EMBARGO: Wednesday 22 May, 12.01am British Summer Time/ 1.01am Central European Summer Time

Autumn and winter storm rainfall in the UK and Ireland was made about 20% heavier by human-caused climate change

Human-induced climate change made the heavy storm downpours that caused devastating flooding across the UK and Ireland between October 2023 and March 2024 about 20% more intense, according to a rapid attribution analysis by an international team of leading climate scientists as part of the World Weather Attribution group. The study also highlights how the floods had cascading effects in the population, impacting human health and food production, as well as contributing to further increase the cost of living.

In late 2023 and early 2024, the UK and Ireland experienced a very active storm season. The countries were affected by 13-14 severe storms, 11 of which were named by the Western Europe Storm Naming group. With the naming of Storm Kathleen, in April, it was just the second time the letter K had been reached since the group was established in 2015. Storms Babet, Ciarán, Henk and Isha were some of the most damaging in Ireland and the UK, leading to severe floods, at least 13 deaths, severe damages to homes and infrastructure, power outages, travel cancellations, and loss of crops and livestock.

To quantify the role of human-caused climate change on strong winds and heavy rainfall from these storms, scientists analysed weather data and climate models to compare how these types of events have changed between today's climate, with approximately 1.2°C of global warming, and the cooler pre-industrial climate, using peer-reviewed methods.

The study focused on Ireland and the UK, and looked at the period from October-March, traditionally the peak of the storm season. To identify the stormiest days, the researchers used the Storm Severity Index (SSI), a metric that considers both strong winds and the size of the affected area. For these days, the researchers analysed wind speed and rainfall. Given the major impacts of rainfall on farming and agricultural areas, brought by both severe storms and smaller weather systems, the researchers also looked at the total rainfall for the October-March period, which was the second wettest in the UK and the third wettest in Ireland.

Rainfall associated with storms is becoming more intense and likely in many parts of the world due to global warming. For this region, in the preindustrial climate, before humans started burning oil, gas and coal for fuel, rainfall from storms as intense as the 2023-24 season, occurred about once every 50 years. However, in today's climate, with 1.2°C of warming, similarly intense storm rainfall is expected to occur more often, about once every five years, the scientists found. Climate change has also increased the amount of rainfall of these storms, making them about 20% more intense. If warming reaches 2°C, as it is expected to occur in the 2040s or 2050s unless emissions are rapidly halted, storm rainfall will become about 4% more intense and will be expected to occur about once every three years.

Climate change also had a strong influence on autumn and winter total rainfall that led to major agricultural impacts. In the cooler, pre-industrial climate, wet periods such as the 2023-24 October-March season occurred at most once every 80 years. But in today's climate, they have become at least four times more likely, expected to occur about once every 20 years, the scientists found. The scientists estimate that climate change contributed to increasing the amount of total rainfall by about 15%. If warming reaches 2°C, similar periods of rainfall that can saturate soils and cause large agricultural losses, will become much more common, expected to occur about once every 13 years.

The analysis found that average wind speed on stormy days has decreased slightly and could continue to decrease with warming. However, other studies using different datasets and climate models, or focusing on storm winds at different times of the year, have identified both small decreases or increases to strong storm winds with warming. Ongoing research is needed to understand these trends.

While storms are well forecast in the UK and Ireland, the storms led to severe impacts across the two countries in 2023 and 2024. Storms Babet, Ciarán and Debi, hit the UK and Ireland in less than a month, meaning some communities were reeling from one storm when another hit, the researchers say. The study also highlights how housing, finances, and health and well-being characteristics mediate the level of impacts. Successive floods compounded impacts on the agricultural and housing sectors, leading to cascading impacts on socioeconomic and psychosocial health and reducing people's coping capacity, particularly among low-income groups.

Farmers in the UK and Ireland experienced huge loss of crops and productivity due to flooding and waterlogged soils during 2023 and 2024. Increasing autumn and winter rainfall highlights the importance of considering how land-use can affect the impacts of heavy rainfall. For example, losses of natural grasses and woodlands can reduce soil drainage and increase the risk of flooding.

The study was conducted by 22 researchers as part of the World Weather Attribution group, including scientists from universities and National Meteorological Services in Ireland, the United Kingdom and the Netherlands.

Quotes

Sarah Kew, Researcher at the Royal Netherlands Meteorological Institute, said:

"The UK and Ireland face a wetter, damper and mouldier future due to climate change.

"While the influence of climate change on strong storm winds is less clear, autumn and winter rainfall has become much heavier, bringing more damaging and sometimes deadly floods to urban and agricultural areas.

"Until the world reduces emissions to net zero, the climate will continue to warm, and rainfall in the UK and Ireland will continue to get heavier."

Ellie Murtagh, UK Climate Adaptation Lead at the British Red Cross, said:

"We know from our work across the UK that flooding has a devastating impact on people's lives. Its effects can be felt for months and years afterwards and those that are most vulnerable, people suffering from poor health or living in inadequate housing, are often hit hardest.

"Heavy downpours linked to climate change are making our winters wetter and flooding more likely. It is crucial we adapt and manage this risk. We will continue to work alongside the government, emergency services and other charities to protect our homes, our livelihoods and the most vulnerable in our communities."

Mark McCarthy, Science manager of Climate Attribution at the Met Office, said:

“The seemingly never ending rainfall this autumn and winter across the UK and Ireland had notable impacts across the two countries.

“This new study shows how rainfall associated with storms and seasonal rainfall through autumn and winter have increased, in part due to human induced climate change.

“In the future we can expect further increases in frequency of wet autumns and winters. That’s why it is so important for us to adapt to our changing climate and become more resilient to increases in rainfall.”

Ciara Ryan, Climatologist at Met Éireann, said:

“This is the second attribution study looking at rainfall associated with storm events in Ireland this season and once again, we see an increase in the likelihood and intensity of the rainfall events as a result of human-induced climate change.”

“Over the recent autumn-winter period we have witnessed the impact that heavy or prolonged rainfall has had on our communities, our land and the farming and agricultural sector, waterlogging the soils with virtually no time for them to dry out and become usable.”

“The insights that we gain from studies like this are important to help us plan for the future, to support adaptation and mitigation strategies for an already changing climate.”

Friederike Otto, Senior Lecturer in Climate Science at Grantham Institute - Climate Change and the Environment, Imperial College London, said:

"To put it bluntly, climate change is already making life shittier.

“Wetter winters are flooding farms, cancelling football matches, and overflowing sewage systems. Groceries are becoming more expensive and Brits holidaying in Europe are having to shelter from record-breaking heatwaves and wildfires.

“Thankfully, we know the solutions - replace oil, gas and coal with cleaner, cheaper renewable sources of energy, insulate homes, restore nature. All this will make life cheaper and better for all, not more expensive. . ”

Notes

2023/24 named storms
The Western Europe storm naming group is a collaboration between the UK Met Office, Met Éireann in Ireland, and Royal Netherlands Meteorological Institute (KNMI) that was formed in 2015.

In 2023 and 2024, the 11 storms named by the group were: Agnes, Babet, Ciarán, Debi, Elin, Fergus, Gerrit, Henk, Isha, Jocelyn and Kathleen. Descriptions of these storms can be found here by Met Éireann and here by the UK Met Office.

2023/24 rainfall
The UK experienced its eighth wettest winter (445.8mm) and its second wettest October-March (844.1mm), with records going back to 1836.

Ireland experienced its fourteenth wettest winter (431.3 mm) and its third wettest October-March (878.5 mm), with records going back to 1941.

World Weather Attribution

World Weather Attribution is an international collaboration that analyses and communicates the possible influence of climate change on extreme weather events, such as storms, extreme rainfall, heatwaves, and droughts.

The group has completed more than 70 studies on a range of extreme weather events around the world using peer-reviewed methods.

The Intergovernmental Panel on Climate Change included research by World Weather Attribution to provide evidence that human-caused climate change is already intensifying weather extremes in every region of the world in its Sixth Assessment Report published in March, 2023.

For further enquiries, contact:
Met Office PressOffice@MetOffice.gov.uk
Met Éireann: media@met.ie
KNMI: persvoorlichting@knmi.nl

Study webpage
The study 'Autumn and winter storms over UK and Ireland are becoming wetter due to climate change' will be published on Wednesday 22 May, 12.01am British Summer Time/ 1.01am Central European Summer Time. When the embargo lifts, the study will be available at:

https://www.worldweatherattribution.org/autumn-and-winter-storms-over-uk-and-ireland-are-becoming-wetter-due-to-climate-change

Study authors:

Sarah F. Kew, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
Mark McCarthy, *Met Office, Exeter, UK*
Ciara Ryan, *Met Éireann, Dublin, Ireland*
Ellie Murtagh, *British Red Cross, London, UK (based in Edinburgh, UK)*
Maja Vahlberg, *Red Cross Red Crescent Climate Centre, the Hague, Netherlands (based in Ubmeje/Umeå, Sweden)*
Adwoa Amankona, *Red Cross Red Crescent Climate Centre, the Hague, Netherlands (based in London, UK)*
James O. Pope, *Met Office, Exeter, UK.*
Jennifer S.R. Pirret, *Met Office, Exeter, UK.*
Fraser Lott, *Met Office, Exeter, UK*
Oliver Claydon, *Met Office, Exeter, UK.*
Barry Coonan, *Met Éireann, Dublin, Ireland*
Izidine Pinto, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
Clair Barnes, *Grantham Institute - Climate change and the Environment, Imperial College London, UK*
Sjoukje Philip, *Royal Netherlands Meteorological Institute (KNMI), De Bilt, The Netherlands*
Friederike Otto, *Grantham Institute - Climate change and the Environment, Imperial College London, UK*
Emily Wallace, *Met Office, Exeter, UK*
Leo Bryant, *British Red Cross, London, UK*
Ellen Tranter, *British Red Cross, London, UK*
Roop Singh, *Red Cross Red Crescent Climate Centre, the Hague, Netherlands*
Ana Mijic, *Faculty of Engineering, Department of Civil and Environmental Engineering, Imperial College London, UK*