From theoretical fixed return period events to real flooding impacts: a new approach to set flooding scenarios, thresholds and alerts

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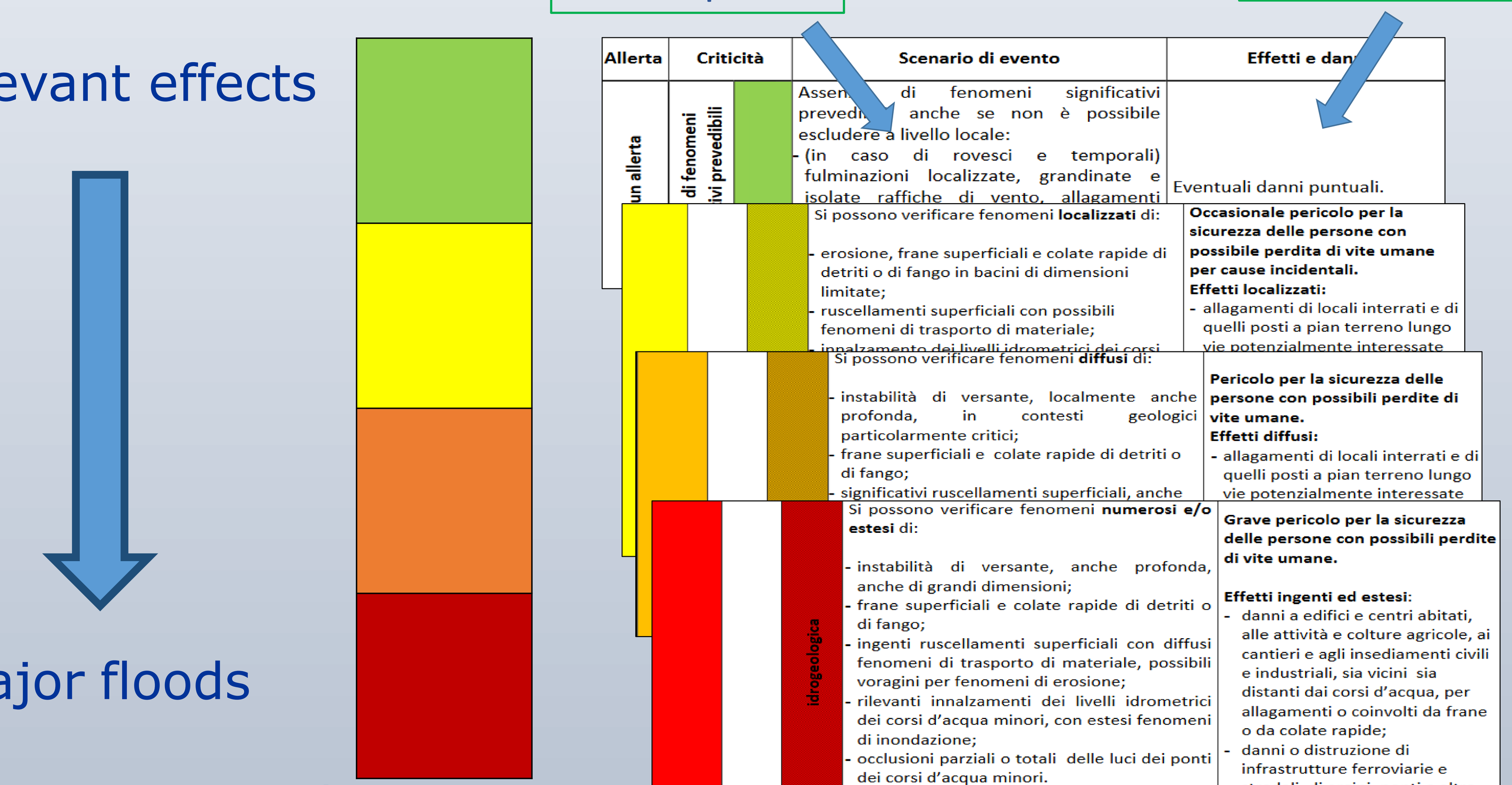
MOTIVATION AND PURPOSES

ARPA Lombardia is the Environmental Protection Agency of Lombardy, a wide region in the North of Italy. ARPA is in charge of river monitoring either for Civil Protection or water balance purposes. It cooperates with the Civil Protection Agency of Lombardy in flood forecasting and early warning. The early warning system is based on rainfall and discharge thresholds: when a threshold exceeding is expected, RL-PC disseminates an alert from yellow to red.

The conventional threshold evaluation is based on events at a fixed return period. Anyway, the impacts of events with the same return period may be different along the river course due to the specific characteristics of the affected areas. A new approach is proposed. It defines different scenarios, corresponding to different flood impacts. A discharge threshold is then associated to each scenario and the return period of the scenario is computed backwards.

1. FLOOD SCENARIOS DEFINITION

Flood scenario definition is based on the description of flood impact, instead of starting from a fixed return period.



Reference: National Civil Protection guidelines

http://www.protezionecivile.gov.it/jcms/it/view_prov.wp?facetNode_1=f4_4_2&prevPage=provvedimenti&toptab=1&catcode=f4_4_2&contentId=LEG56184#top-content

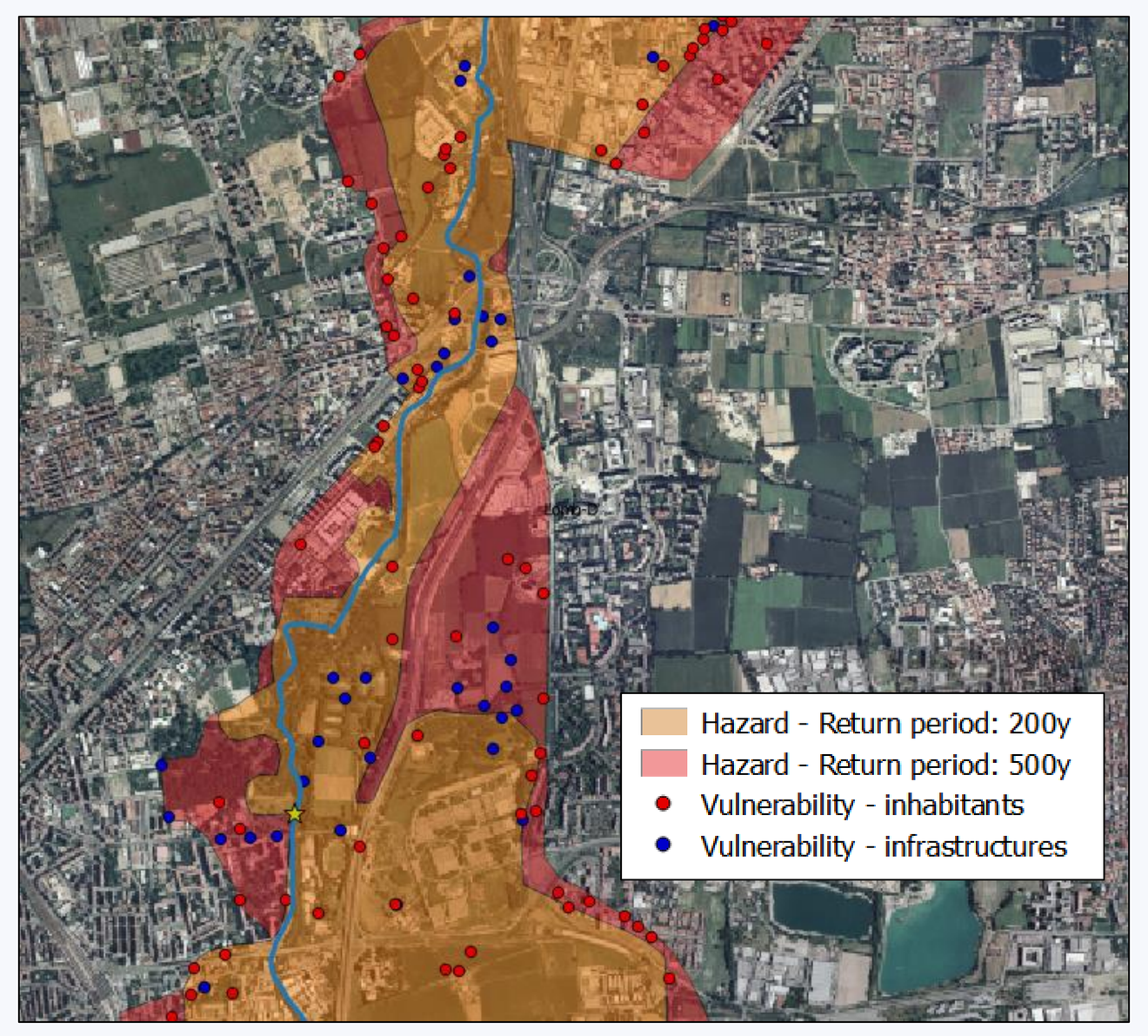
2. EVENT BASED ANALYSIS FOR THRESHOLDS IDENTIFICATION

A range of discharges is associated with each scenario, considering their flood impact; the threshold is set as the discharge corresponding to the transition between two scenarios.

A wide range of event-based information is used to estimate the thresholds, together with ARPA Lombardia gauging network data.

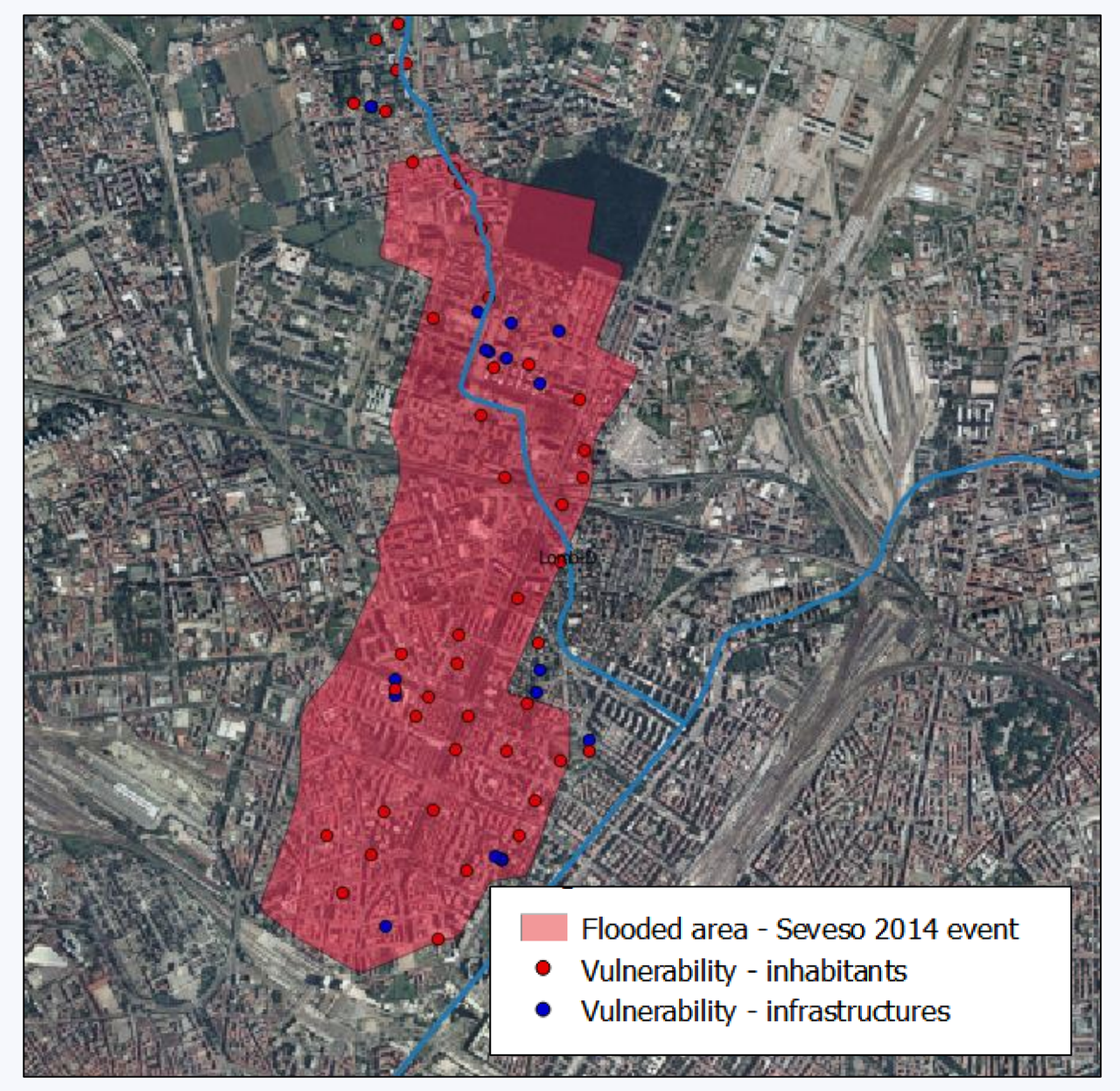
Finally, return period is computed from discharge values.

Floods Directive (2007/60/EC) maps



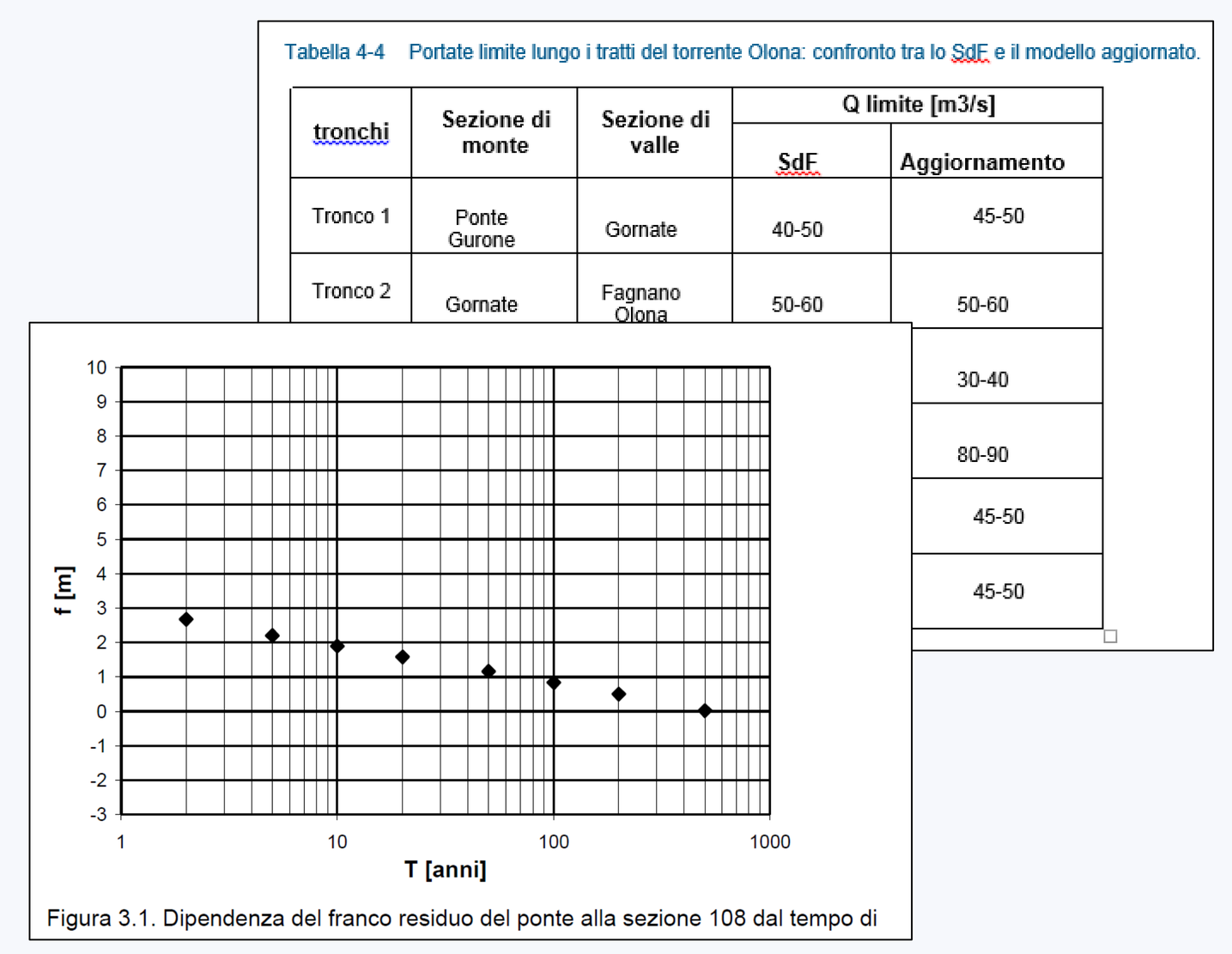
http://www.geoportale.regione.lombardia.it/

Flooded areas maps



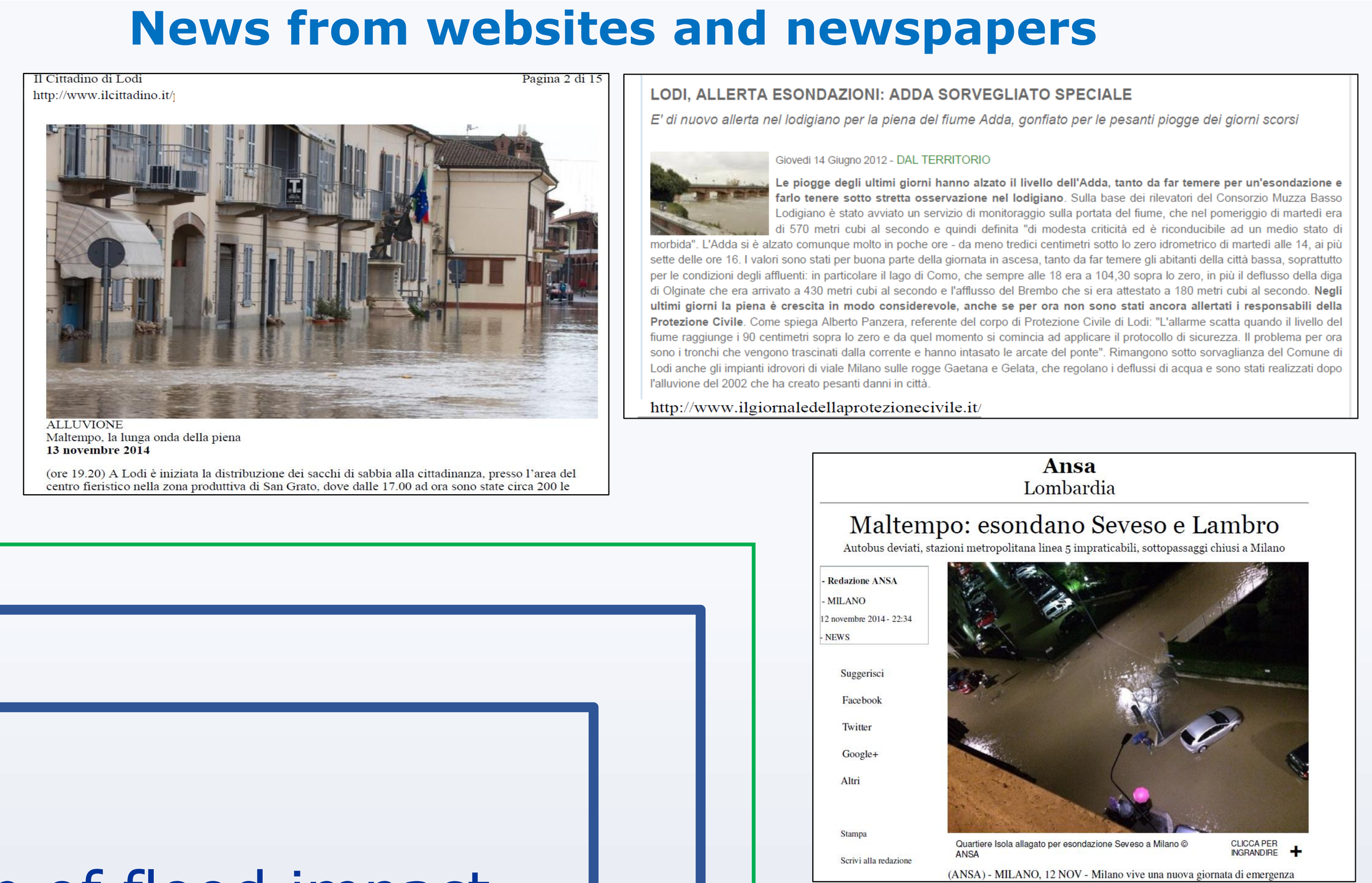
http://www.geoportale.regione.lombardia.it/

Studies about flood hazard and flood risk

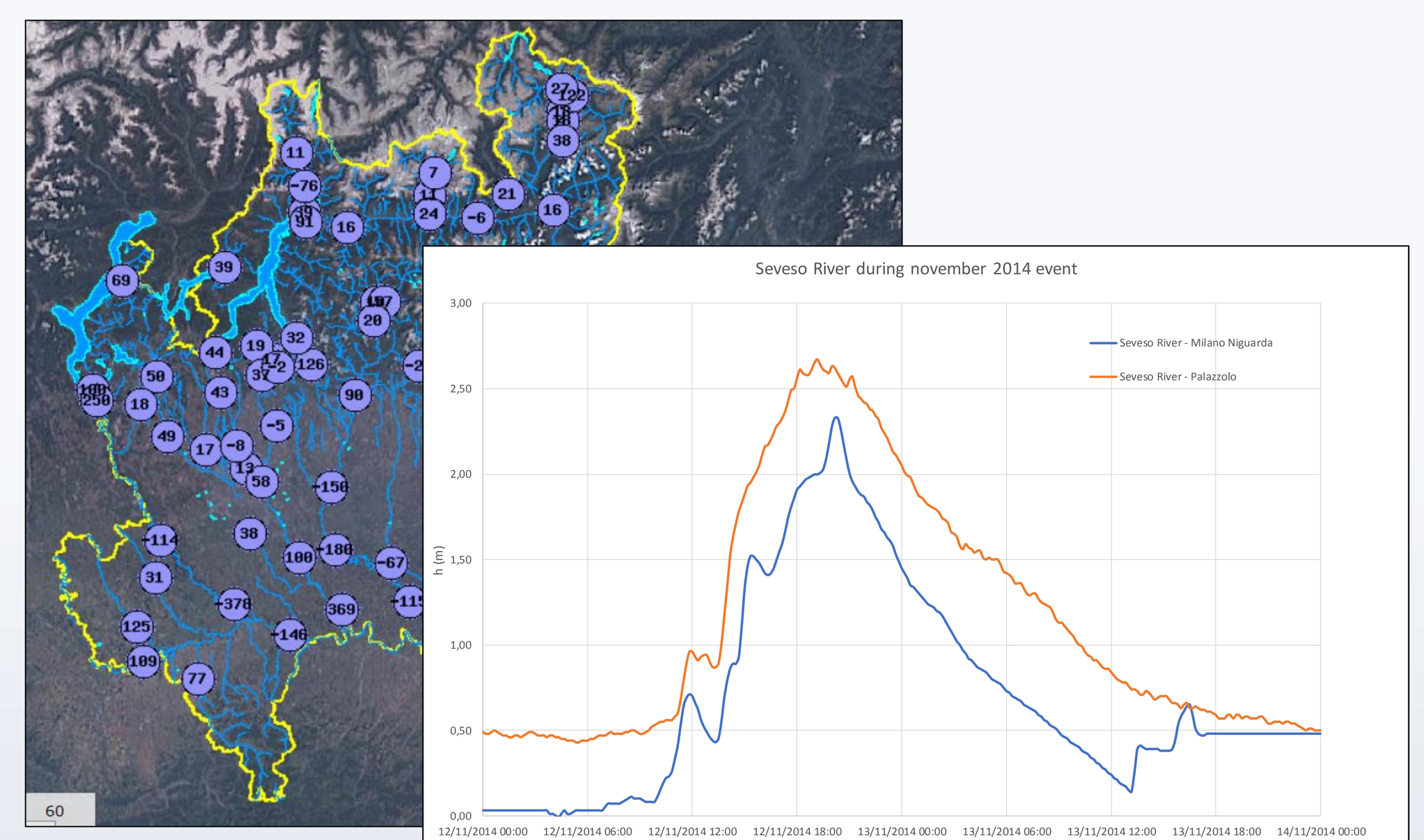


Reference: Po River Basin Authority (AdBPo)

News from websites and newspapers



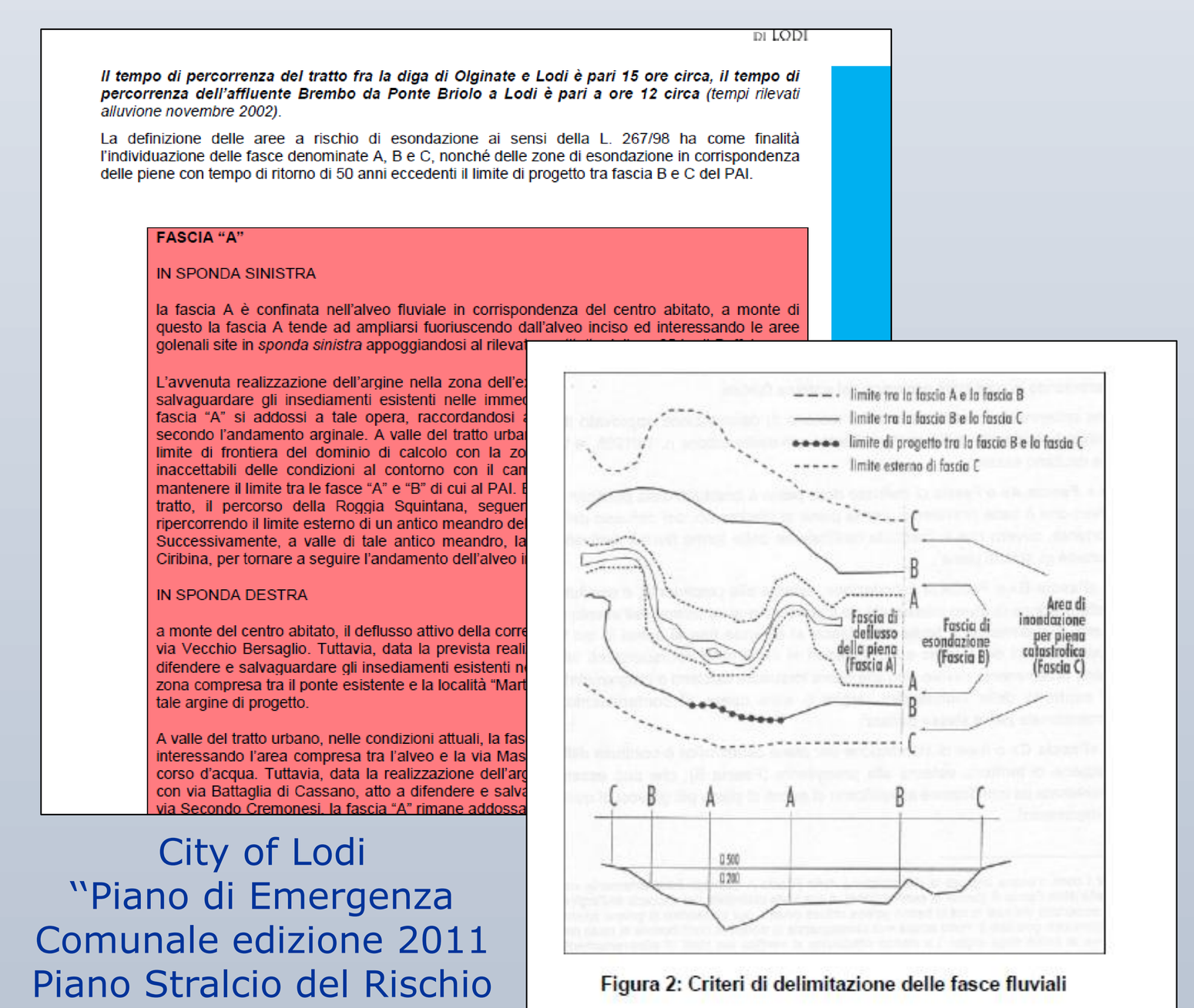
Data from river gauging network



idro.arpalombardia.it

On site measurements

Local Civil Protection Emergency Plans

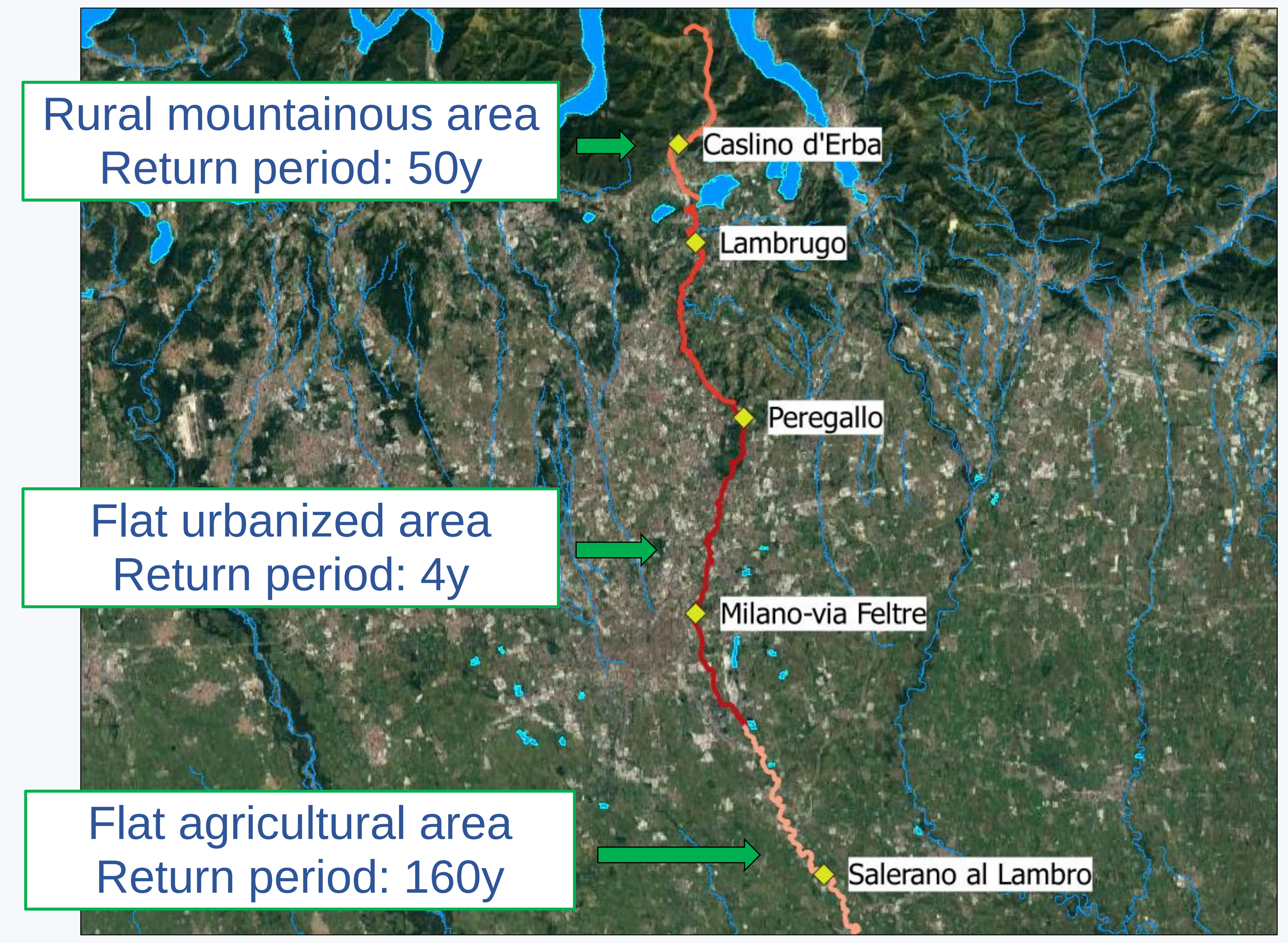


City of Lodi "Piano di Emergenza Comunale edizione 2011 Piano Stralcio del Rischio Idraulico"

3. APPLICATIONS

Civil protection emergency planning and river monitoring → values of return period can show the areas characterized by higher risk

Lambro River, red scenario (major flood)



Evaluation of the compliance of the monitoring network with early warning requirements → further development of the network itself

Mella River, new gauging station