

Central and western Europe can expect a substantially higher flood risk in the future, even with ambitious cuts in temperature.

If you live in Europe, get ready not only for a warmer future, but for a decidedly wetter one as well - with the likelihood in many regions of more disruption and danger, as the flood risk rises sharply.

Much of the continent is expected to see a steep rise in flood risk in coming years, even under an optimistic climate change scenario of 1.5°C of warming compared with pre-industrial levels.

A study by the European Commission's Joint Research Centre assesses the flood impacts for three scenarios - of 1.5°C, 2°C and 3°C warming.

It finds, elaborating the tenor of numerous previous studies, that many risks are growing. Most of central and western Europe will experience a substantial increase in flood risk at all warming levels: the higher the warming, the higher the risk.

The global treaty on tackling climate change, the 2015 Paris Agreement, set 2°C as the maximum tolerable increase in global average temperatures above their pre-industrial level, while urging countries to aim for the much more demanding 1.5°C. How realistic even the 2°C target may prove is hotly debated.

Damage from floods across Europe is projected to more than double, from a 113% average increase if warming is kept to 1.5°C, to 145% under the 3°C scenario. In terms of population affected, the projected increase ranges from 86% to 123%.

While the pattern for central and western Europe is one of a consistent increase in flood risk, the study also finds that the risk may actually decrease with warmer temperatures in some parts of eastern Europe, although those results also show a high degree of uncertainty.

Similarly, in Spain, Portugal and Greece, the initial increase in impacts at 1.5°C turns into more uncertain projections for higher warming levels, because of a substantial reduction in annual rainfall.

The JRC analysis, published in the open access journal *Climate*, improves scientists' understanding of future trends in river flood risk in Europe, as well as stressing the need to prepare effective adaptation plans for a probable increase in the severity and frequency of European floods.

Finding the cause

The study authors' aim was to identify consistent trends, independent of the models used, in flood risk in Europe attributable to climate change, and to identify the reasons for both the differences and the similarities between projections of river flood risk.

The three studies cover a wide range of methods and climate-relevant datasets (including for example temperature and precipitation), hydrological and flood modelling, and impact assessment.

The comparison sheds light on the influence of the data applied and methods used to assess impact projections. Results from the three assessments confirm that climate projections are the main driver influencing future flood risk trends.

The scientists say other factors, such as correcting any bias in climate projections, the method for assessing the year of exceeding global warming levels, and the spatial resolution of the input data did influence the results, but only to a small degree, and without affecting the direction of the projected changes in the three scenarios.

Reliability essential

They also point out the importance of using accurate modelling of the extent of floods to achieve reliable impact estimates. At the moment, this is limited by the availability of high-resolution digital elevation models (digital representations of ground surfaces) over large areas, where small-scale features can considerably influence the distribution of floodwaters. The study confirms that global warming has a significant impact on river flood risk in Europe, though it can vary in magnitude from region to region.

Even if global warming is limited to the levels spelt out in the Paris Agreement, changes in regional temperatures (and therefore climate change impacts) can vary significantly from the global average.

The encouraging news is that the results of this study show that substantial worsening of flood risk can be avoided, by limiting global warming to lower temperature thresholds. But a considerable increase in risk is predicted, even under the most optimistic scenario. -

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