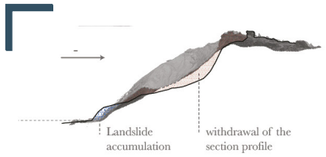
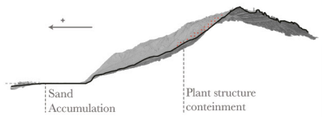
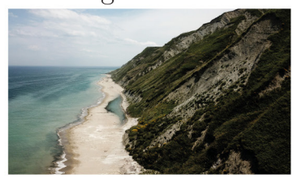
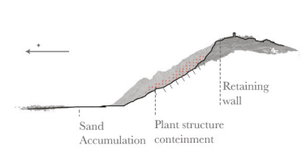


Erosion *site*

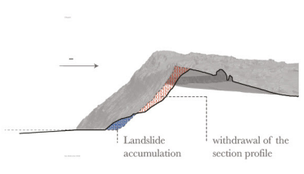


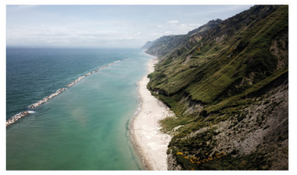
Growing *site*



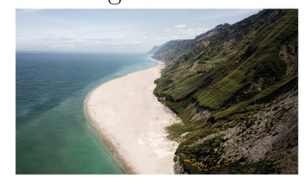


Erosion *site*





Growing *site*



Country / City	Italy, Ferrara
University / School	University of Ferrara / Architecture Department / Sealine Research Center
Academic year	2018/2019
Title of the project	ACTIVE LANDSCAPE. A dynamic strategy for a weak land, the case-study of Monte San Bartolo
Authors	Pietro Benedettini, Chiara Graziadei

TECHNICAL DOSSIER

Title of the project	ACTIVE LANDSCAPE. A dynamic strategy for a weak land, the case-study of Monte San Bartolo
Authors	Pietro Benedettini, Chiara Graziadei
Title of the course	Master Thesis Laboratory in Landscape Architecture and Infrastructures
Academic year	2018/2019
Teaching Staff	Luca Emanueli, Gianni Lobosco (Supervisors), Marco Medici, Massimo Tondello (Co-Supervisors)
Department/Section/Program of belonging	Architecture Department / Sealine Research Centre
University/School	University of Ferrara

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

The landscape of Monte San Bartolo is a very fragile land with a steep cliff overlooking the Adriatic Sea that has long been subject to landslides and fires which are seriously endangering the stability of human settlements and the infrastructures there. In the next 80 years, IPCC predicts that sea level rise will grow up to 1 meter quickly increasing the risk of erosion and the collapse of the villages built nearby the cliff. The thesis strategy is not aimed at just fixing and freezing the current situation with a heavy infrastructure, leading to further decay, but proposes to get inside transformative dynamics of the landscape and to guide its evolution to generate a new inviting scenario. The project focuses on the stretch of cliff from Gabicce to Pesaro considering it as an elastic: if in some points it is necessary to generate a thickening of the coast line, moving the contact of the sea from the foot of the mountain, in the immediately following areas, the erosive action of the sea can proceed, with a consequent retreat. In this way the landscape is activated letting landslides be the trigger for a new transformative process that will reach its own stability by 2100. Two sample areas are presented to show the different actions to be developed in growing and erosion sites. Such long lasting program is supported by a monitoring project that is meant to progressively feed back the planned interventions by fine-tuning the inputs of the numeric models that ground the proposal.

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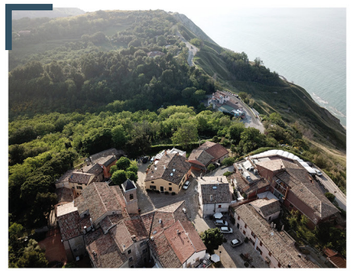
CLIMATE CHANGE AGAIN

11th International Biennial Landscape Barcelona

Barcelona September 2020

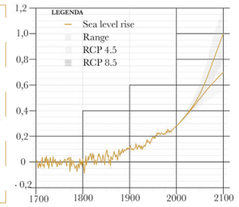
SCHOOL PRIZE



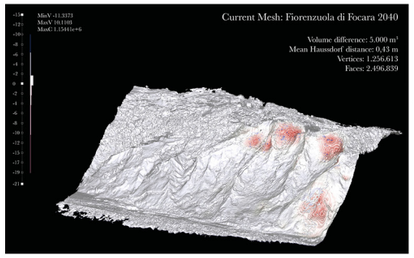
CC Scenarios

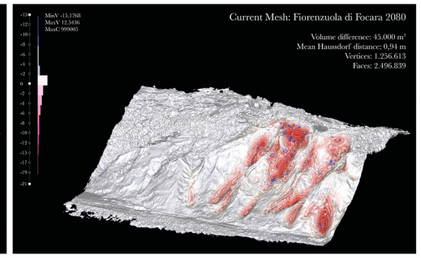
In the next 80 years, the IPCC forecasts predict that the sea level rise will grow up to 1 meter. That means that the risk of erosion in the Monte San Bartolo area is quickly increasing and the villages built next to the cliff might collapse soon as well as the activities (like farming) assuring the landscape management.

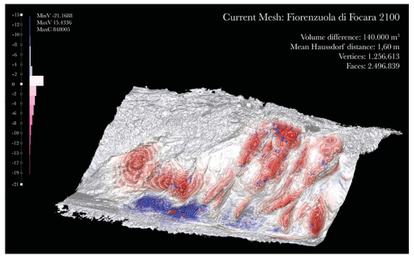
▲ *Kinematic Recap*

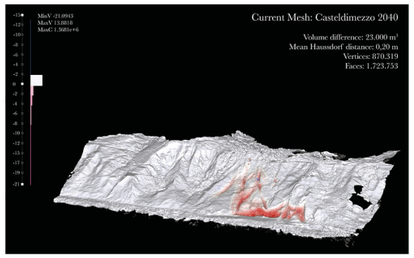


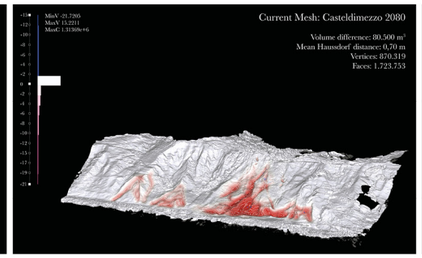
▲ *IPCC scenario, sea level rise*

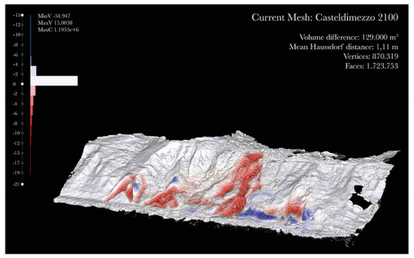




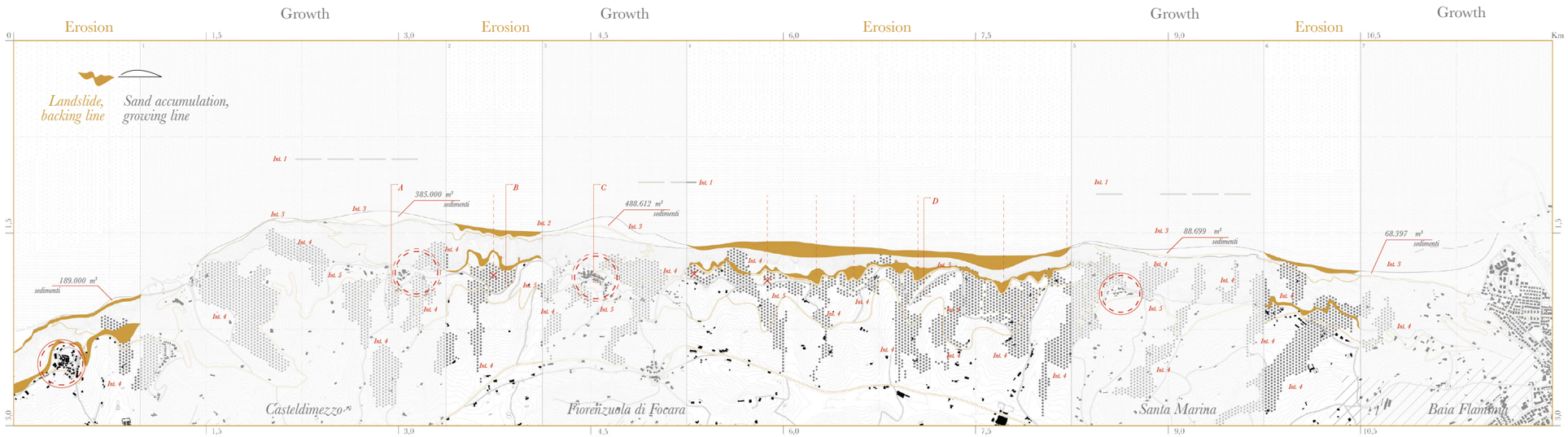








▼ *General masterplan, coast line projection as an elastic*



Strategy

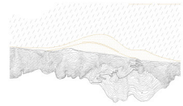
The project focuses on the stretch of cliff from Gabicce to Pesaro considering it as an elastic landscape: if in some points it is necessary to generate a thickening of the coast line, moving the contact of the sea from the foot of the mountain, in the immediately following areas, the erosive action of the sea can naturally proceed, with a consequent retreat.
In this way the landscape is activated letting landslides be the trigger for a new transformative process development.

EROSION actions

- Driven erosion
- Vegetation for erosion control
- Vegetation for fire control
- Roads and paths adaption

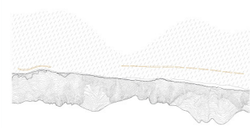
GROWTH actions

- Nourishment, sand accumulation
- Breakwater barriers (underwater)
- Retain wall
- Environmental engineering

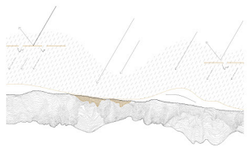


DYNAMICS OF GROWTH

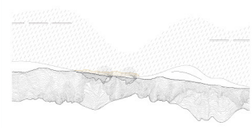
1 | Existing barriers removal



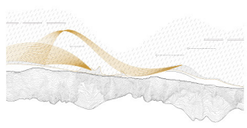
2 | New breakwaters and nourishments



3 | Driven landslides



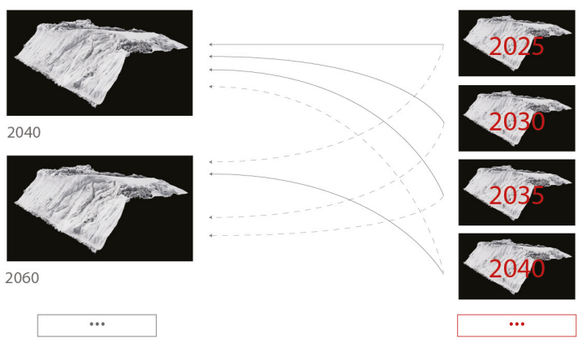
4 | Natural dredging of sediments



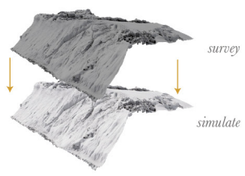
The Monitoring as a design tool

A Lapse: 5 years

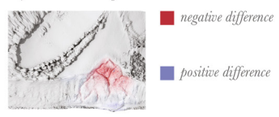
Simulation of future scenarios ◂ COMPARISON ▸ **Survey** (every 5 years)



1 | Meshes' overlay



2 | Surfaces comparison



The project's guidelines refer to a time frame of 80 years and since the landscape is in constant transformation, it is required to combine the project actions with constant monitoring.

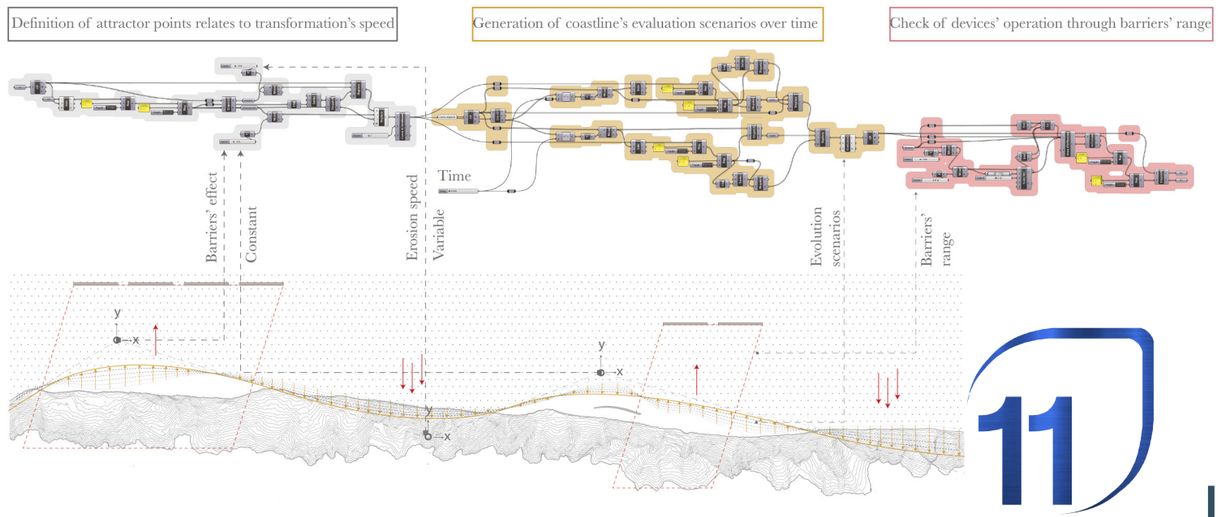
Two tools are proposed to verify the forecasts made over time: the first (A) is based on the comparison between a simulated future model and a survey carried out at a time of 5 years;

the other tool (B) supports the landscape design and, through a specific algorithm, it allows the generation of new evolutionary scenarios of the landscape by evaluating, over the months, the adequacy of the planned interventions.

B Lapse: 3/4 months

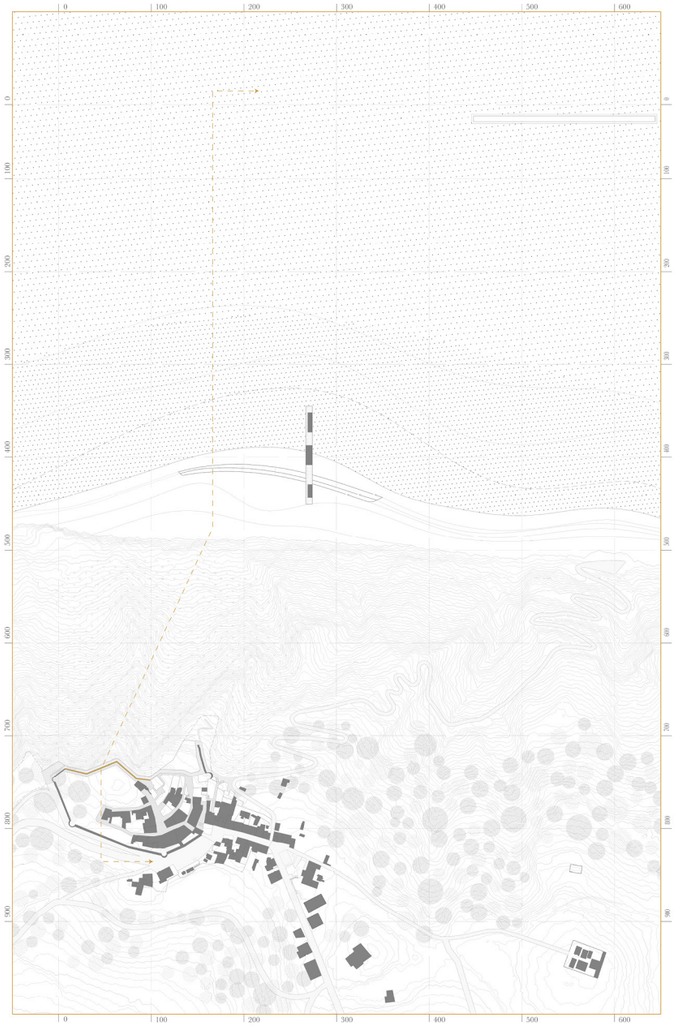
Methodological scheme ▸

Through specific algorithms it is possible to generate a coastal evolution model as a simulation tool for the sediment transport process along the coast. This exemplary scheme (developed in Grasshopper) outlines a method of simulating natural processes and in particular it acts as a tool to support the design of underwater structures. An integrated system could be developed that combines the simulation with monitoring data in order to generate an efficient workflow for the site.

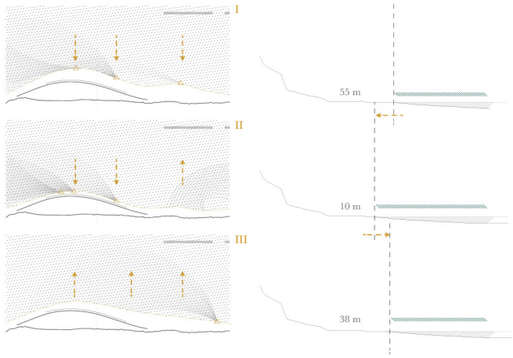


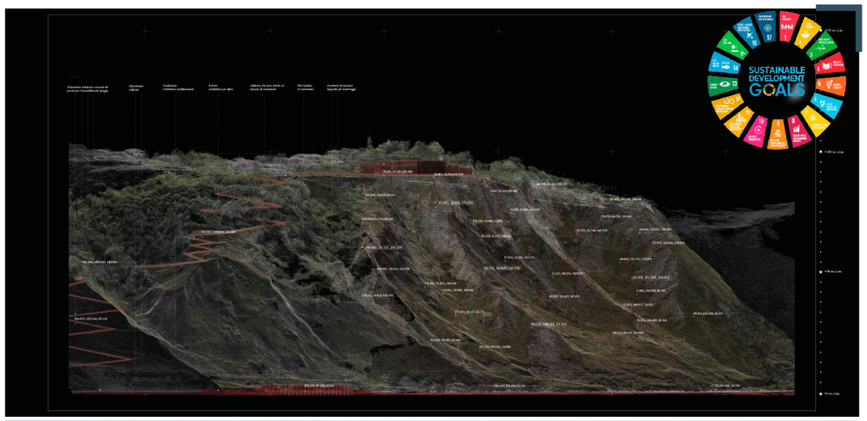
01 | Fiorenzuola di Focara (Growing site)

Masterplan of Fiorenzuola di Focara



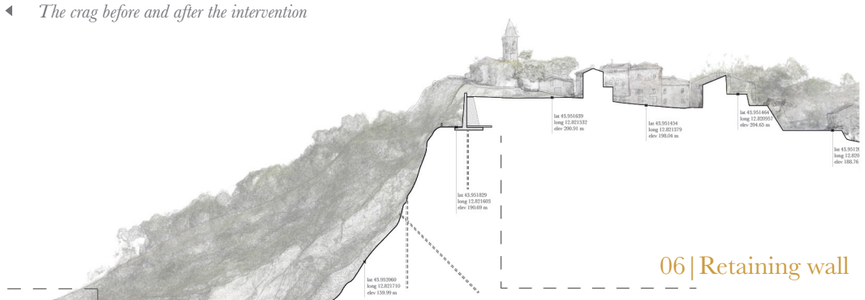
To defend Fiorenzuola di Focara a new dynamic beach is placed to move the contact between the sea and the mountain. This is protected by new underwater devices which intercept and stop the sediments incoming. In this way the beach becomes a new hypernatural space that, underlining the characteristics of the existing landscape, is constantly changing. In an attempt to stop the landslides and establish the state of affairs, the crag is consolidated thanks to an environmental engineering system and the vegetation that will grow over time giving a new homogeneity to the crag that has now been lost. In addition, a stabilizing wall is built at the base of the village.





General perspective view, of the project

The crag before and after the intervention



01 | Breakwater barriers

Placed 500 meters from the coast they dissipate the energy of the sea waves

02 | Tourist facility

The only settlements are skeletons, made up of driftwood brought by the sea. The carrying capacity is 5400 people in order to contain the anthropic pressure.

03 | Sliding barrier

Thanks to the fixed barrier installed on the beach, sediments are intercepted and blocked.

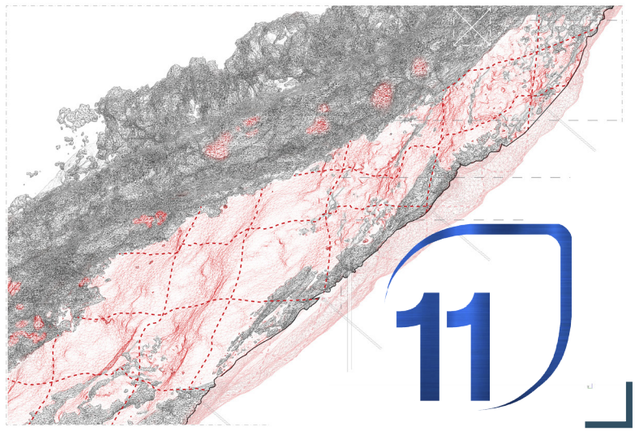
04 | Beach nourishment

Made with 400000 cubic meters of sand transported by dredging

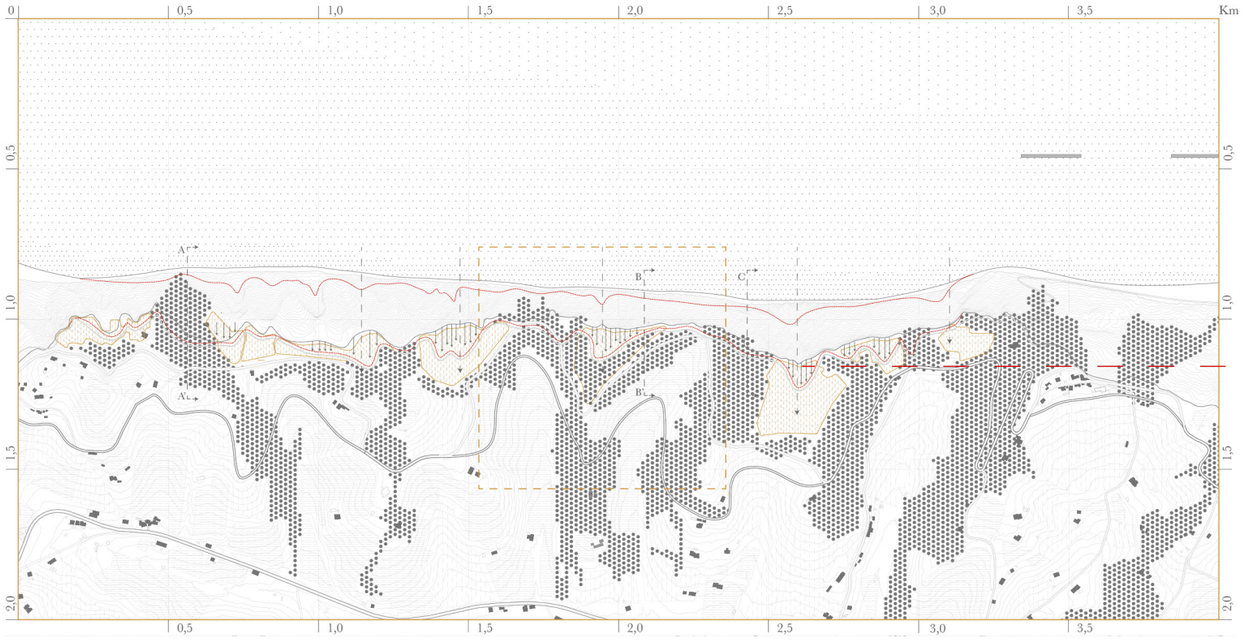
05 | System in micropiles, tie rods and metal mesh

06 | Retaining wall

Detail of the crag reinforcement

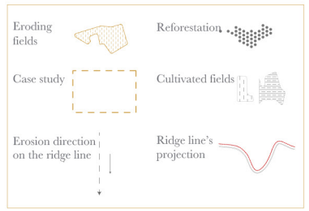


02| Monte Castellaro (Erosion site)

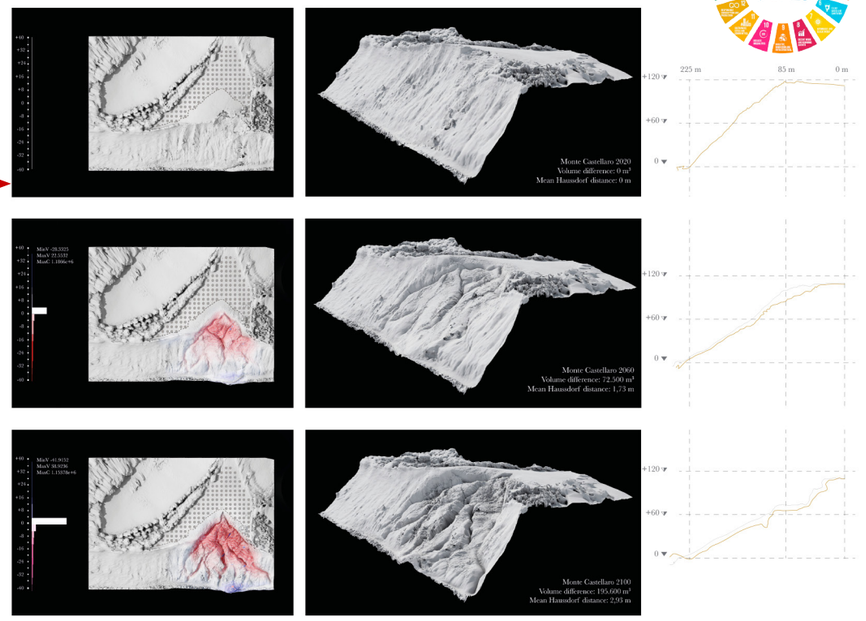


The geomorphological characteristics and the absence of anthropic presence along this stretch of cliff are suitable for welcoming an area of main erosive outlet. Thanks to the digital models of the landscape it has been possible to simulate the instability of the cliff over the years up to 2100.
The erosion in this stretch is therefore driven and limited thanks to the use of vegetation: the fields that before were abandoned, become now the defense of the whole landscape.
That erosion is estimated to cover, over 80 years, a large part of the needs of San Bartolo (60%).

Legend

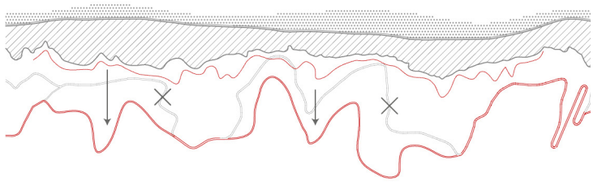


Simulations of erosive scenarios in 2100, divided by phases: 2020 - 2060 - 2100

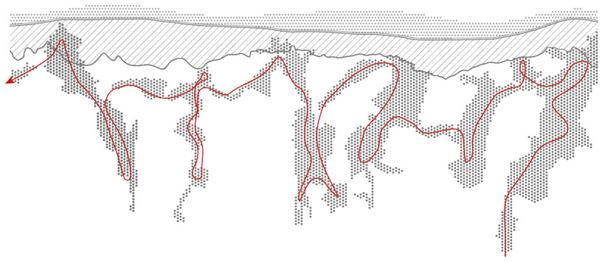


Reforestation and strengthening of forestry sectors as difence infrastructure

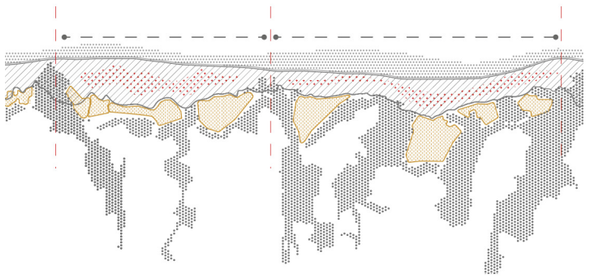
Revision of the mobility network and accessibility



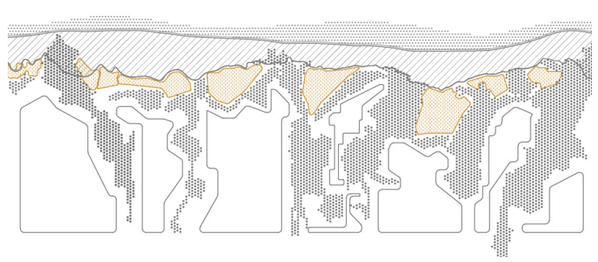
Restoration of ecological corridors



Definition of erosion boundaries

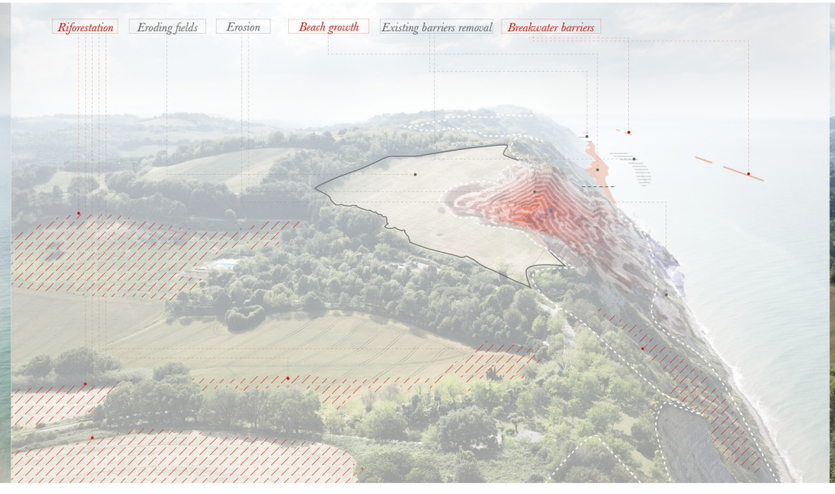


Retreat planning of farming areas



01 | Actual landscape, Monte Castellaro

02 | Transformations, Monte Castellaro



02 | Evolutionary scenario to 2060, Monte Castellaro