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Large-scale early flood warning systems provide high returns on investment

Continental-scale early flood warning systems in Europe can provide significant monetary benefits by reducing flood damage and associated costs. Specifically, a new study found that the return from the European Flood Awareness System (EFAS) and available flood damage data has the potential to be as high as approximately 400 euros for every one euro invested.

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Early flood warnings — and proper responses to them — are key to reducing flood damage to property, infrastructure, agricultural areas, the natural environment, and humans themselves. The United Nations has asserted the need for large-scale forecast and warning systems that cross borders, this being particularly salient for a continent such as Europe. Researchers believe that investing in such systems could avoid costs associated with floods, but exactly how much can be saved receives little attention.

The EFAS is a continental-scale forecasting system delivering weather and flood forecasts across Europe up to 10 days before an event. It became fully operational in 2012 under the Copernicus Emergency Management Service and provides 138 pan-European flood forecasts daily for the whole of Europe. Data are collected, interpreted, and distributed by people trained to work with the system. Forecasts are issued to the national institutions responsible for flood warnings in each of Europe's Member States.

Flood damage and associated costs can be very difficult to estimate and usually contain a high amount of uncertainty. To address this, the researchers used three monetary datasets to calculate both the annual average damages and avoided damages from floods across Europe. This approach combined data from the Joint Research Centre of the European Commission, an emergency events database called EM-DAT, and the EU Solidarity Fund. They then compared this information on flood damage to the costs of operating and maintaining EFAS, to see how effective it is at saving money. The efficiency of the forecasting system was calculated by dividing its number of 'hits' by the number of total number of 'hits' and 'misses'. A hit is defined as a correct forecast of a flood, and a miss is when the system fails to foresee a flood event. The efficiency, or hit rate, of EFAS was calculated at 55%.

The researchers performed analysis based on different scenarios and developed a range of monetary benefits. A conservative estimate of the return on investment in the range is approximately 160 euros for every one euro invested after 20 years of operating the system, which is higher than most similar systems. But if forecasting is improved and more training allows for better responses to early warnings, the ratio could become as high as approximately 400 euros to one.

These forecasts are important for risk management. While there are large amounts of uncertainty in flood damage data, this study concludes that investment in these systems can lead to a high monetary return. The researchers also emphasise that swift and proper responses to early warnings by governments and people can have wide and significant effects on flood damage.

The researchers say research of weather and flood forecasting models deserve priority and funding because they save money and lives. They also note the importance of funding and effort in other areas of mitigation such as training, and better and quicker responses to early warnings, in addition to forecasting. This study complements the wider need to use large-scale prediction systems to mitigate the effects of natural hazards in a changing climate.