel to schematically study the relationship with the debris flow.

On the left, plan and elevation of the proposed tunnel in relation to the road and railway section and the two different-debris collection basins.