

## QGIS Plugin

# Lateral Spreading for Seismic Microzonation

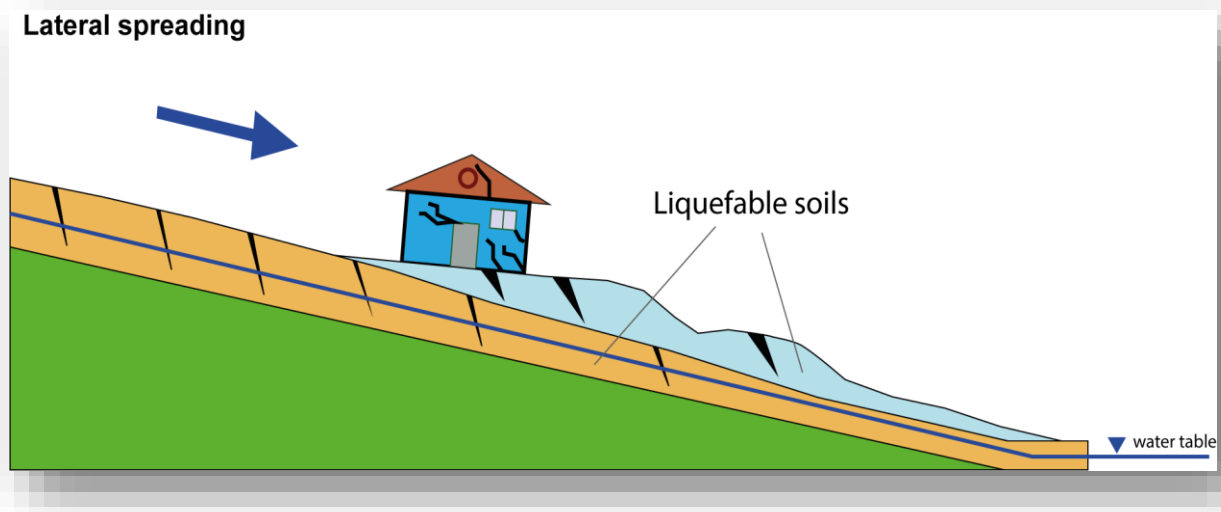


Figure 1. Phenomenon of Lateral Spreading

Lateral spreading (Figure 1. lateral spreading diagram) is a term used in geotechnical and earthquake engineering. It refers to the horizontal movement of soil or rock, often occurring during an earthquake. This phenomenon typically happens in areas with loose, saturated soils, and it can cause significant ground deformation, impacting structures, pipelines, and other infrastructure. Lateral spreading usually occurs when:

- There is a liquefaction of loose, water-saturated soils.
- The ground surface slopes gently.

There are nearby free faces, like riverbanks or sea cliffs, providing an unconfined direction for the soil to move.

This type of ground failure is especially dangerous because it can lead to the collapse of buildings, bridges, and other critical infrastructure.

**Input parameters:** Polygon geometry layer; Geotechnical parameter: Liquefaction Index (IL); Digital Terrain Model (DTM).

**Output files:** Slope %; Low Susceptibility Zones; Respect Zones; Susceptibility Zones.

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The Plugin works in QGIS, software open source, and calculates zones subject to lateral spreading:

## A) Low Susceptibility Zones (Z0):

- $2 < \text{Slope\%} \leq 5$  and  $0 < \text{IL} \leq 2$

## B) Susceptibility Zones (SZ)

- $0 < \text{IL} \leq 2$  and  $5 < \text{Slope\%} \leq 15$
- $2 < \text{IL} \leq 5$  and  $2 < \text{Slope\%} > 5$
- $5 < \text{IL} \leq 15$  and  $2 < \text{Slope\%} \leq 5$

## C) Respect Zones (RZ)

- $0 < \text{IL} \leq 2$  and  $\text{Slope\%} > 15$
- $2 < \text{IL} \leq 5$  and  $\text{Slope\%} > 5$
- $5 < \text{IL} \leq 15$  and  $\text{Slope\%} > 5$
- $\text{IL} > 15$  and  $\text{Slope\%} > 2$

\*IL = liquefaction index

## Software installation

Installation is performed directly from the QGIS plugins section (Figure 2. QGIS Plugins Section) by entering the keyword "Geology" in the search box (Figure 3. Plugin Search and Installation).

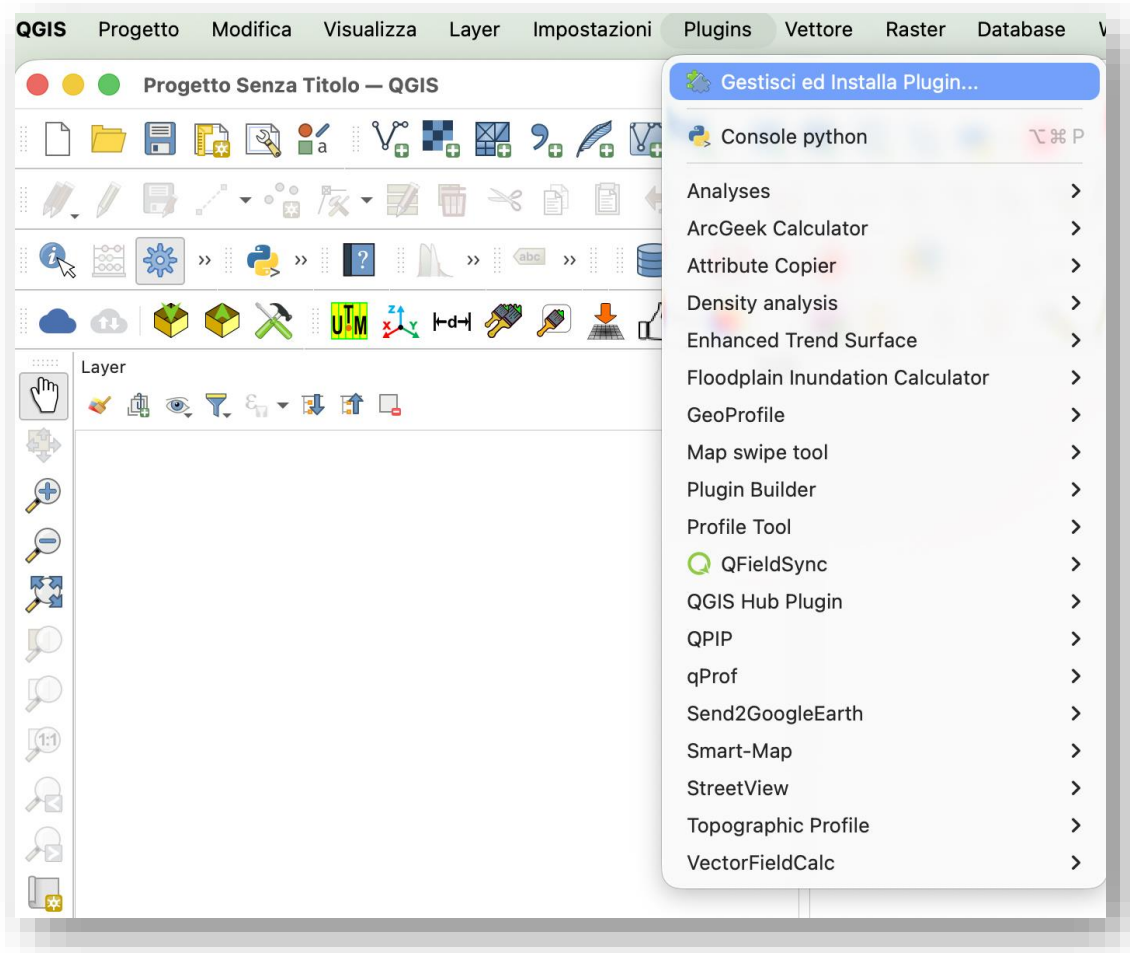


Figure 2. QGIS plugins section

Once installed, the plugin will be available in the Processing Tools section (Figure 4. QGIS Processing Tools Section).

Clicking on the tool will open the interface for selecting input files and configuring the geoprocessing operations (Figure 5. Plugin Input and Output data entry form).

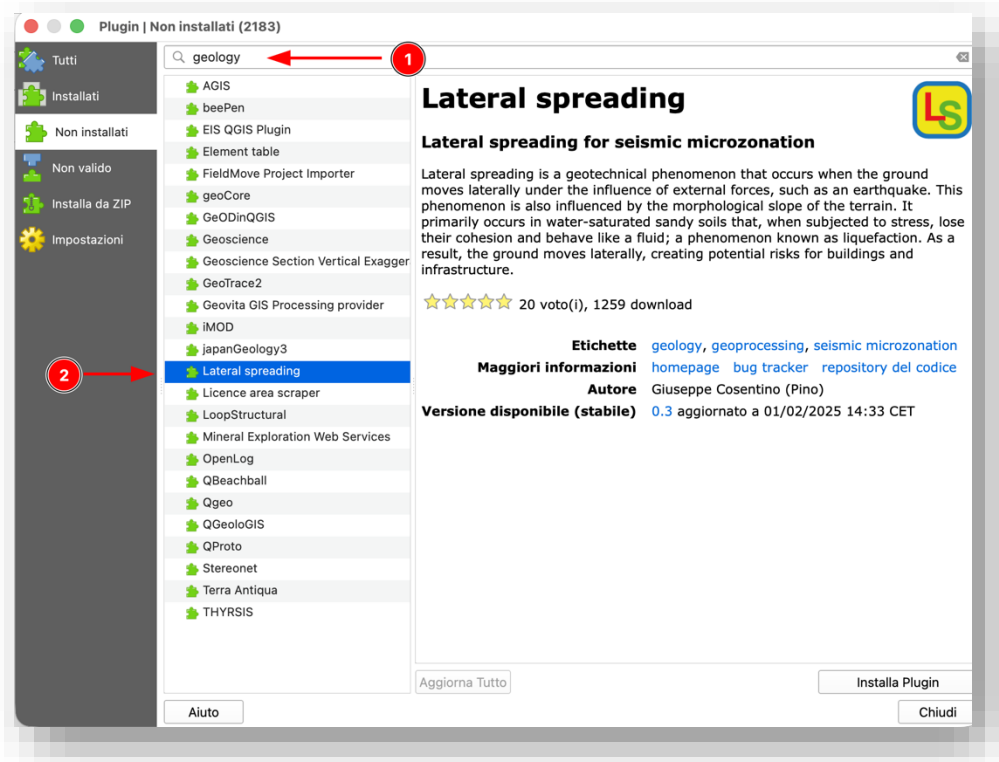


Figure 3. Plugin search and installation

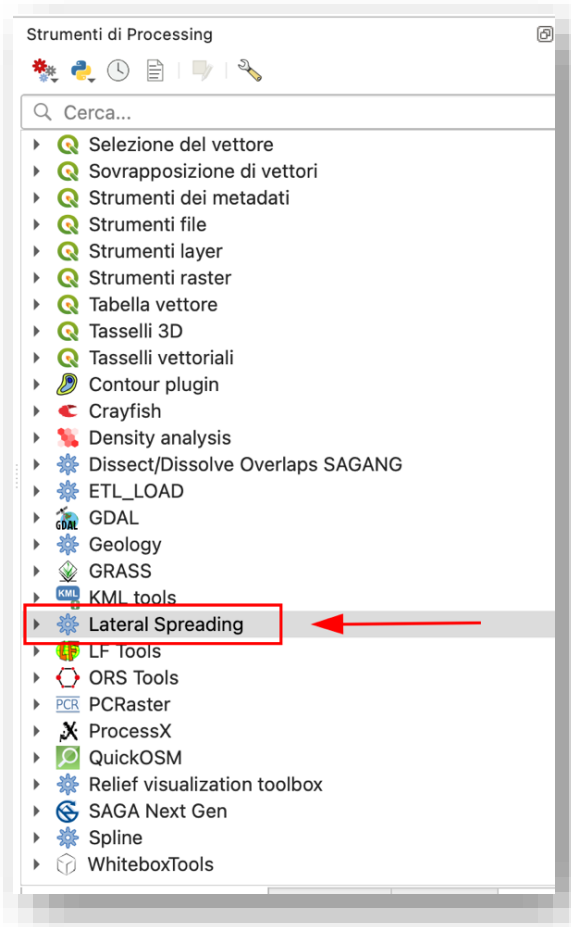


Figure 4. QGIS processing Tools section

Parametri

Log

Digital Terrain Model (DTM)

...

Layer with IL index

...

IL index

...

slope%

[Salva in un file temporaneo]

...

☒ Apri il file risultante dopo l'esecuzione dell'algoritmo

SZ\_RZ\_lateral\_spreading

[Crea layer temporaneo]

...

☒ Apri il file risultante dopo l'esecuzione dell'algoritmo

Lateral Spreading

Lateral spreading for seismic microzonation

The tool calculates zones subject to lateral spreading:

A) Low Susceptibility Zones (Z0):  
 $2 < \text{Slope\%} \leq 5$  and  $0 < \text{IL} \leq 2$

B) Susceptibility Zones (SZ)  
 $0 < \text{IL} \leq 2$  and  $5 < \text{Slope\%} \leq 15$   
 $2 < \text{IL} \leq 5$  and  $2 < \text{Slope\%} > 5$   
 $5 < \text{IL} \leq 15$  and  $2 < \text{Slope\%} \leq 5$

C) Respect Zones (RZ)  
 $0 < \text{IL} \leq 2$  and  $\text{Slope\%} > 15$   
 $2 < \text{IL} \leq 5$  and  $\text{Slope\%} > 5$   
 $5 < \text{IL} \leq 15$  and  $\text{Slope\%} > 5$   
 $\text{IL} > 15$  and  $\text{Slope\%} > 2$

\*IL = liquefaction index

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Versione algoritmo: 0.3 20250202

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Avanzato

Esegui come Processo in Serie...

Chiudi

Esegui

Figure 5. Form plugin for data input and output files