

UNESCO CHAIR

PREVENTION AND SUSTAINABLE MANAGEMENT OF GEO-HYDROLOGICAL HAZARDS

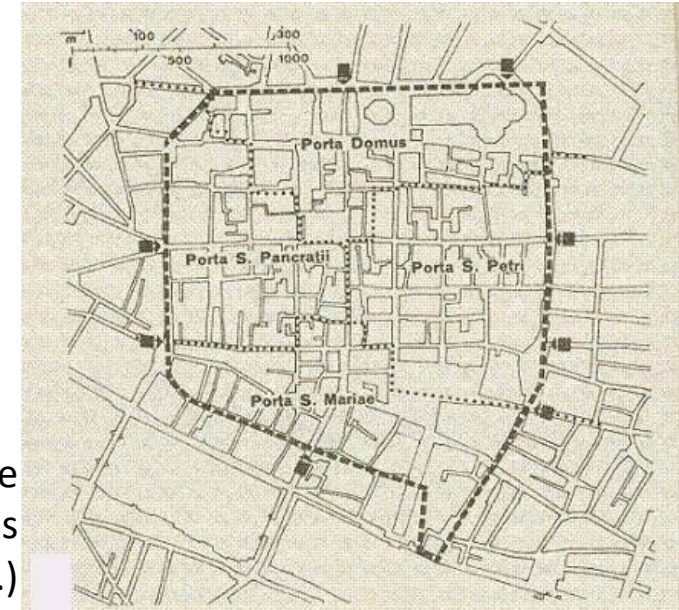
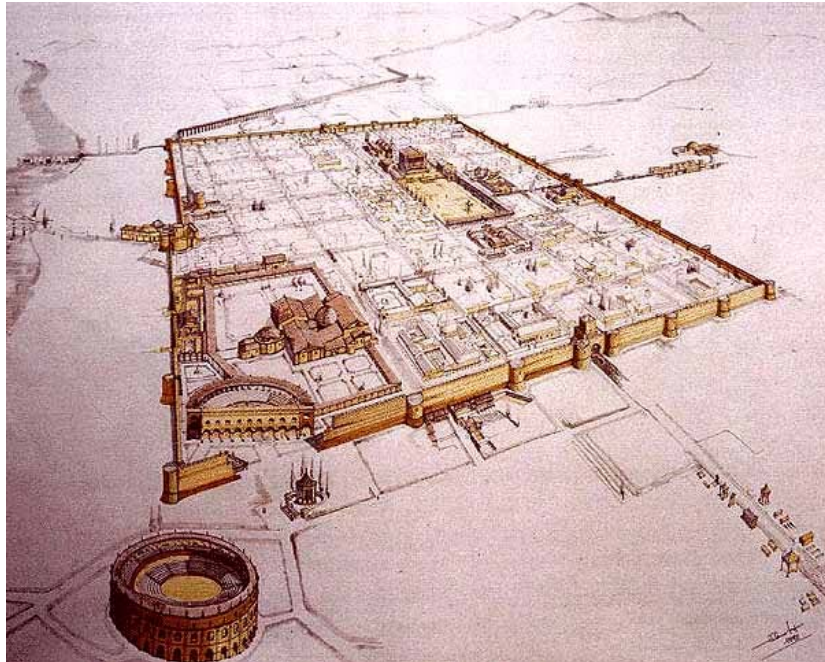
Art cities and water risk: The city of Florence Case Study



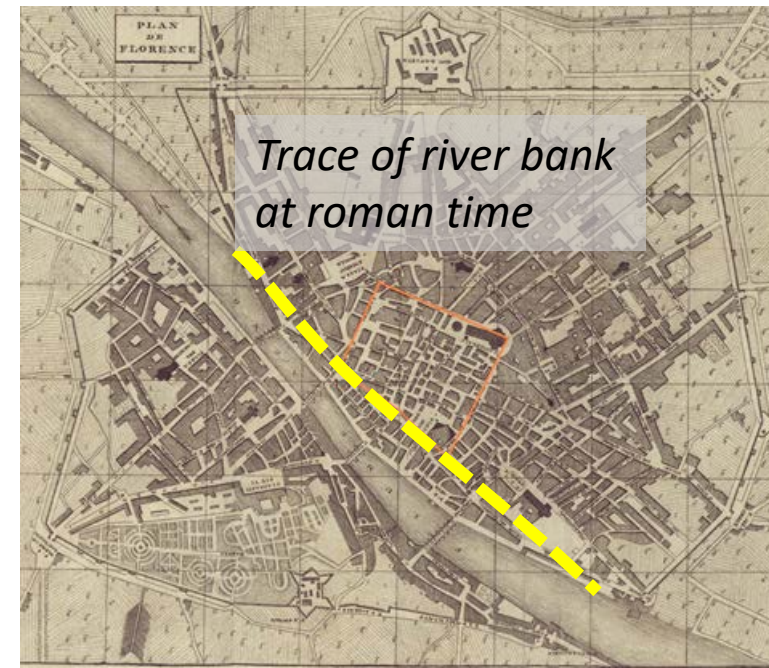
fabio.castelli@unifi.it

The origin of risk in Middle-Ages

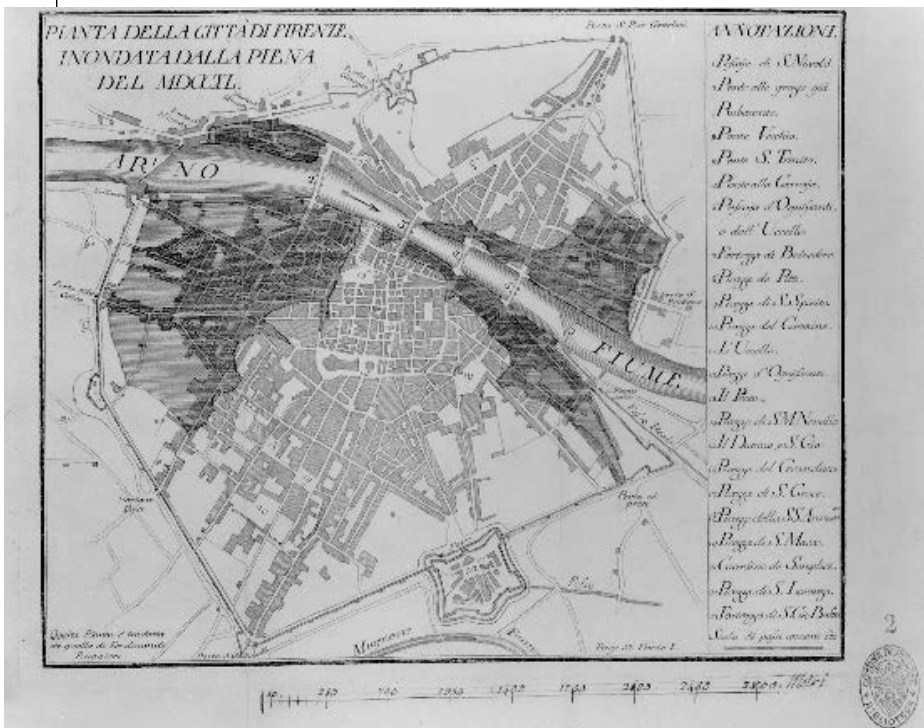
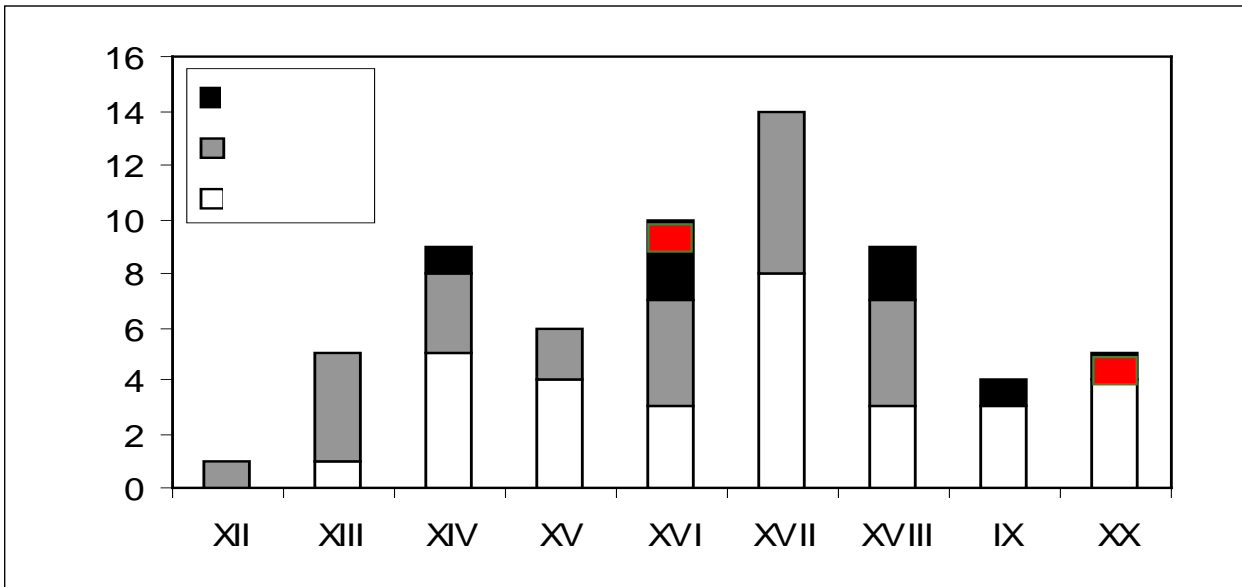
Florentia in Roman times



Location of the Matilde Walls (1078 ca.)



A 1822 map of the city

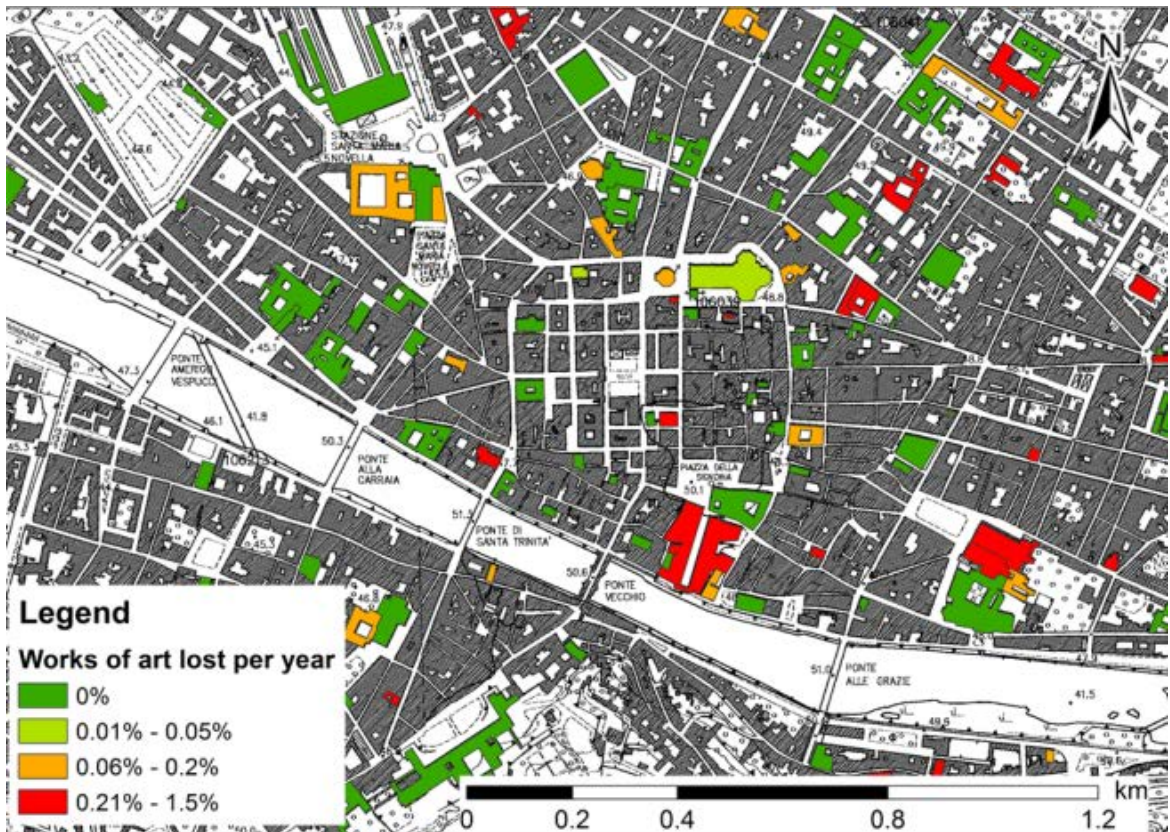
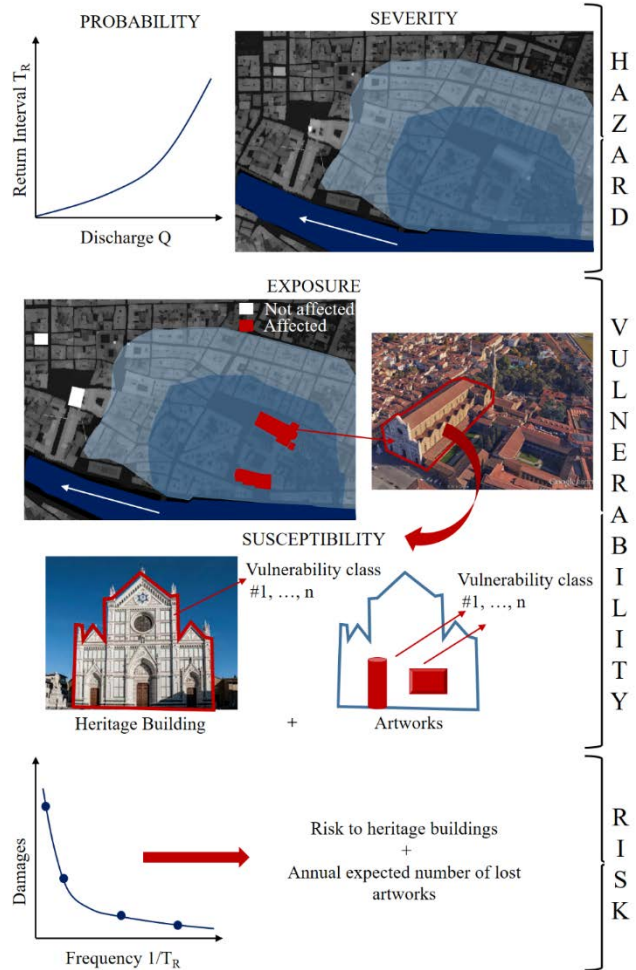


A 1740 flood map



A 1966-like scenario:

14.5 Billion € expected damage + non tangible

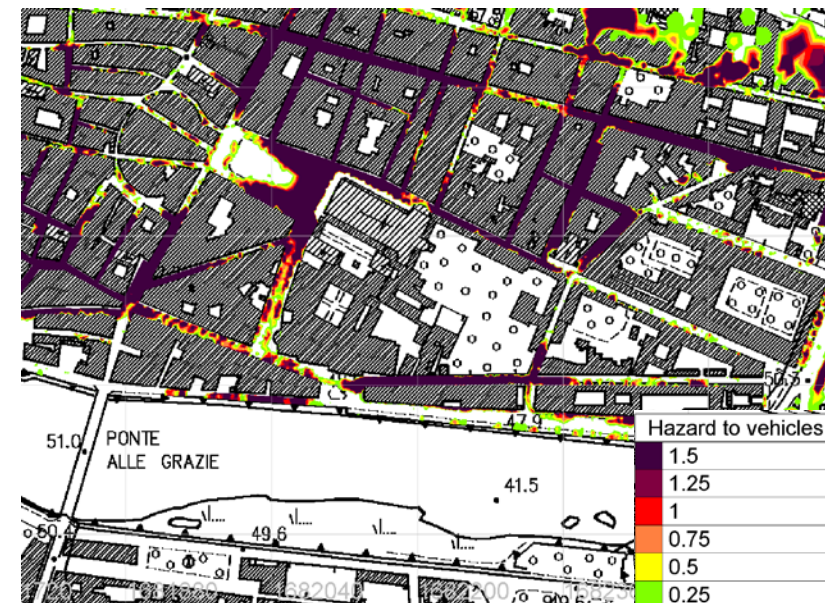
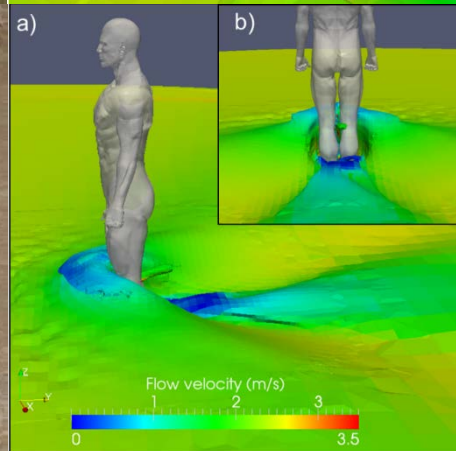
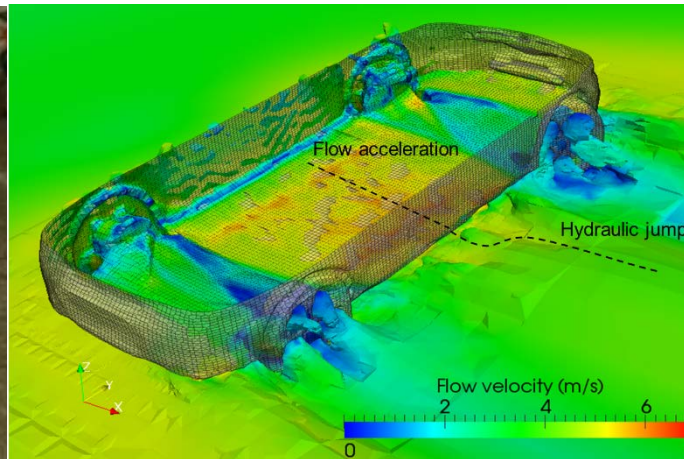


Flood risk for art-works



A 'tiny' example of restoration costs: old books and manuscripts damaged in 1966

- Uffizi library (6 km of 'filze', 1/3 still to be repaired) 37.8 M€
- National library (24 km of shelves of the 'historic archive') 137 M€



Flood risk for vehicles and pedestrians

Support to regional flood alerting system



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Previsioni Idrologiche

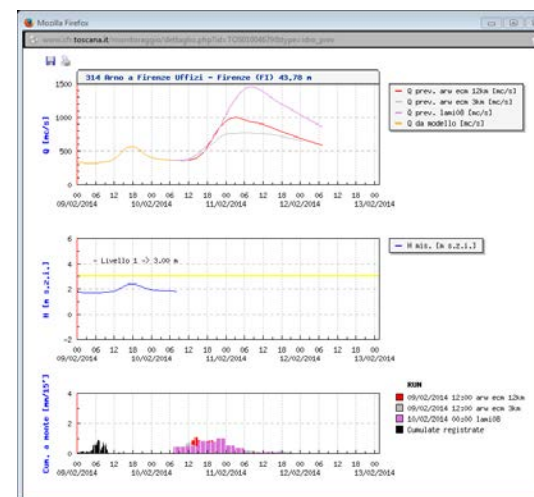
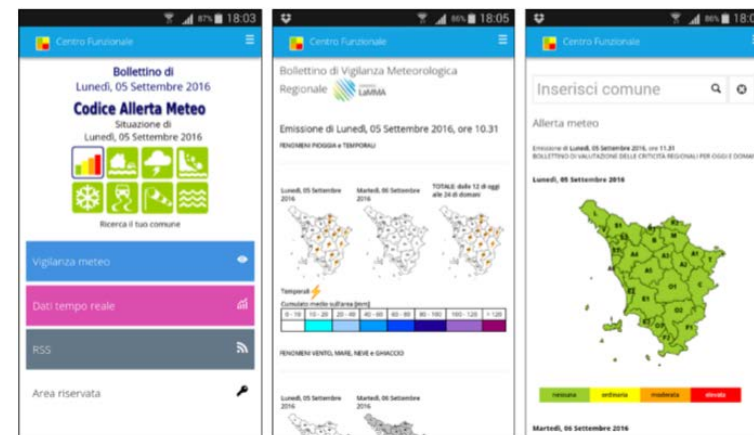
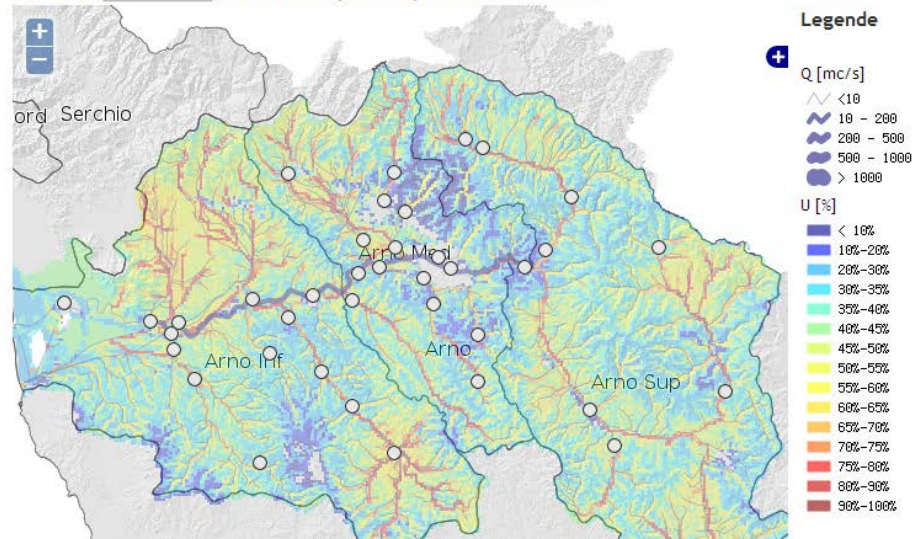
MOBIDIC

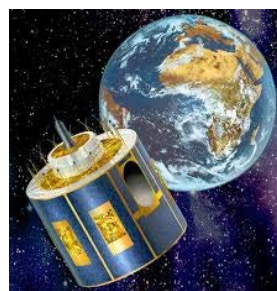
Sistema modellistico sperimentale per il calcolo dei bilanci idrici superficiali e sotterranei e le previsioni di piena. L'algoritmo di bilancio idrologico attualmente in uso per le previsioni idrologiche non contempla i fenomeni di scioglimento della neve e dell'influenza della marea alla foce

Bacino

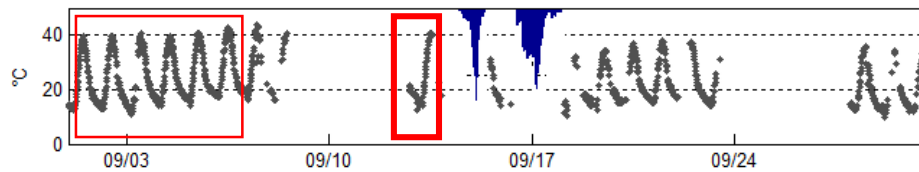
Stato attuale 19/06/2014 00:00 trasp. 50%

Modello relativo alle portate previste nel reticolo



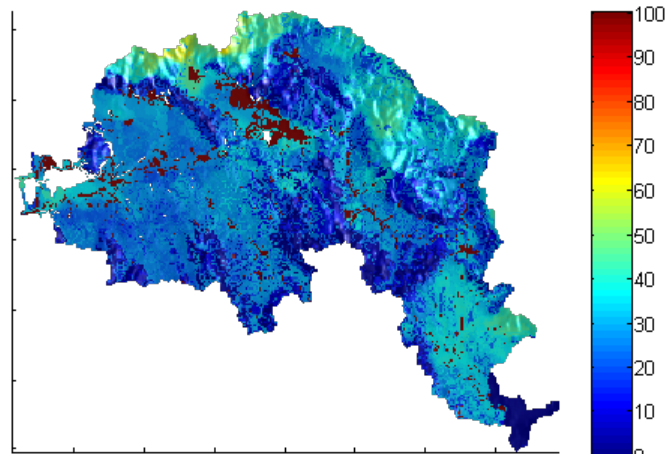


Assimilation of Meteosat Land Surface Temperature

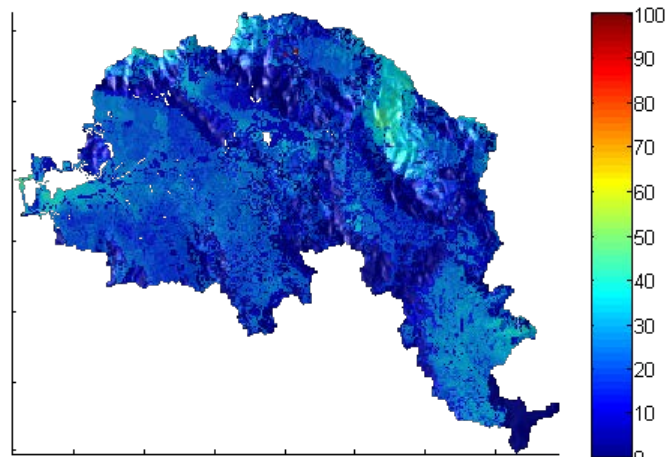


Soil saturation (%)

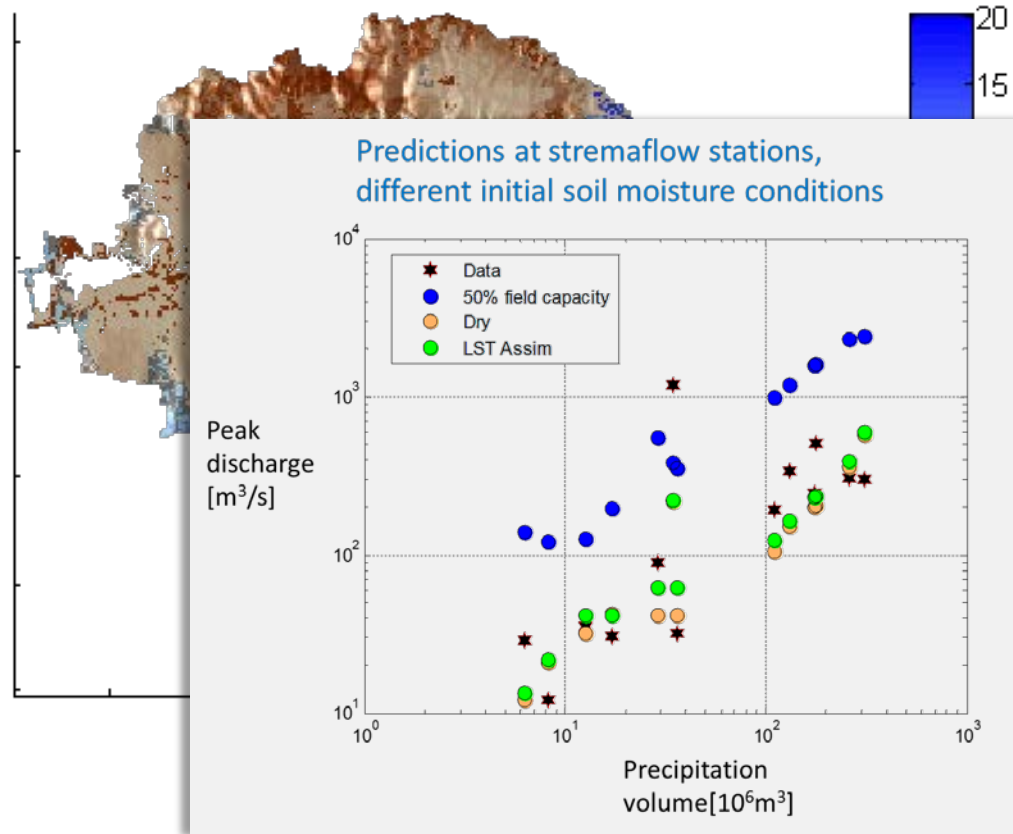
Background



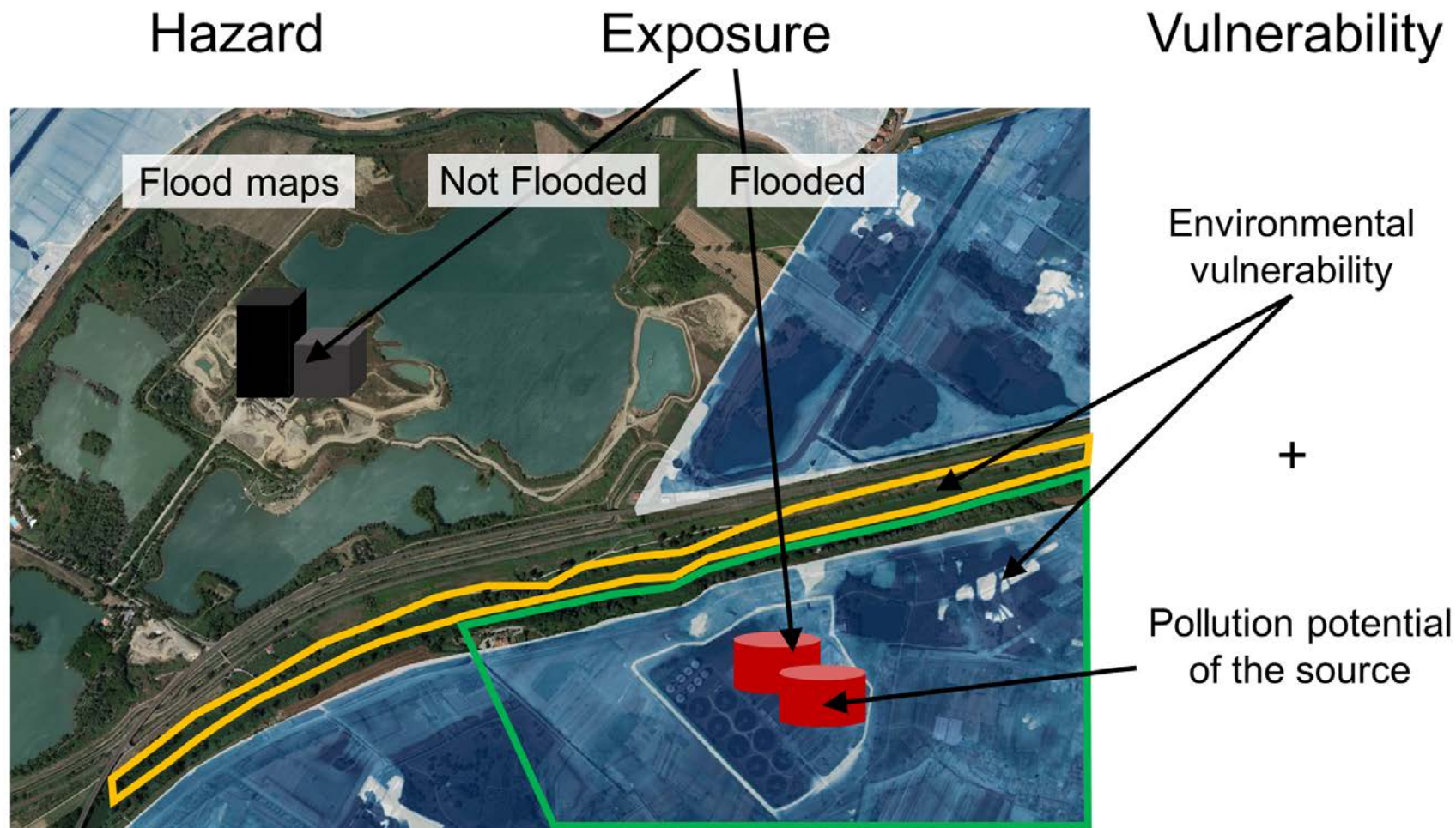
Analysis



Analysis increment



Natech issues: potential spread of pollutants due to floods



Pollution potential of the sources



Wastewater treatment plants

- Area
- Population equivalent

Waste facilities

- Type of activity
- Waste characteristics
- Mass handled per year

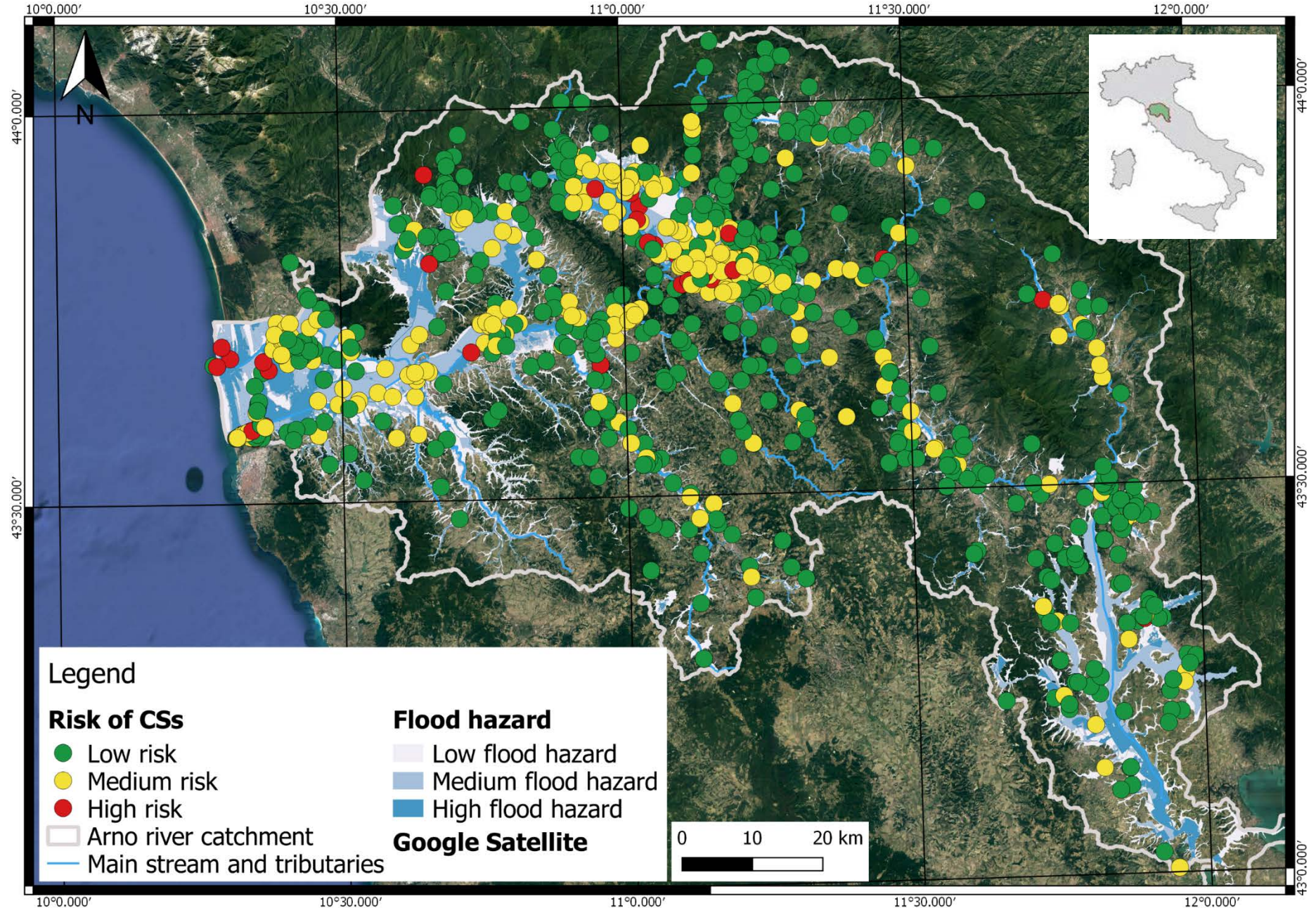
Contaminated sites

- National/regional interest
- Contamination source
- Area

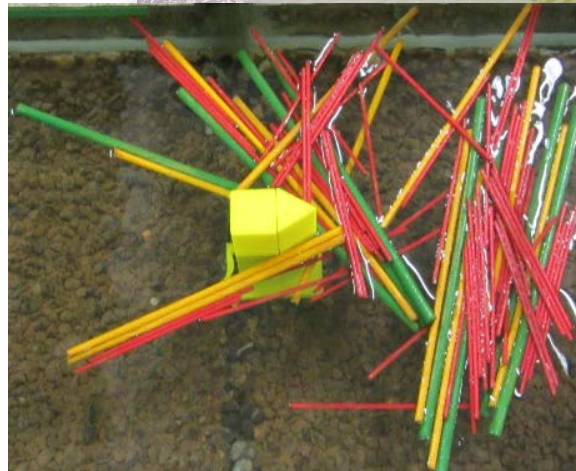
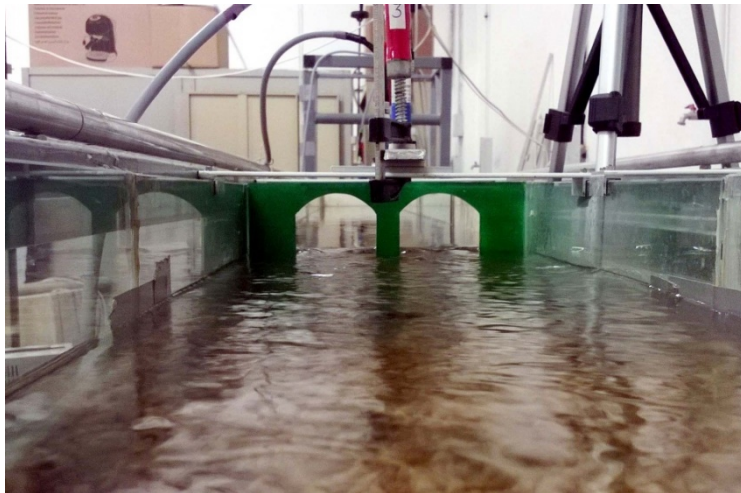
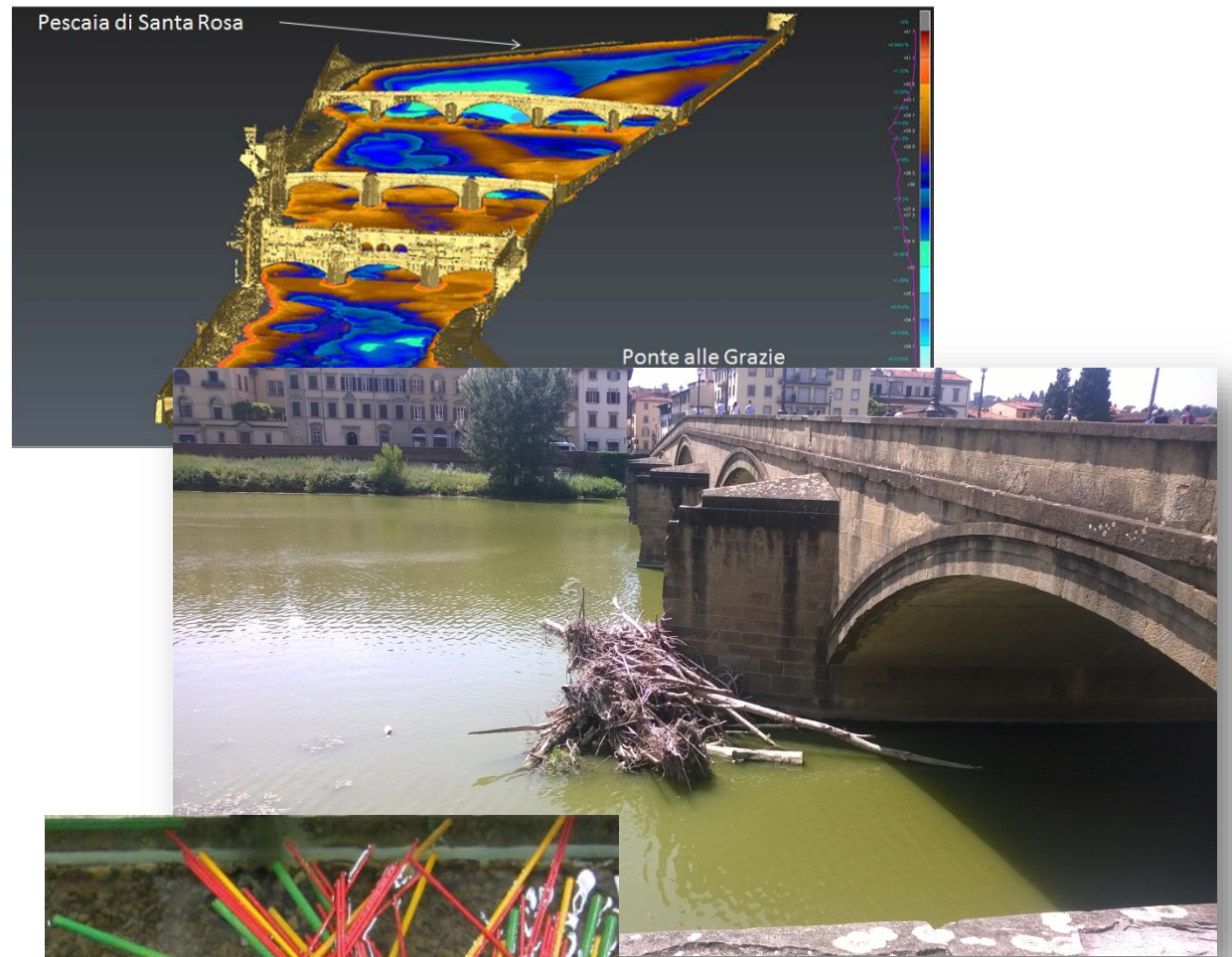
Environmental susceptibility

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> ▪ Land use ▪ Aquifer use ▪ Ecological status of water body | <ul style="list-style-type: none"> ▪ Chemical status of water body ▪ Proximity to protected wetlands | <ul style="list-style-type: none"> ▪ Natura2000 sites ▪ Hydraulic conductivity of the soil ▪ Terrain slope |
|--|--|---|

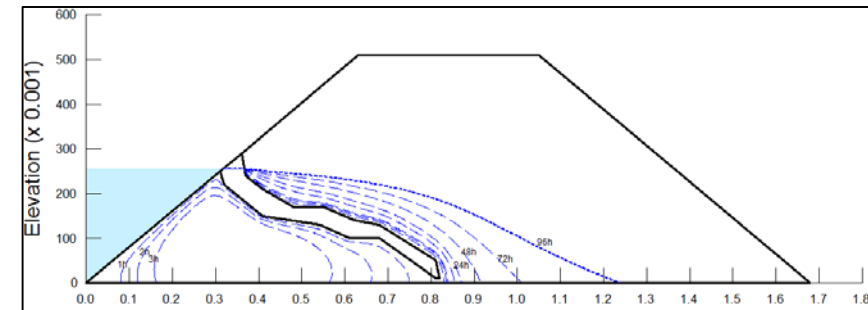
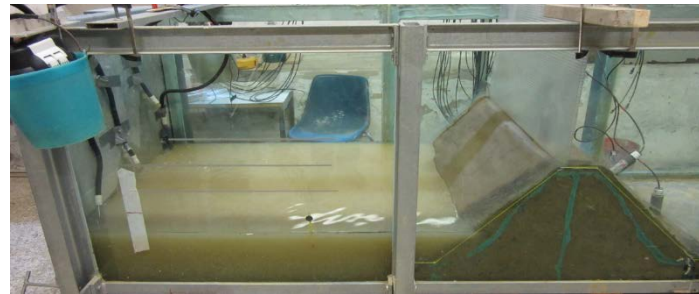
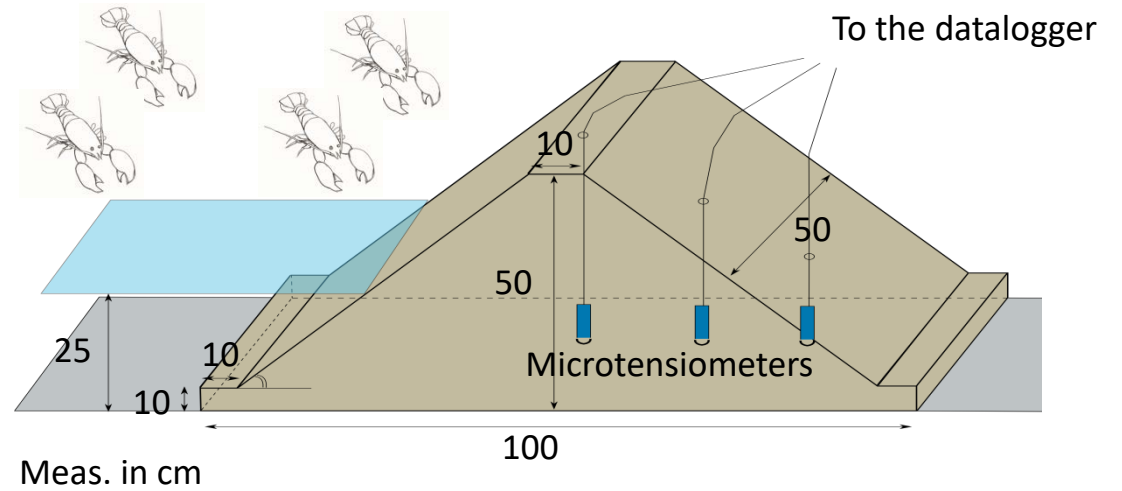
Example: Contaminated sites (CSs) at risk



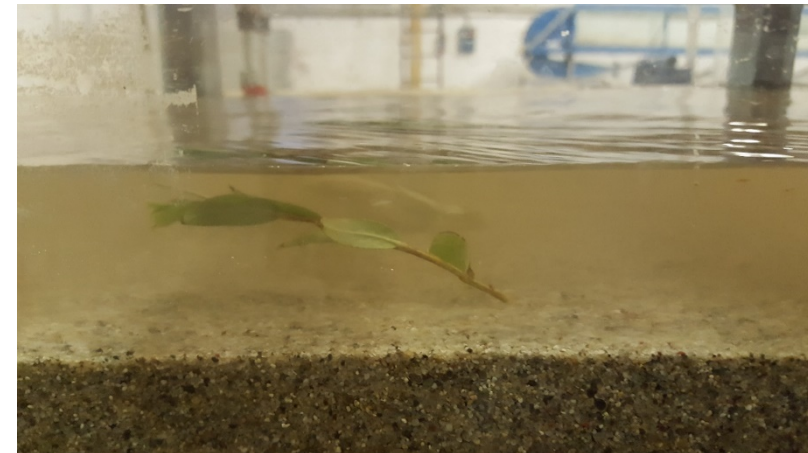
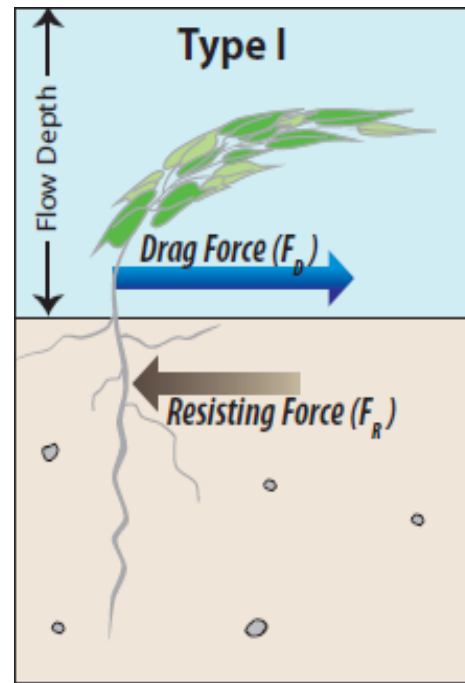
Lab-scale and numerical modeling on wood accumulation at bridge piers



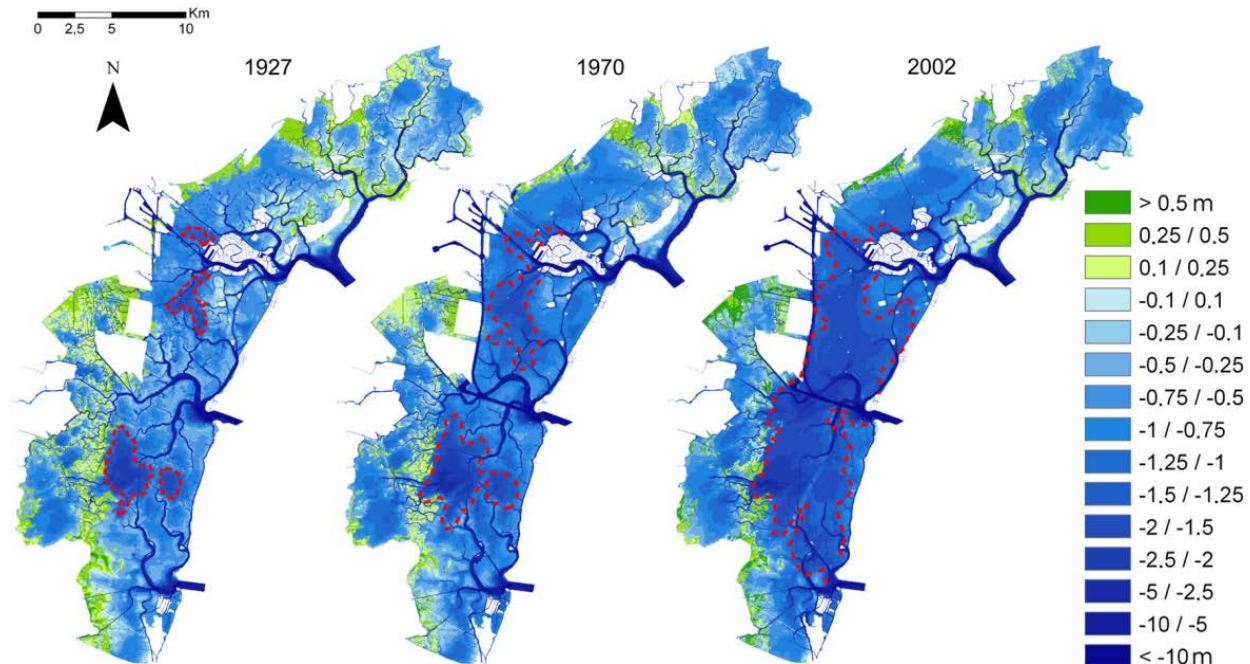
Burrowing activity in channel levees: impact of the invasive red swamp crayfish *Procambarus clarkii*. Laboratory experiments and mathematical modeling



Uprooting of flexible vegetation due to river flow and sediment transport



Salt marsh edge erosion due to wind-induced waves: field measurements in the Venice lagoon and mathematical modeling





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ARROWS New vehicles – MARTA (UNIFI) UNIFI LAB

