BRIDGE FAILURE AND CONSEQUENCES: THE EXISTING INFRASTRUCTURES NEED OF MITIGATION TECHNIQUES

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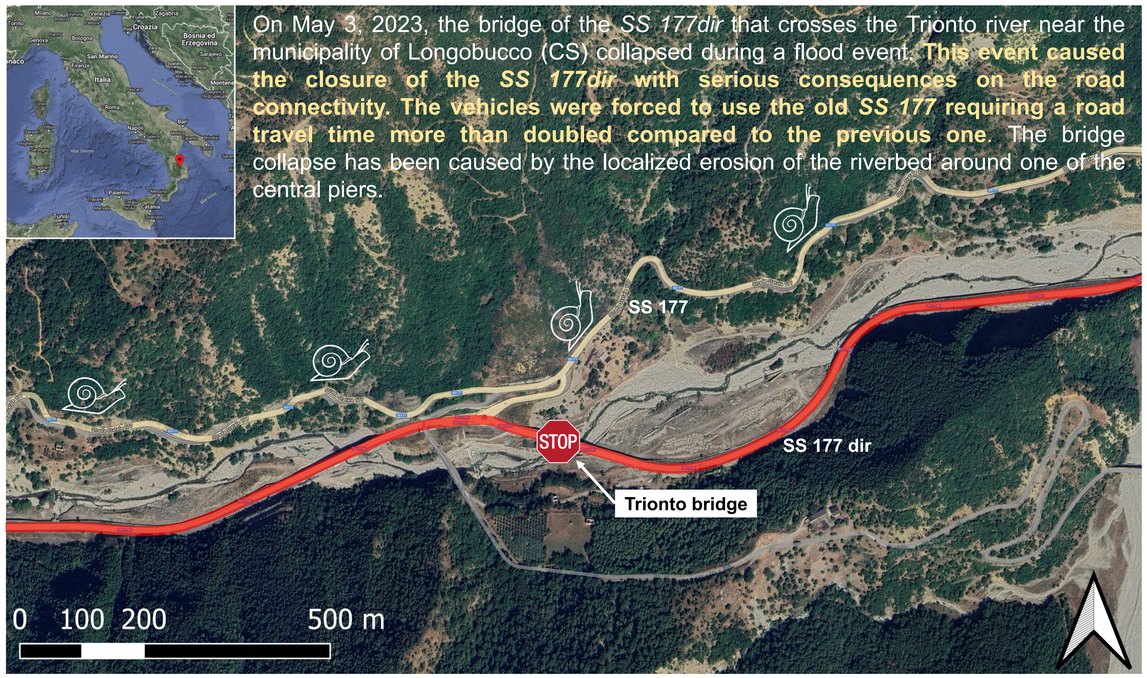
1. BRIDGE FAILURE



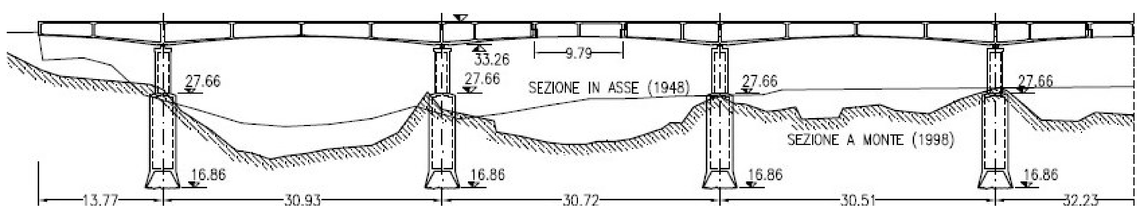
On May 3, 2023, the bridge of the *SS 177dir* that crosses the Trionto river near the municipality of Longobucco (CS) collapsed during a flood event. **This event caused the closure of the *SS 177dir* with serious consequences on the road connectivity. The vehicles were forced to use the old *SS 177* requiring a road travel time more than doubled compared to the previous one.** The bridge collapse has been caused by the localized erosion of the riverbed around one of the central piers.

2. COUNTERMEASURES AGAINST LOCALIZED EROSION

More than 50% of bridge failures are related to hydraulic phenomena, mainly scour around piers and abutments if a proper foundation deepening is not provided in the design.

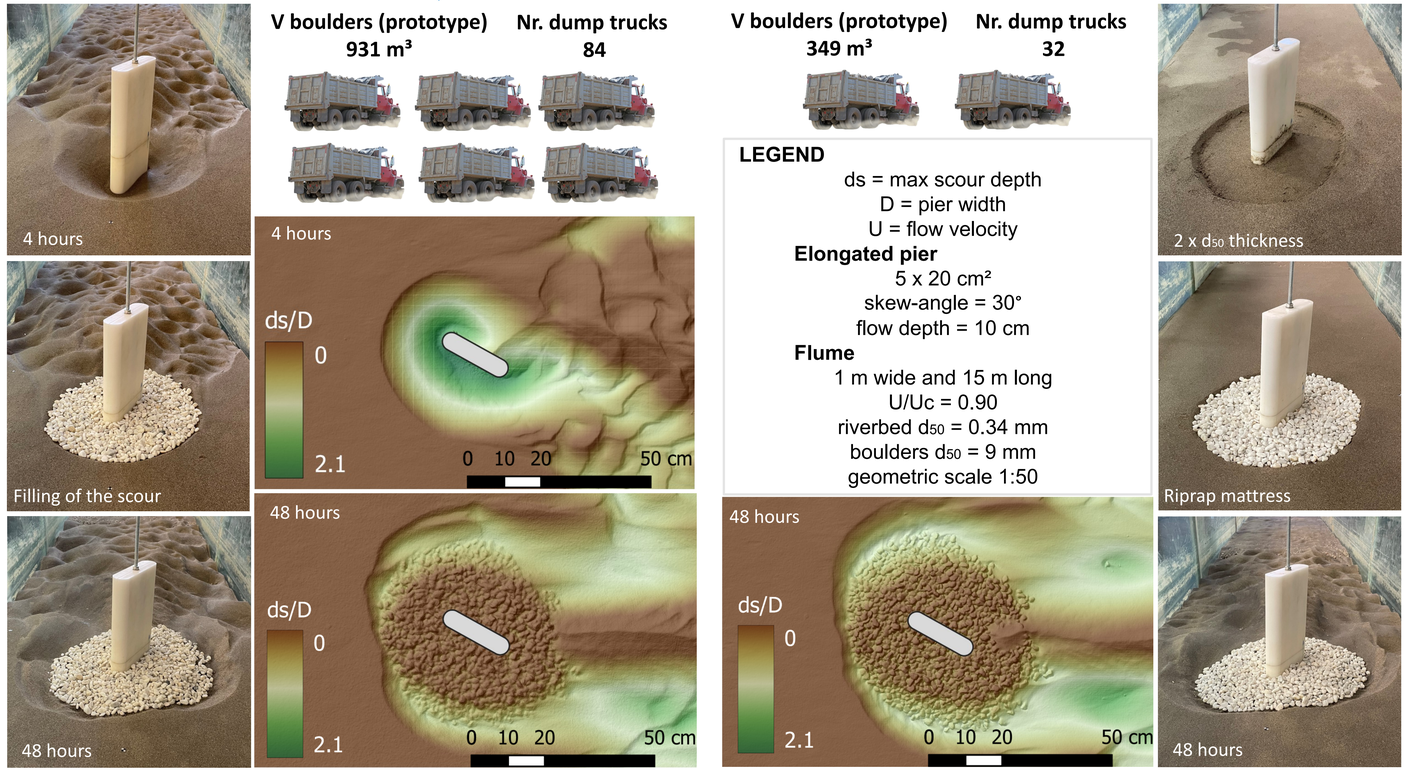
Among existing infrastructures, the foundations of piers and abutments are characterized by limited depth, also due to the technology available in the past. Nevertheless, old bridges are still working thanks to the ancient custom of filling any recognized scour around piers and abutments with **launchable stones** after each relevant flood event. Now, **riprap mattresses** are sometimes adopted as countermeasures instead to assume a proper deepening of foundations.

Perez bridge, Zevio (VR), Italy



3. EXPERIMENTAL ANALYSIS

LAUNCHABLE STONES ⟵ **COST INCREASE** ⟶ ***RIPRAP MATTRESS***



LEGEND

ds = max scour depth
D = pier width
U = flow velocity

Elongated pier

5 x 20 cm²
skew-angle = 30°
flow depth = 10 cm

Flume

1 m wide and 15 m long
U/Uc = 0.90
riverbed d_{50} = 0.34 mm
boulders d_{50} = 9 mm
geometric scale 1:50

4. PROTOTYPE AND LABORATORY COMPARISON

A mattress of limited thickness around surficial foundation does not guarantee the bridge safety

Stability against localized scour can only be obtained by proper deepening of foundations

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