

## ***Flood-Battered Italian Region May See More Violent and Frequent Storms***

Experts have linked recent deadly rains in the north of the country to climate change, but decades of urbanization and neglect helped lay the groundwork for a calamity.

**By Elisabetta Povoledo**

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The floods that submerged the northern Italian region of Emilia-Romagna this month, killing 15 people, leaving thousands homeless and grinding transportation and businesses to a halt, were not one-off events, warn experts, who predict that there are more similar, frequent and violent storms to come.

“The question to ask,” the country’s civil protection minister, Nello Musumeci, told an Italian newspaper, “is not whether a disastrous event” like the deadly flooding will happen again, “but when and where it will occur.”

The causes of floods are complex, including land development and ground conditions. But many experts in Italy, including Barbara Lastoria, a hydraulic engineer, have linked the two devastating storms that occurred over two weeks to climate change.

The amount of water that fell — about 19.6 inches of rain in 15 days, more than half the average annual rainfall in the region — was extraordinary, experts say, exacerbated by a monthslong drought that had left the terrain struggling to absorb all of that rain. It swelled nearly two dozen rivers and sent billions of gallons of water pouring into streets and untold acres of farmland.

The storms found fertile ground for disaster because of events both natural and human made, including questionable decisions and decades of neglect of some infrastructure.

“The problem has certainly been underestimated,” said Armando Brath, the president of the Italian Association for Hydrotechniques. “Unfortunately, in Italy, we are not the champions of prevention.”

The solution, some say, may take political will, billions of euros and a populace keenly aware that their future may be imperiled.

About 70 percent of Emilia-Romagna was already at risk of flooding — “a well-known fact,” said Francesco Violo, the president of the National Council of Geologists. And of the 80,000 landslides that have been mapped there, several hundred were reactivated by the recent storms, he added.



A flooded street in Cesena, in the Emilia-Romagna region of Italy, this month. Alessandro Serrano/Agence France-Presse — Getty Images

The area that flooded is a low-lying floodplain for the Po River. And the widely held view among geologists and hydraulic engineers is that the region's urbanization in recent decades not only reduced the space where water could flow, but also contributed to the sinking of vast areas where water had been extracted to keep foundations dry.

Rivers were channeled, narrowed, diverted and entombed over generations. Riverbeds and embankments have not been properly maintained; vegetation and animal dens have weakened levees. Many canals, waterways and dams built in past decades — centuries even — to calm waters flowing down from the Apennine Mountains have been partly neglected.

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“Structures to intercept water had been built over many years, and even if many still function, some others have to be fixed up in terms of retrofitting and maintenance so that they can be used again in an optimal configuration,” said Ms. Lastoria, who works with the Italian National Institute for Environmental Protection and Research.

In response to the floods, the Italian government on Tuesday set aside two billion euros (\$2.15 billion) for the flood-stricken area, but Prime Minister Giorgia Meloni said that the full damage still had to be evaluated and that more funds would go toward reconstruction.

Experts say rebuilding must go hand in hand with preventive measures to at least mitigate the effects of future storms.

“Prevention, maintenance, protection pay off significantly,” said Carlo Carraro, president emeritus and a professor of environmental economics at Ca’ Foscari University of Venice.

But Italy is one of the few countries that have not approved a European Commission directive, the National Adaptation Plan, that obliges all European Union member nations to adopt policies to reduce their vulnerability to climate change.

On Wednesday, Mr. Musumeci, the civil protection minister, told a Senate briefing that the plan would be out at the end of this year or the start of next year, “updated with data processed between 2016 and 2020.” He said that the plan “had not made significant progress” for years, but that a “major acceleration” would now take place.

Studies have shown that every euro invested in these policies equaled five or six euros in averted damage, Mr. Carraro said.



A worker walking by a car that had been uprooted by the force of the Santerno River last weekend in Sant'Agata sul Santerno, a small Italian town. Elisabetta Zavoli for The New York Times

“Extreme events have always happened, but because of climate change, they are becoming more frequent” and more expensive, he said.

Italy has spent €75 billion over 40 years on damage caused by severe weather events, according to an estimate by the European Environment Agency. “It is an average value that hides, however, an exponential trend,” Mr. Carraro said.

There are many departments, regional officers and officials in municipalities responsible for assessing risks and planning countermeasures to disasters. But they are fragmented, said Mr. Violo, from the geologists’ council.

“Often they don’t work together to coordinate necessary interventions,” he said. “It would be important to create a central office that could ensure a long-term vision, over years, because if ordinary plans aren’t kept up, then emergencies happen.”



Excavators worked on the banks of the Santerno River to build a dike and tear down a home that had been severely damaged by the floods. Elisabetta Zavoli for The New York Times

Centuries ago, the country began building artificial barriers and dams in many mountainous areas, which make up about 70 percent of Italian territory, but maintenance was gradually abandoned. The solution to flooding on lower-lying plains starts there, said Mauro Agnoletti, the UNESCO Chair on Agricultural Heritage at the University of Florence. Maintenance must be increased, he said, “especially in areas upstream of cities.”

Italians generally do not dwell on the fact that their livelihoods, or their lives, could be at risk from natural calamities — at least not until disaster strikes, experts say.

That indifference puts risk assessment, and risk prevention, “out of the political agenda,” said Erasmo D’Angelis, the former head of Safe Italy, a government organization, who evaluated such risks and allocated funds to offset them.

“Major, national public works project must immediately get on the way in order to ensure the safety of millions of citizens,” he said, “not to mention an enormous industrial and cultural heritage.”

To confront the challenges of climate change, some experts have suggested stopping land consumption and redeveloping or reclaiming abandoned, polluted or degraded areas. Where new construction is deemed unavoidable, they say, it should take into account existing hydraulic conditions and guarantee that they would be maintained after completion.

“Ensure that climate change is factored into all planning,” said Ilaria Falconi of the Italian Society of Environmental Geology.

Some have also proposed building reservoirs along rivers, but that can run into political opposition. Mr. D’Angelis noted that building reservoirs to stop flooding from the Seveso River in Milan led to “harsh battles” with town mayors and took years.

Others say that Italy already has many structures that could be revived for the protection of millions.

“Dams already exist in Italy in the best places they could be built — the problem is recovering them so that they work to their full potential,” said Ms. Lastoria.

She suggested broader solutions like more sustainable agriculture, rethinking how “how we occupy the territory, to give back some space to water” and reducing greenhouse gas emissions.

“There is no quick simple solution, no magic wand — that’s why you need to plan,” Ms. Lastoria said. “Otherwise, we risk reaching a point of no return.”



Mud-covered furniture from a tailor's shop on the street last weekend after floodwaters receded in Sant'Agata sul Santerno. Elisabetta Zavoli for The New York Times

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