



Comune di Faenza  
Premio Europa 1968

Luleå, Sweden – 23.05.2024

# Climate changes in a fragile territory: Faenza flood experience

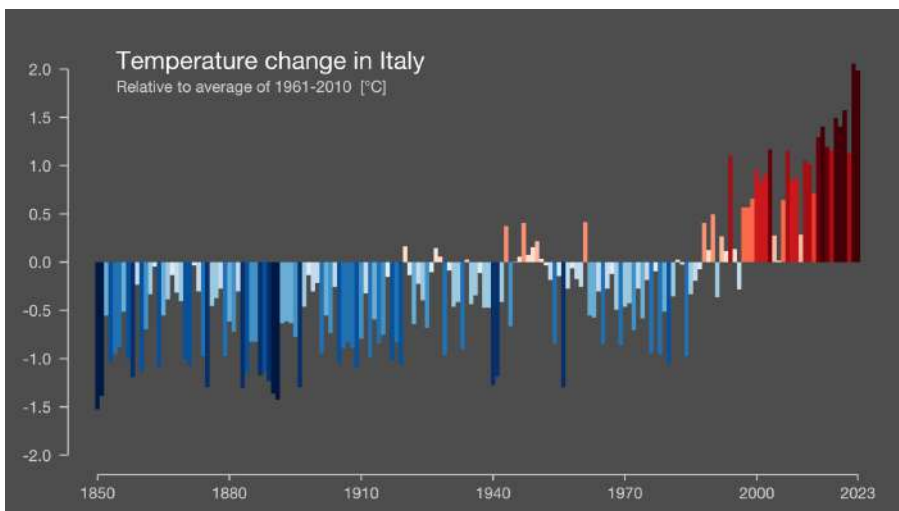
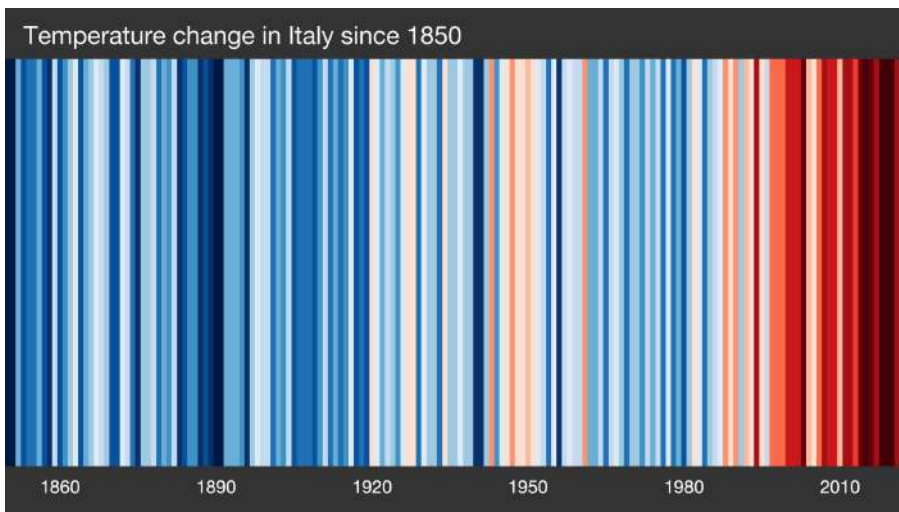
Luca Ortolani

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Comune di Faenza



# Global warming is real



During the night of 16 May there was 12°C in Faenza and during the days before, after six months without rain, *everyone was joking about weather alerts and global warming.*

**Weather** is different from **climate**, the former describing atmospheric conditions here and now, the latter defining a weather trend spanning over large areas and timescale.

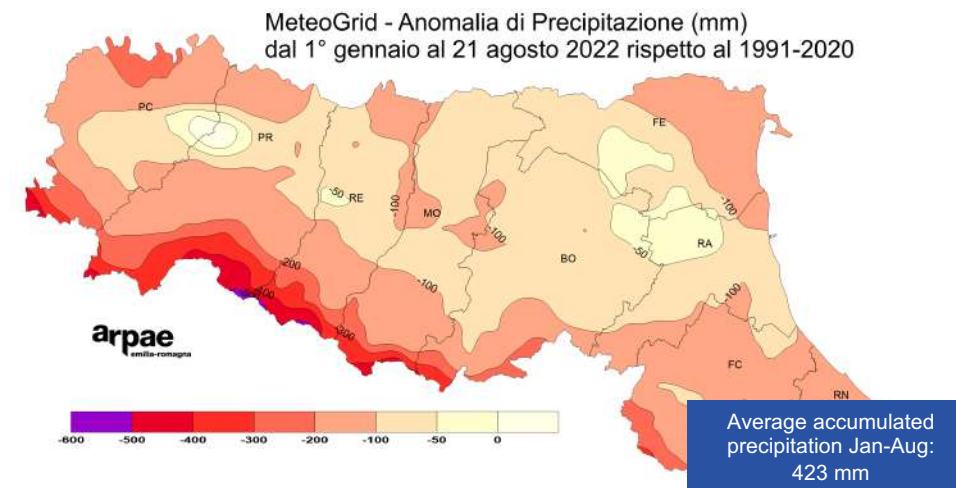
Climate scientist **Ed Hawkings**, from University of Reading (UK), found a simple and effective way to visualize climate change.

Each stripe represents the **average temperature for a single year**, relative to the average temperature over the period as a whole.

<https://www.reading.ac.uk/planet/climate-resources/climate-stripes>



# Climate Change - Droughts



**Droughts** are probably the most intuitive consequences, and very likely the first occurred since a decade, of a warmer climate.

Public policies are (fruitfully) working to reduce the effects on crops and to create new **sustainable and resilient water infrastructures** capillary spread over the whole territory.



# Climate change - atmospheric rivers



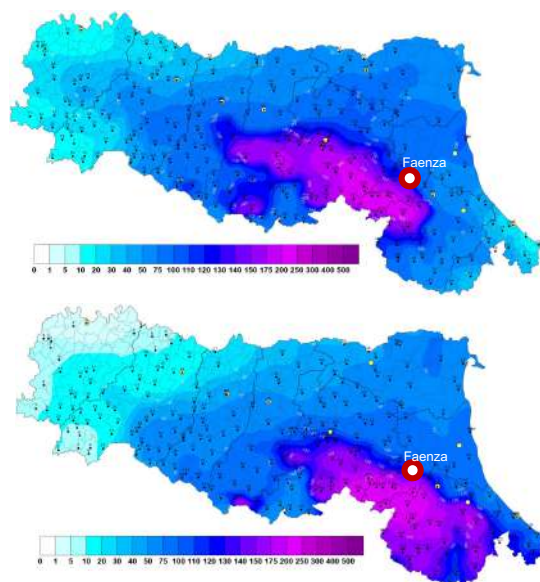
***Water do not disappear!*** For each degree of temperature increase, air can transport 7% more water vapor.

With extreme temperature anomalies over the seas and the oceans, water is moving from the surface to create large ***atmospheric rivers***, moving across the continents, with 25 times the the whole flow rate Mississippi river in the USA.

Forecasting Atmospheric Rivers, Scientific American Magazine Vol. 327 No. 3 (September 2022), p. 62



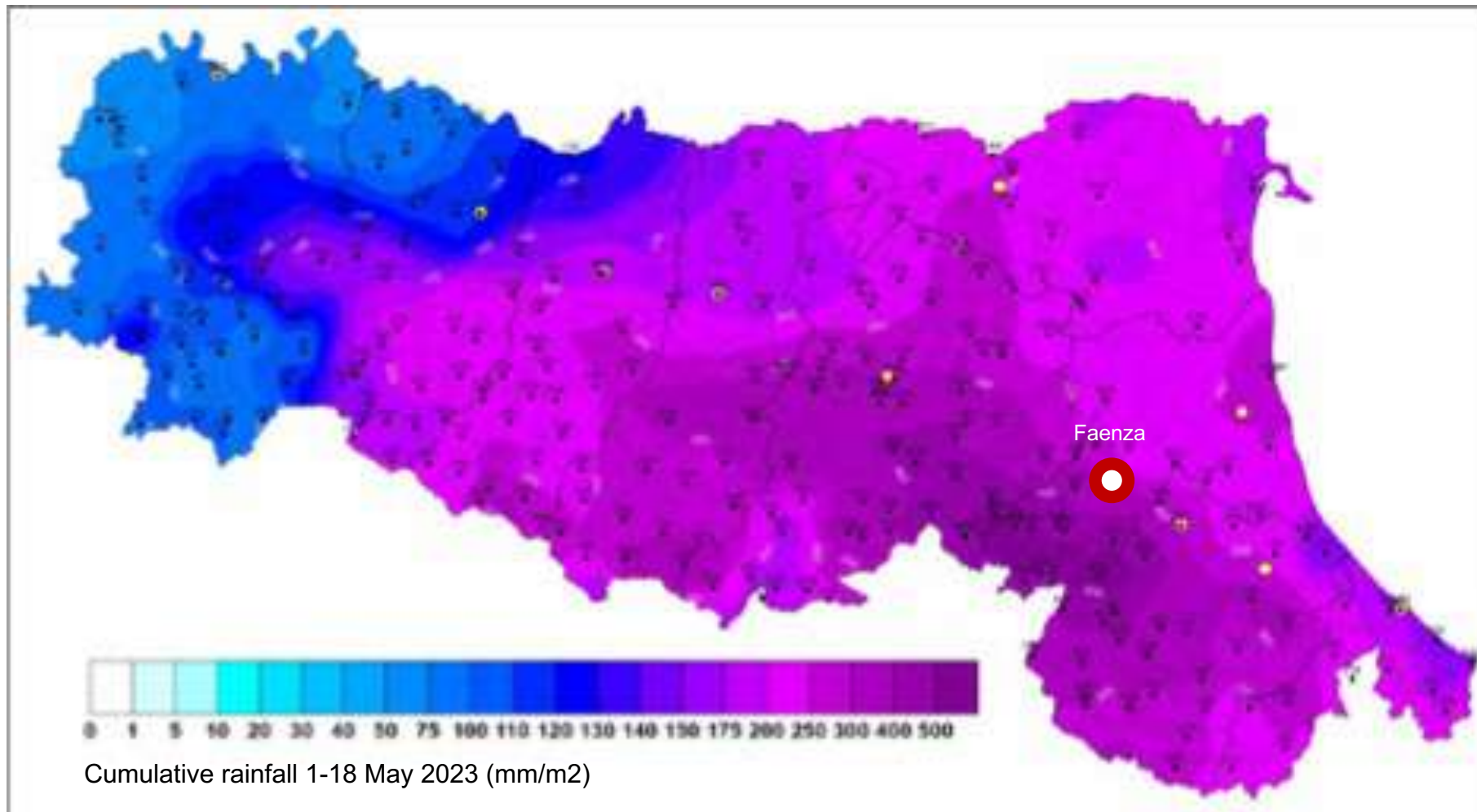
# May 2023 event(s)



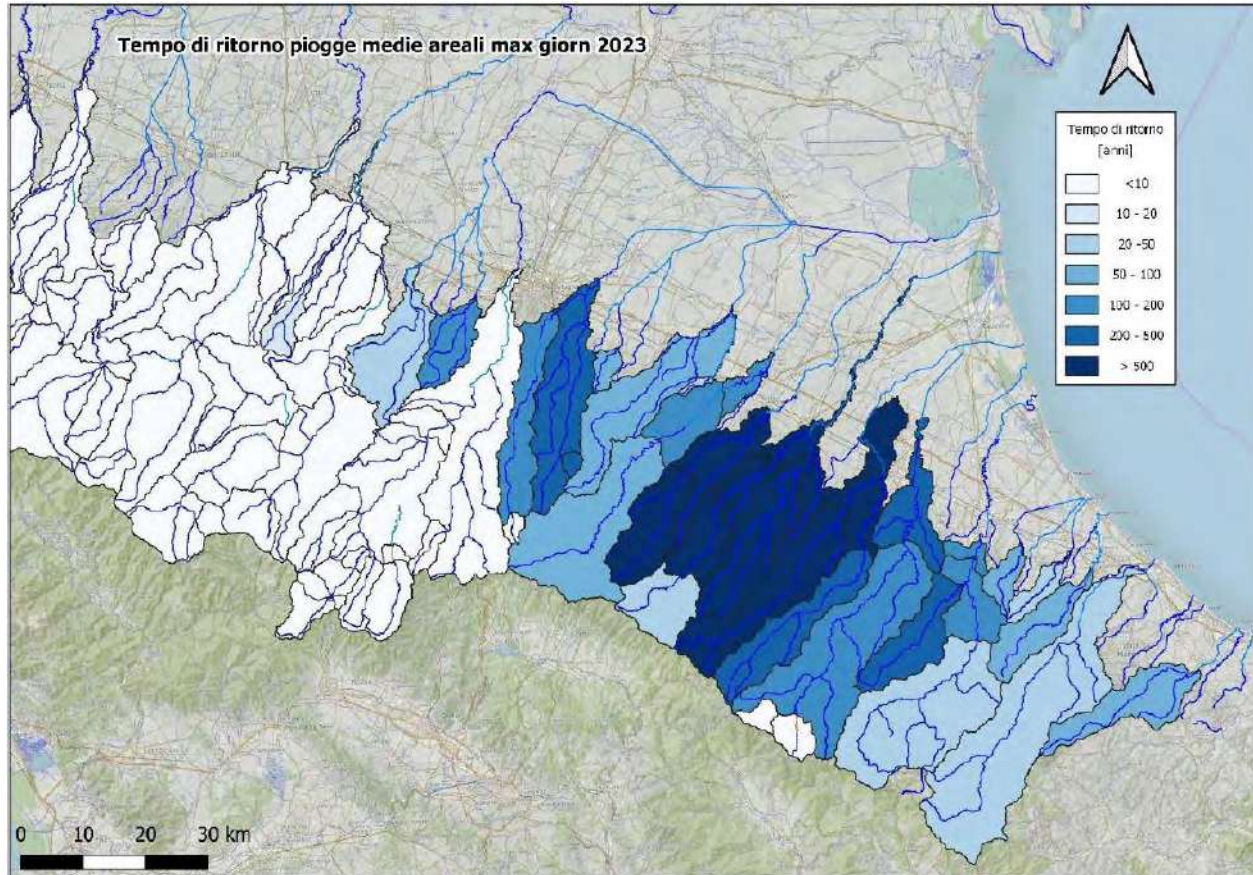
**Two identical events, within 15 days, with peaks of more than 200 mm/m<sup>2</sup>**

The rainfall of an entire year.

Dry soil on the first, oversaturated during the second one.



# Millennial Return Time ( ...in a stable climate!)

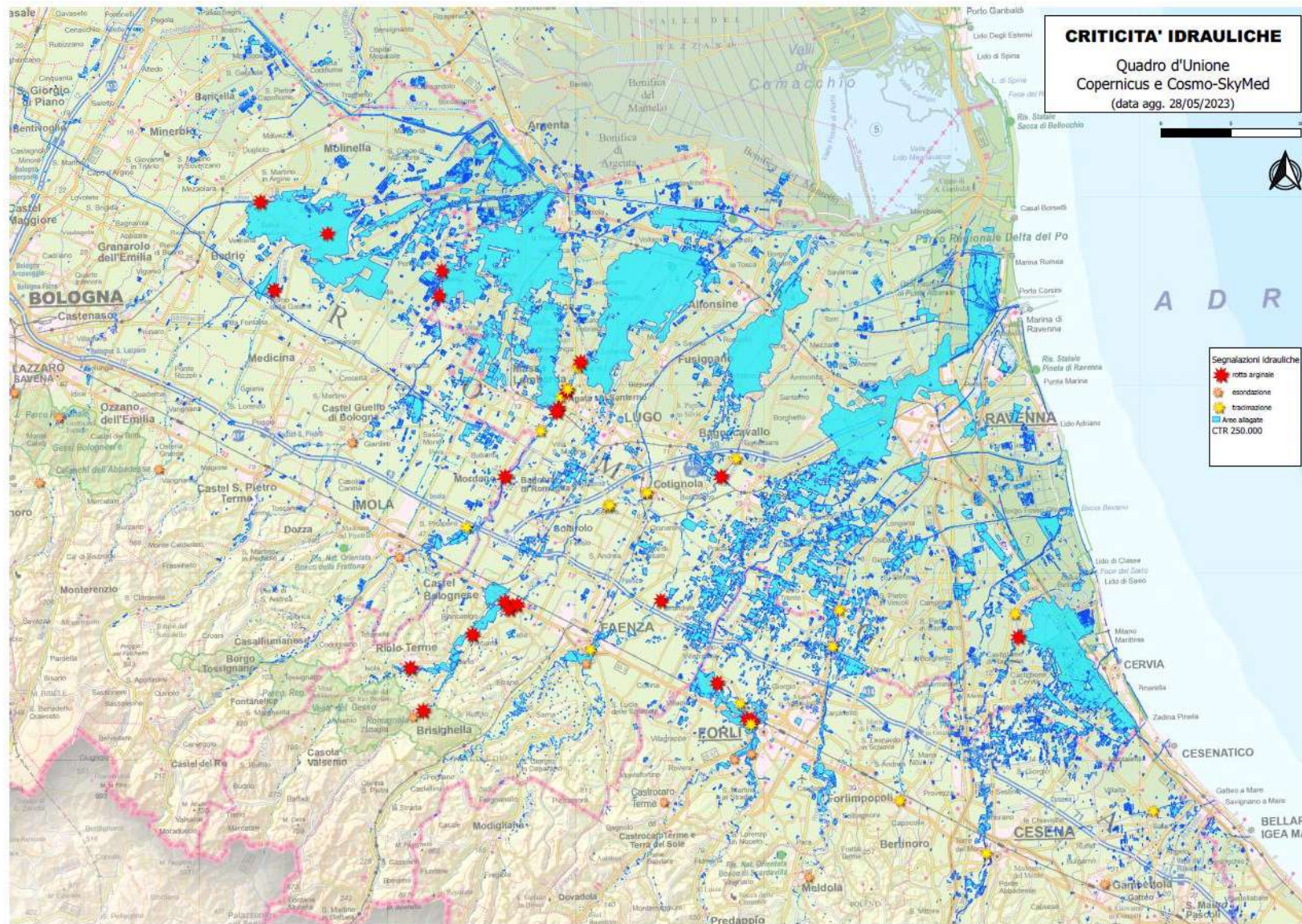


**Current water infrastructures** (river embankments, expansion tanks, canals, ...) from the 20<sup>th</sup> century were able to provide acceptable safety levels for over 100 years... until now!

Combined may 2023 events have an estimated **return time of more than 500 years** on many rivers.

The history of Emilia-Romagna is made of land reclamation from water and rivers.





# Overflows everywhere

**Almost every river, canal or trench did overflow from Bologna to Rimini.**

23 river overflows at the same time (+13 rivers exceeding red threshold)

Estimated flooded area more than 100.000 ha

4 billions mc of rainfall (1.4 billions mc of water used in one year)

9 Billions euro estimated damages to public and private structures





# Faenza flooding



Half of the **historic city center submerged**, and more than 10.000 residential units flooded. Water level higher than 6 mt in many residential areas. 500 families submerged twice.

22.000 people and 10.000 families, with 3.400 children

More than 60 mln euros **damages to public structures** and buildings.

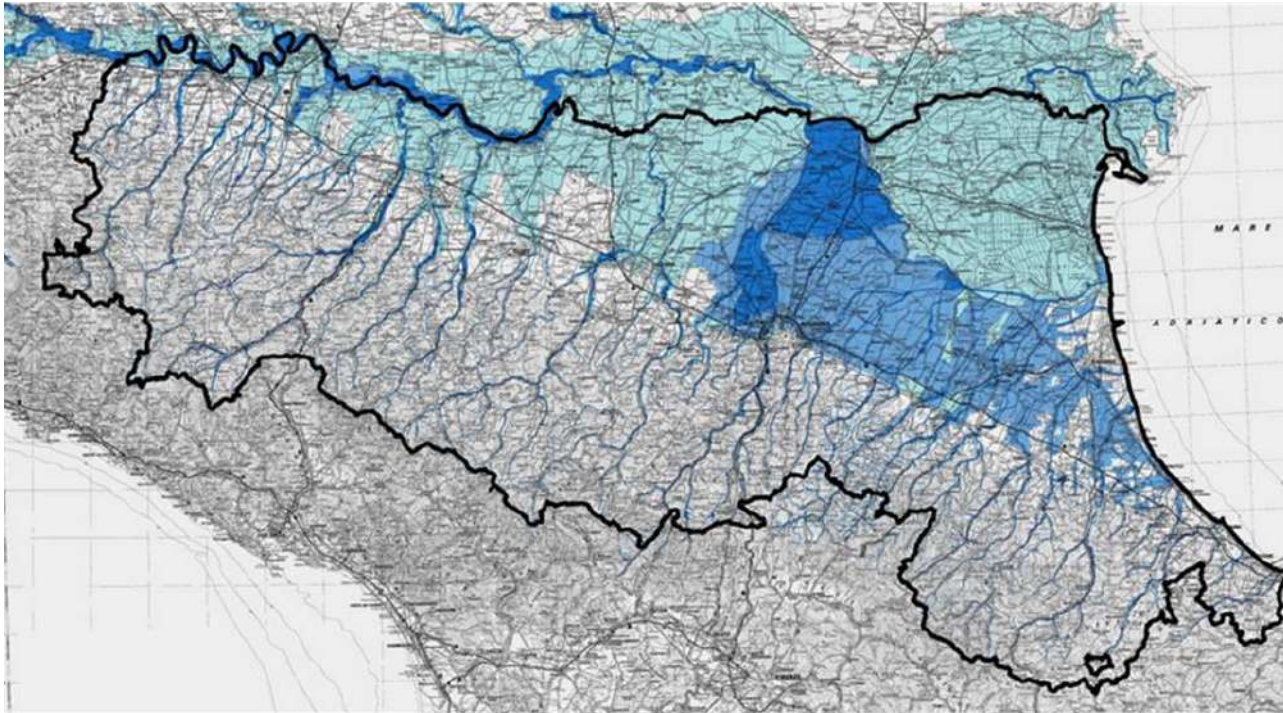
**1.600 cars** damaged or destroyed by water and mud.

150.000 m<sup>3</sup> of garbage collected.

More than 40.000 m<sup>3</sup> of mud collected.



# Rising awareness – be prepared



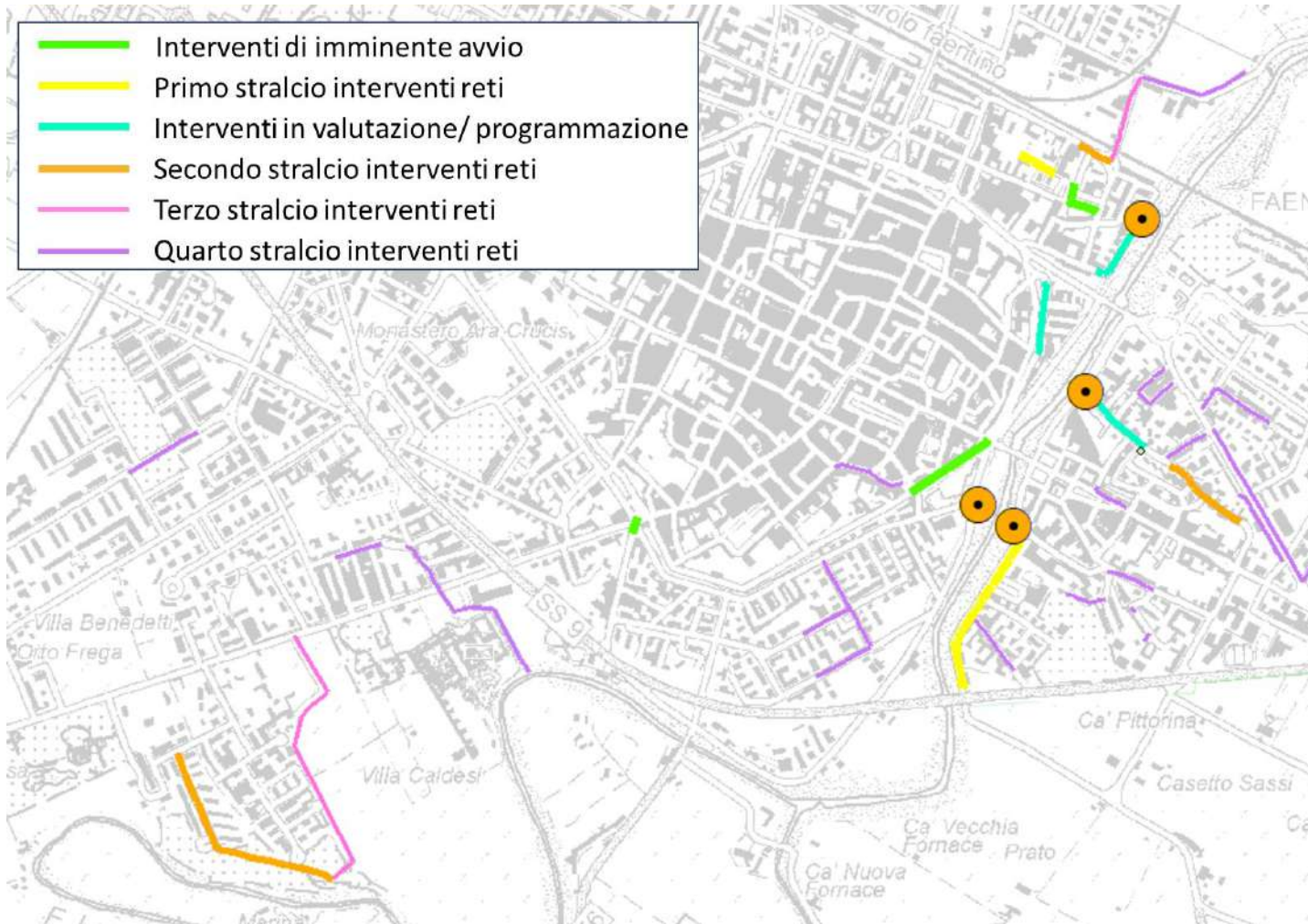
In Emilia-Romagna **45% of the territory is exposed to risk of flooding** (2.7 million of people, 250.000 private companies). Only 5% of buildings in Italy has flood/earthquake insurance coverage.

The municipality of Faenza is delivering the **new emergency plan** by December, updating alerting systems and evacuation procedures.

Nationwide **IT-alert system**, tested after ER flood, will be able to deliver push notification to all mobile phones within an area, providing emergency information.



# Upgrading the sewage system



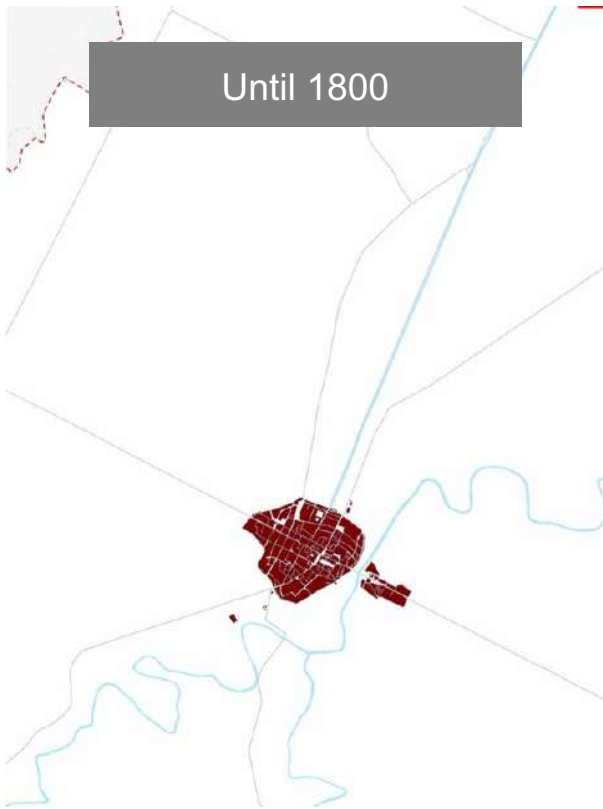
Together with the integrated water manager the Municipality is planning a **complete revamping of the public sewage system**, increasing capacity and resilience to extreme rainfall.

1. **Emergency hydraulic pumping** to lift water during high river flood levels.
2. **Doubling of critical sewer pipes** to account for excess water in extreme weather conditions
3. **By-pass and re-routing** of sewer pipes to reduce the water level in low elevation areas.

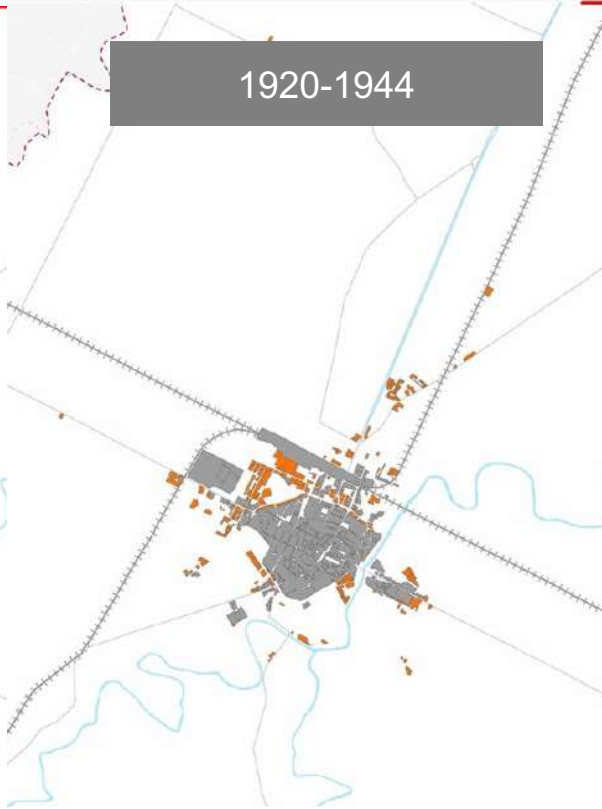


# Protecting the city center / Building Differently

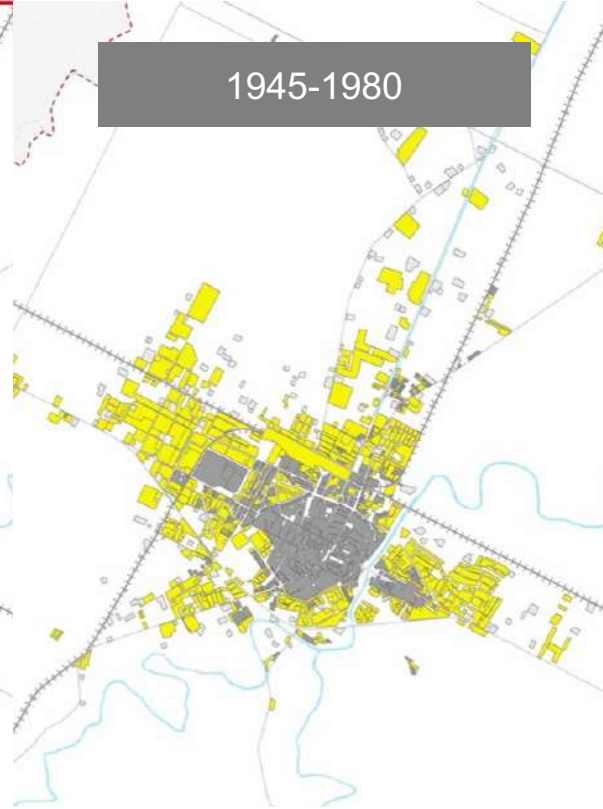
Until 1800



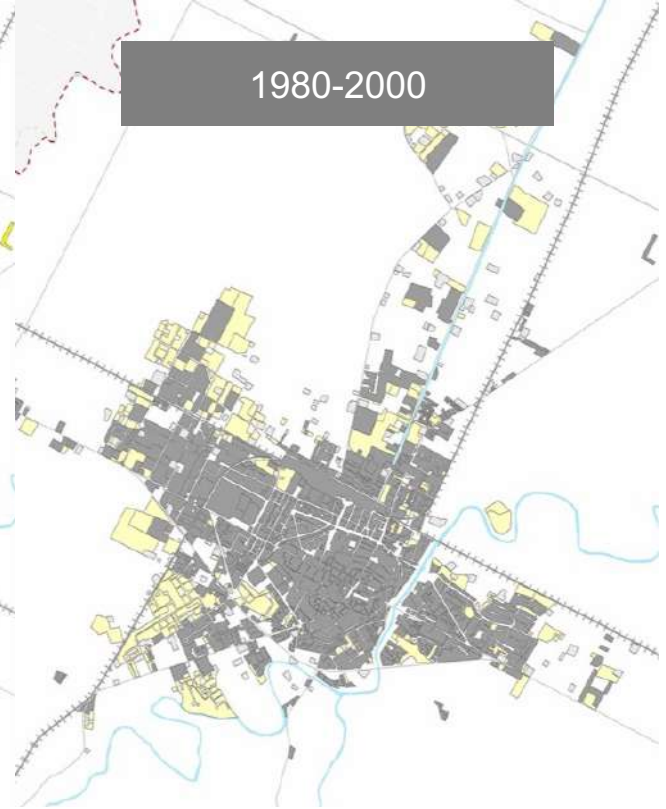
1920-1944



1945-1980



1980-2000



Urbanization remained on higher terrains until the building of **hydraulic engineering infrastructures** (higher riverbanks) in the city centre and in the whole territory released a **false safety perception**.



# Protecting the city center / Building Differently



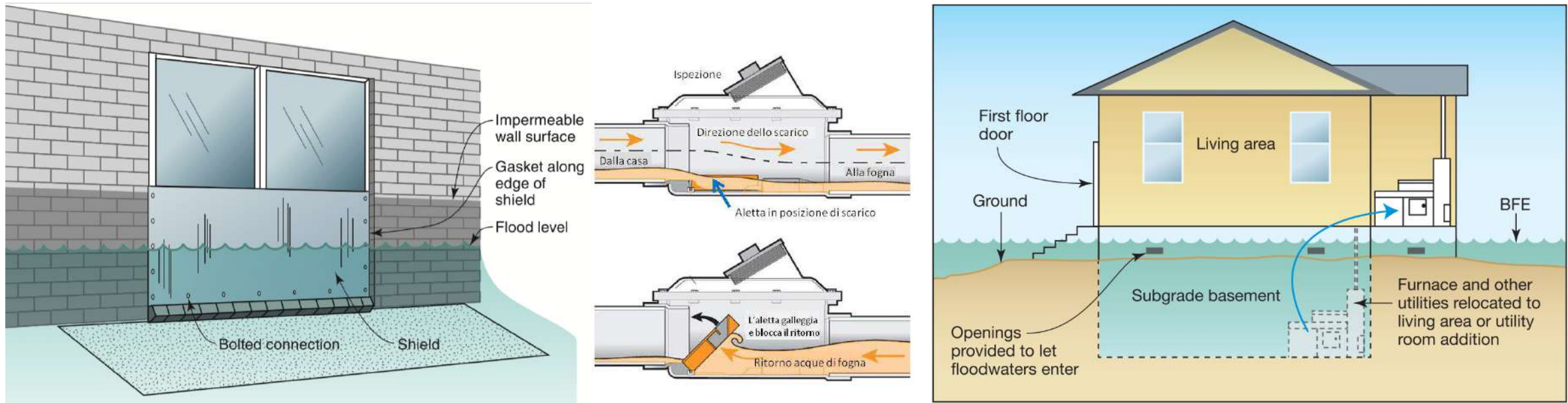
Public authorities are about to release a ***new strategic plan for flood risk reduction*** over the whole regional territory, providing new hydraulic engineering infrastructure to reduce river flood levels.



Individual cities and towns are committed to find local solutions to secure individual critical neighborhoods.



# Protecting the city center / Building Differently



New buildings or renovations in flooded areas must use a design paradigm for risk mitigation, ready for emergency situations, as even with the most effective hydraulic engineering protection infrastructures, **there is no risk zero scenario in lower elevation terrains.**

**Public policies** must guide and provide economic support for private actions that can **retrofit** using technologies and design concepts to **increase building flood resilience.**



**Thank you all**  
**... be ready, stay safe!**

