Hydrogeological Instability, an Italian Case Study: Civita di Bagnoregio

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Table of Contents

Introduction

'Hydrogeological instability' > all processes which have a destructive action on the ground, caused by:

- human activities
- extreme weather conditions
- geomorphology of the territory
- climate changes

Valencia, Spain

Emilia Romagna, Italy

Objectives

Why Civita di Bagnoregio as a case study?

Morphology and geology of the territory + suggestive location of the small town

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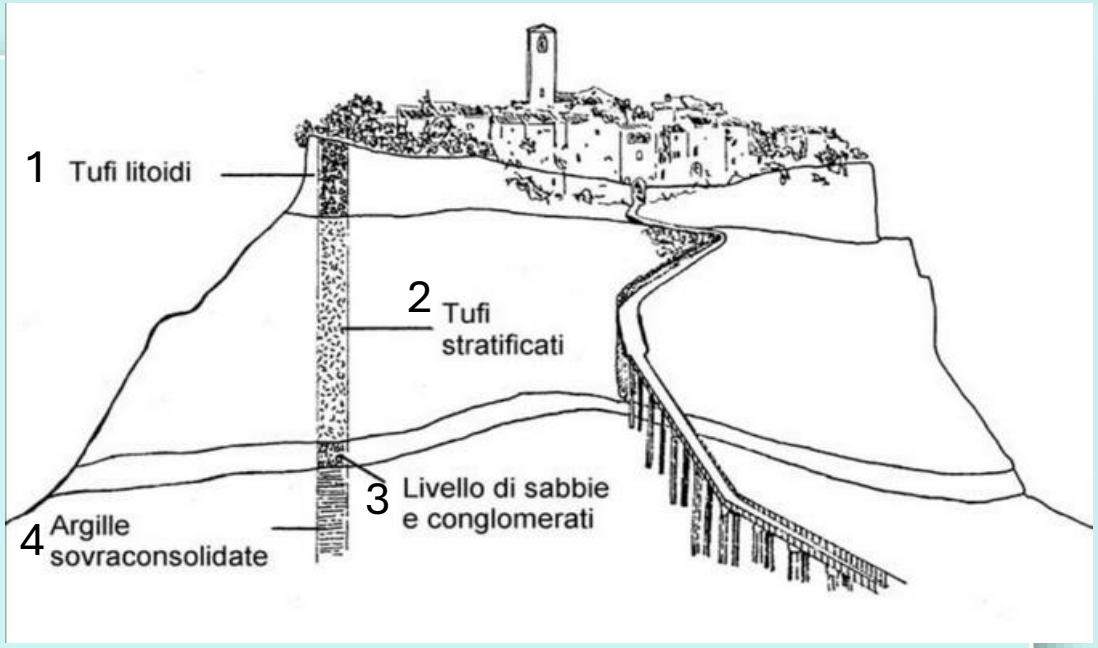
"**dangerous beauty**"

State of the Question: Civita di Bagnoregio



Margottini and Serafini, 1990

Civita di Bagnoregio: current view

1= Lithoid tuffs; 2=Stratified tuffs; 3=Level of sands and conglomerates; 4=Overconsolidated clays

State of the Question: Civita di Bagnoregio

STORY AND LANDSLIDES

Geological structure and deepening of the valleys (18 thousand years ago, during the last glacial peak)

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evolution of the slopes linked to phenomena that interacted with each other

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landslides

«Calanchi» of Civita di Bagnoregio

State of the Question: Civita di Bagnoregio

THE GEOLOGICAL MUSEUM OF LANDSLIDES

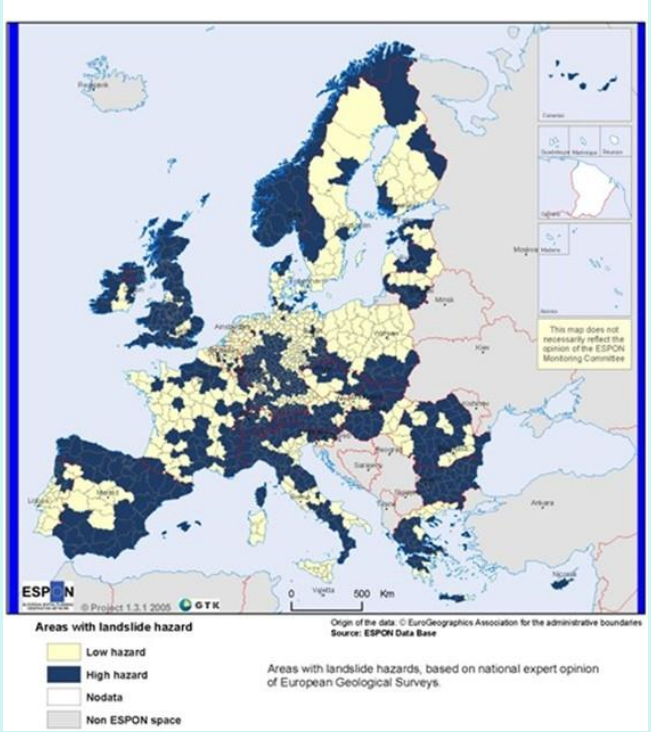
At the ‘’Geological museum of landslides'' where the history of Civita di Bagnoregio is illustrated

Materials and Methods 1

GEOSITE DATA AND MAPS COLLECTION

Internet open source data bases:

- EU Flood risk area viewer
- European Spatial Planning Observation Network
- Inventario Nazionale Geositi (ISPRA)
- Google Earth
- Inventario Fenomeni Franosi Italia (ISPRA)



Results 1

From Italian Landslide Inventory (IFFI)

The Bagnoregio area is classified as “**very high risk**”

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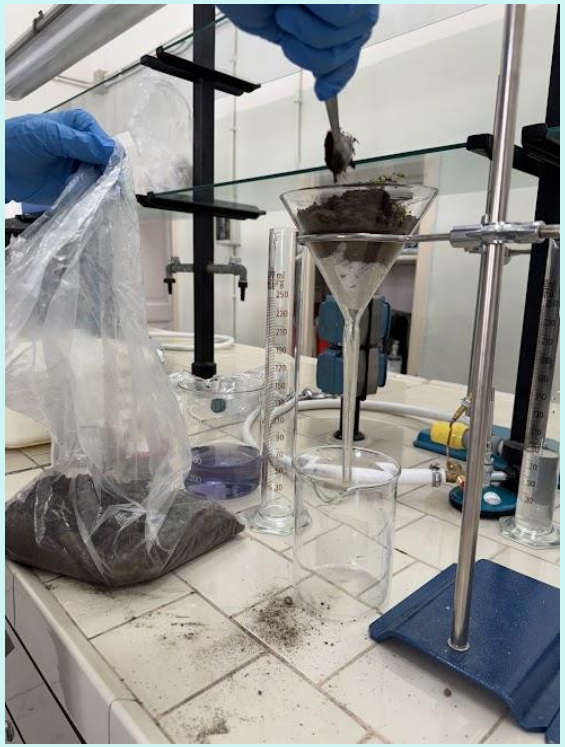
54 landslides recorded

Materials and Methods 2

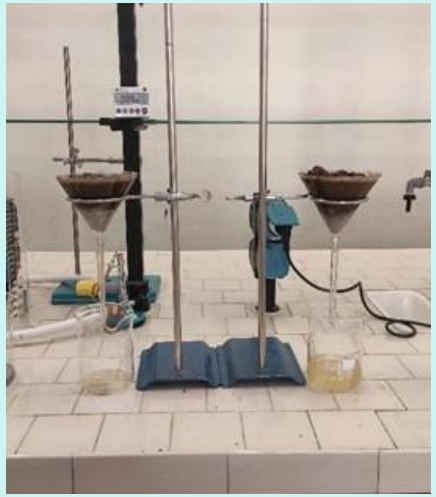
LABORATORY PERMEABILITY TEST

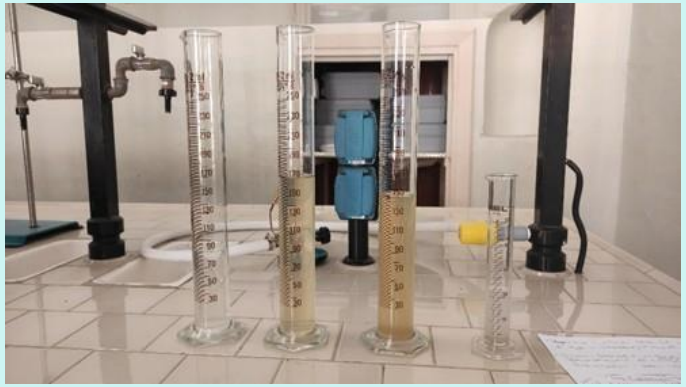
- Different soils and laboratory materials:
- Lithoid tuffs* / Stratified tuffs* / Sand / Clay
- H_2O
- Glass funnels

(*Tufaceous soils recovered in the area of Viterbo, Italy)



Results 2





SAMPLE	Layers	H_2O initial volume	Time 1st drop	Time last drop	H_2O eluated volume
A	Sand	250 ml	5 sec	1 min 36 sec	88 ml
B	Lithoid tuffs / Stratified tuffs / Sand	250 ml	2 min 9 sec	29 min 57 sec	170 ml
C	Lithoid tuffs / Stratified tuffs/ Sand / Clay (Civita's stratification like)	250 ml	4 min 8 sec	42 min 36 sec	150 ml
D	Lithoid tuffs / Clay	250 ml	1 min 54 sec	42 min	22 ml

Clay in the lower layer tends to hold more water and drain more slowly

Materials and Methods 3

SIMULATION OF LANDSLIDE (*due to a flood*)

-Different soils and laboratory materials:

- Lithoid tuffs* / Stratified tuffs* / Sand / Clay

-Wooden scale model

-H_2O

(*Tufaceous soils recovered in the area of Viterbo – Italy)

Results 3

The research highlights:

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the importance of considering the interaction between **clay layers** and **tuff layers** in contexts of **soil instability**, suggesting that water management is crucial to prevent landslides

Discussion

1. Flood and Landslides Risk in Italy

2. Geological Interest of Civita di Bagnoregio

3. Data Analysis

Conclusions

The findings from Civita di Bagnoregio serve as a call to action for **enhanced monitoring** and **prevention strategies** to safeguard this unique landscape and its communities.

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