

How does a flood become a disaster?

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What are the causes, patterns and effects of disastrous river flood? An international group of researchers led by GFZ hydrologist Bruno Merz has investigated this question in a review article published in the journal *Nature Reviews Earth and Environment*. The short answer: It's complicated. What is certain, however, is that there is an opposing trend

of property damage and personal injury. Since the 1990s, the number of fatalities from river floods has declined worldwide, but the amount of damage has risen sharply. The researchers attribute the decline in casualties to improved flood warning, technical protection measures and heightened hazard awareness.

Asia is the worst hit by floods worldwide: "More than ninety percent of the people affected by [flood](#) disasters live in Asia," says Bruno Merz. The head of GFZ's Hydrology Section cites a few reasons: "There are huge floodplains of large [rivers](#) there, and that's exactly where many people live together."

On a long-term average, 125 million people are affected by a disastrous river flood every year. They have to leave their homes, suffer financial losses, are injured, or are even killed. The most dramatic events are those where dams or dikes suddenly break, and flash floods such as the recent ones in Germany and Belgium. The global economic losses from flooding of about 100 billion USD result from both major flood disasters and many smaller, less dramatic events, i.e., as a cumulative effect.

As far as the causes are concerned, the researchers have identified a whole network of factors. These include socioeconomic reasons (poverty, population growth, higher values in flood-prone regions) as well as natural ones, above all climate change. However, for an extreme weather event to become a disastrous flood, other conditions must be added, such as a lack of awareness of hazards or non-existent or failing protection and warning systems. "The primary focus must therefore be on reducing the vulnerability of communities," says Bruno Merz. The decline in the number of victims worldwide in recent decades shows that progress is being made here, he adds.

So how can vulnerability be further reduced? The researchers focus here on the less obvious measures. For example, they say, the element of

surprise must be considered in the first place. Classifying areas according to "susceptibility to surprise" could help. It is also a matter of developing extreme scenarios in advance: What could happen if several factors overlap unfavorably and situations occur that typical risk assessments do not depict? A policy of "building back better" also contributes to minimizing risk, he said. A key to better understanding flood disasters lies in the past—Merz says: "Historical disasters hold many valuable lessons and therefore need to be incorporated into current datasets even more than before."

More information: Bruno Merz et al, Causes, impacts and patterns of disastrous river floods, *Nature Reviews Earth & Environment* (2021).
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