

IREC assesses the impact of floods on Barcelona's electricity infrastructure

- *The Catalonia Institute for Energy Research (IREC) has developed a methodology to identify vulnerable points in the electricity grid in the case of flooding in the Barcelona metropolitan area*
- *Maps from the European project ICARIA indicate that areas at risk of severe pluvial flooding in the region could grow by up to 25% over the next 75 years*
- *Extreme weather events are estimated to cause between 3 and 4 million euros in annual damage to the metropolitan electricity grid*
- *An extreme event such as a DANA or a storm like Gloria could cause around 5 million euros in damage every ten years*

Barcelona, September the 9th, 2026. The Catalonia Institute for Energy Research (IREC) has developed a planning tool that allows to locate and quantify the risks that flooding can pose to the electricity grid in the Barcelona metropolitan region. The aim is to help public authorities make early decisions on climate adaptation based on scientific data.

Over the past three years, the European project ICARIA, led by Veolia and the *Universitat Politècnica de Catalunya (UPC)*, has analysed how climate change can intensify the effects of flooding caused by both extreme rainfall and maritime storms and wave action. These types of episodes, known as compound events, occur when several phenomena coincide within the same period, amplifying their impacts. According to these studies, areas vulnerable to serious rainfall-induced flooding in the Barcelona metropolitan region could increase by up to 25% over the next 75 years.

In this context, the project has developed urban flood models that have been used to produce flood risk maps for all municipalities in the metropolitan area. These maps classify risk according to different severity levels and various future climate change scenarios.

Given the growing impact of these phenomena on critical infrastructure, IREC has applied its own risk analysis methodology to the electricity grid, which also allows for the study of possible adaptation measures in the event of flooding. This methodology identifies both direct impacts — such as those that substations and electricity distribution centres may suffer — and indirect impacts on consumers, who ultimately experience the consequences.

As explained by Pol Paradell, researcher in IREC's Power Systems department: *"This methodology was initiated within the framework of the RESCCUE project,*

with applications in Barcelona and Bristol", and he adds, "now, in the ICARIA project, we have expanded and optimised this scope so it can be applied to larger areas, such as the Barcelona metropolitan area, thus facilitating decision-making by public bodies based on scientific data".

The analysis has also enabled historical projections and an economic estimation of the impacts of flooding on the electricity grid. According to the results, an extreme event such as a DANA or a storm like *Gloria* could cause around 5 million euros in damage every 10 years. Overall, the expected annual damage is estimated between 3 and 4 million euros in the Barcelona metropolitan region alone, of which approximately half corresponds to direct damage to infrastructure and the other half to impacts on grid users and cascading effects on other infrastructures.

A tool usable in other European cities

In addition to the Barcelona case, the project has also carried out studies in the European regions of Salzburg (Austria) and the South Aegean Islands (Greece) to quantify the impact of extreme climate events — such as heatwaves, flooding, maritime storms, extreme winds or wildfires — on housing and critical infrastructure, including roads and the electricity grid. The three case studies (including Barcelona) therefore present different scenarios that can be extrapolated to other European regions.

The adaptation measures proposed in the ICARIA project are designed to be replicable across Europe, enabling other areas to incorporate them into their climate adaptation policies.

About ICARIA

The ICARIA project, led by [Veolia in Spain](#) and [Universitat Politècnica de Catalunya \(UPC\)](#), has been carried out over more than three years in collaboration with 14 other European partners, including the [Catalonia Institute for Energy Research \(IREC\)](#), [Cetaqua](#), [Aigües de Barcelona](#) or [Àrea Metropolitana de Barcelona \(AMB\)](#).

More information on the projects' website [ICARIA](#).

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About IREC

The Catalonia Institute for Energy Research (IREC) is a public research center ascribed to the Department of Territory, Housing and Ecological Transition of the *Generalitat de Catalunya*, in which the Department of Research and Universities also participates. IREC is a CERCA center and accredited as a TECNIO center. Created in 2008, it aims to contribute to the sustainable development of society and to increase the competitiveness of industry in the energy sector. The center develops research of excellence in the medium and long term, innovation and the development of new technological products and the dissemination of important knowledge and findings to the general public.

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