

JBA ITALY FLOOD MAP EXECUTIVE BRIEFING.

Our latest flood mapping for Italy enables insurers, reinsurers, brokers and property search companies to assess flood risk against the highest resolution flood data available in the market at national scale. The maps address river and surface water flood across Italy with both a defended and undefended view of the hazard. The river flood data can be used in conjunction with the river flood defended area data to present a realistic view of risk.

High-resolution mapping enables the most appropriate differentiation between properties at risk for greater confidence in property-level assessment, accumulation control and risk management.

Background

Italy has the largest population living in flood-prone areas in Europe and has been affected by major flood events in 1994, 2000 and 2002.¹ Similarly,

HIGHLIGHTS.

Consistent view of flood hazard across Italy

High resolution for indicative assessment at property level

Informed risk selection and pricing for underwriting, accumulation assessment and risk management

Seamless integration with JBA's mapping for all other Continental European countries

Italy experiences extensive regional events causing devastating flooding, including the recent 2016 and 2017 flooding in Piedmont, Liguria and Emilia-Romagna. Research conducted by JBA suggests that the Annual Average Loss (AAL) from flooding for residential buildings in Italy could be as high as €300 million.

At a wider European level, the number of devastating flood events stemming from river and surface water has more than doubled over the past 30 years, with a proportionally higher increase in the frequency of events caused by surface water flooding.² Projections suggest this trend will continue, with effects exacerbated by climate change, particularly across Central and Western Europe.³ A general

Figure 1
River and Surface Water flood extent for the 100-year return period, Asti.



¹ European Environment Agency (EEA) - EEA Report No 1/2016 (<https://www.eea.europa.eu/publications/flood-risks-and-environmental-vulnerability>), 26 January 2016.

² European Academics Science Advisory Council (easac), *Extreme weather events in Europe*, (https://easac.eu/fileadmin/PDF_s/reports_statements/Extreme_Weather/EASAC_Extreme_Weather_2018_web_23March.pdf), March 2018.

³ Lorenzo Alfieri, *Multi-Model Projections of River Flood Risk in Europe under Global Warming, Climate 2018*, (www.mdpi.com/journal/climate), 24 January 2018.

⁴ David Moncoulon, *Impact of climate change on natural disaster insurance in France*, *Consorteguros Revista Digital*, Number 04, (<http://www.consortegurosdigital.com/en/numero-04/news/impact-of-climate-change-on-natural-disaster-insurance-in-france>), April 2016.

⁵ Lorenzo Carrera, *Economics of flood risk in Italy under current and future climate*, *CMCC Research Papers*, Issue RP0272, (<http://www.cmcc.it/wp-content/uploads/2016/06/rp0272-ecip-12-2015.pdf>), December 2015.

⁶ European Academics Science Advisory Council (easac), *'Extreme weather events in Europe'*.

Figure 2
River flood mapping includes all rivers of Italy without applying any minimum catchment size criteria.

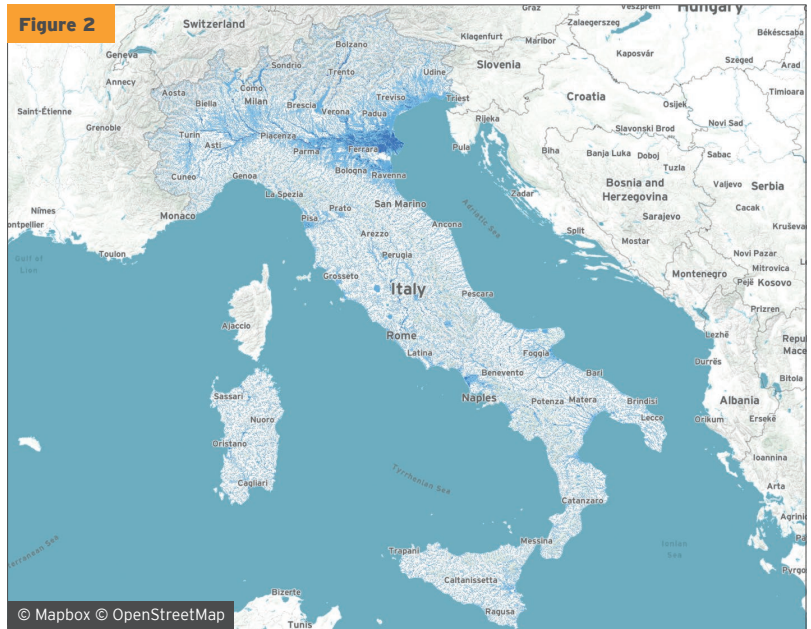
tendency towards larger overall losses or damages is expected.^{4 5} Additionally, more extensive flooding in extreme events could be expected, along with more frequent localised high intensity flood events in areas previously unaffected by flooding.⁶

As the global leader in flood risk management, we invest in the development of maps and models to bring the latest science and data to the forefront of flood risk management practices. As a result, we are updating our existing flood mapping for Continental Europe to 5m. This new mapping assists with the challenges faced across the industry in the assessment of risk from river and surface water flooding at single locations, at national level and at international level.

Figure 3
Effect of the map resolution on risk assessment. At 5m resolution, JBA's flood maps provide clearer definition of the river channel and floodplain compared to coarser resolution mapping.

High-resolution analysis for property specific flood assessment

Our market-leading, peer-reviewed flood mapping methodologies are based on observed river gauge



and rainfall data. Flood extents and water depths are derived by 2D-hydrodynamic modelling using high-resolution digital terrain data for specific return periods.

The development of these maps at 5m resolution enables clients to achieve an indicative flood assessment at property level. The maps are also beneficial for more detailed accumulation assessment and to help clients decide whether to obtain a site survey for any particular property. In addition, the water depth information is classified into depth bands to support property-specific vulnerability consideration.

The flood maps are available for 6 return periods (20, 50, 100, 200, 500 and 1,500 years), enabling users to perform analysis against a range of flood severities, from low to extreme, for the development of a detailed risk profile.

When used in conjunction with our suite of probabilistic catastrophe models for Europe or our flood event sets, the maps enable a consistent view of risk across the transfer chain, from location-level risk selection pricing and underwriting to portfolio management and optimisation.

Understand the different impact of river and surface water flooding

River and surface water flooding behave in different ways and have different impacts on risk. As a result, our experienced hydrologists have developed a methodology for separately modelling the two different flood types. Our flood maps therefore provide

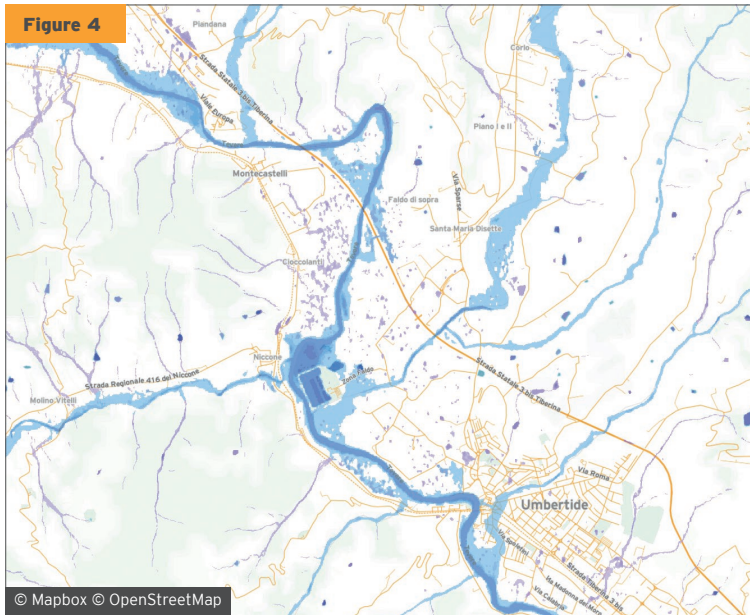
Figure 3



MAP FEATURES.

- 5m resolution mapping**
- River flooding and surface water flooding separately identified**
- Flood extents and flood depths**
- 6 return periods**
- Defended and undefended view of risk**

Figure 4
5m flood map extents for the 100-year return period, Umbertide, Italy. River flood (blue) and surface water flood (purple).



We also offer consultancy opportunities to help you identify exposure hotspots, run bespoke flood risk assessments and manage your accumulations.

About JBA Risk Management Limited

Established in 2011, we are a global leader in flood risk management. Affectionately known as The Flood People, our flood maps, catastrophe models and analytics are used by some of the world's largest insurers, reinsurers, financial institutions, property companies and governments. We're experts in translating complex, scientific data into useful information, using sophisticated hydraulic approaches and models to provide cutting-edge flood risk intelligence.

an opportunity to consider surface water flooding separately in the risk assessment process.

Due to the ability to separately assess river and surface water flooding, comparing flood claims data against these maps will support a greater insight into the type of flooding that drives the losses.

Account for the positive impact of river flood defences

The river flood map is complemented by flood defence data based on a variety of sources, including information from national agencies and detailed local knowledge where available to JBA. The dataset delineates areas protected by flood defences and provides the standard of protection (expressed as a return period) associated with each.

The combination of the maps and defence data enables users to decide how to consider flood defences for their own risk preferences, by choosing whether to incorporate none, some, or all of the defended areas for their risk assessment.

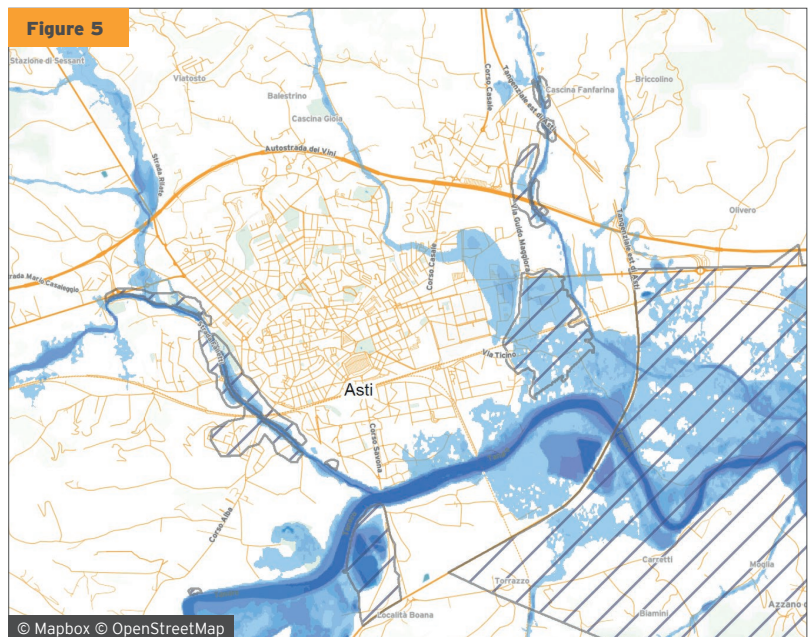
Data access

To enable easy integration into pre-existing systems, we provide flood map data in a range of formats either directly from JBA or via our network of resellers.

As part of the JBA group, established over 20 years ago, we work closely with leading academic institutions in the field of flood risk. We also support our independent charity, JBA Trust, which enables research, education and training in the water environment sector.

Our commitment to continuous improvement and detailed research and development is what makes us the number one choice for many insurers, reinsurers, financial institutions and governments.

Figure 5
Example of defended river area data for Italy with a standard of protection of 100 years (hashed polygons) overlaid on top of the 100-year return period river flood map (blue). The overlap between both datasets indicates areas that benefit from existing flood defences during river flood events of return periods of up to 100 years.



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