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

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The origin of risk in Middle-Ages

Florentia in Roman times

Location of the Matilde Walls (1078 ca.)

Trace of river bank at roman time

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
Assimilation of Meteosat Land Surface Temperature

Soil saturation (%)

Background

Analysis increment

Analysis

Predictions at streamflow stations, different initial soil moisture conditions

Peak discharge $[\text{m}^3/\text{s}]$

Precipitation volume $[10^9 \text{m}^3]$
Natech issues: potential spread of pollutants due to floods
Pollution potential of the sources

<table>
<thead>
<tr>
<th>Wastewater treatment plants</th>
<th>Waste facilities</th>
<th>Contaminated sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Area</td>
<td>▪ Type of activity</td>
<td>▪ National/regional interest</td>
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<tr>
<td>▪ Population equivalent</td>
<td>▪ Waste characteristics</td>
<td>▪ Contamination source</td>
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<td></td>
<td>▪ Mass handled per year</td>
<td>▪ Area</td>
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</tbody>
</table>

Environmental susceptibility

- Land use
- Aquifer use
- Ecological status of water body
- Chemical status of water body
- Proximity to protected wetlands
- 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
New vehicles – MARTA (UNIFI)