

MODELLING CLIMATE IMPACTS: CONSIDERING ALTERNATIVE SCENARIOS

Posted on 02/05/2025 by Naider

Situated in the European Atlantic bioregion, the Basque Country enjoys privileged climatic conditions that have historically favoured its economic, urban and social development, providing fresh water from rivers, vast expanses of timber in the mountains, mountains that have also acted as natural defences, access to the sea for trade and fishing, and the expansion of barren pastures and arable land.

Unfortunately, these same natural conditions often go hand in hand with their sibling, climate change, which has economic, environmental and social impacts. Given that we are in a context in which meteorological phenomena are increasing in their presence and aggressiveness, it seems appropriate to analyse which of these phenomena will cause the most damage to the territory. We will focus on the three that seem to us to be the most relevant: floods, heat waves and droughts.

Floods: The most tangible impact

Floods, both fluvial and coastal, are the most obvious climatic risk in the Basque Country. The mountainous orography, the high rainfall and the exposure to the Cantabrian Sea expose us to floods that particularly affect urbanised basins and coastal areas.

As in so many other places, **the Basque Country has developed much of its urban and industrial infrastructure in river valleys and low-lying areas, functional but exposed spaces.** According to recent studies, around 6% of the Basque industrial area is located in areas at risk of flooding, although this figure varies considerably between counties and municipalities. This figure is particularly relevant in a context where extreme rainfall tends to increase in intensity and frequency, which would pose a direct risk to the safety of the population, in addition to the significant economic losses due to damage to buildings and infrastructure.

Floods seem to be forgotten, but their damage is very tangible, as the low recurrence of major floods acts as a double-edged sword: it allows long periods of apparent stability, but also contributes to institutional and social forgetting of the risk.



Figure 1: example of an urban flood risk map of the impact of flooding on population and infrastructure

When a severe event occurs, its impact can be devastating, both in terms of economic losses and in terms of the health and safety of the population. In this scenario, the conservation and restoration of forests and natural watersheds is a key risk mitigation tool due to their hydrological buffering capacity.

Heat waves: beyond discomfort

The direct impact on health in the Basque Country may seem small compared to regions in the south of the peninsula, but a mistake in these matters is not trivial. Proximity to the sea and a temperate climate mitigate temperature extremes, while denser urban environments trap heat in stone and asphalt, creating heat islands and posing a greater threat to human health.

Although the Basque Country is not one of the regions most threatened by heatwaves in absolute terms, **the increase in their frequency and intensity in climate projections makes it necessary to analyse the spectrum of their effects and prepare for them.**

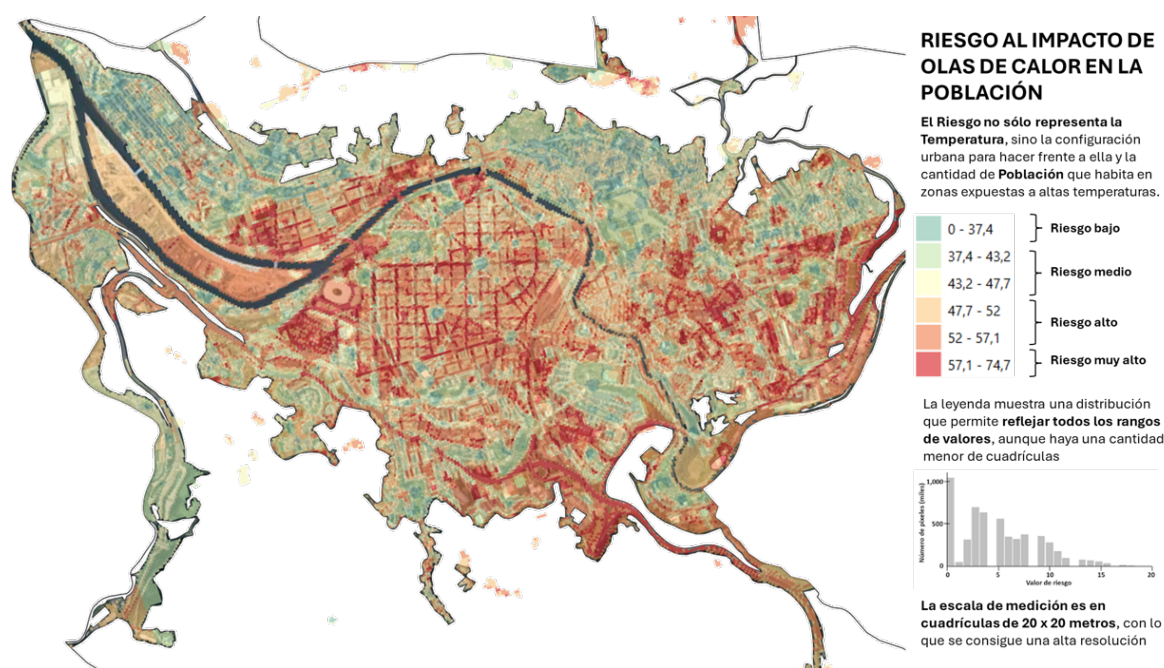


Figure 2: Example of an urban risk map of the impact of heat waves on the population.

In the case of heat, in addition to mortality, higher temperatures are associated with poorer air quality, increased energy consumption, allergens and respiratory diseases, reduced labour productivity and increased likelihood of infectious vectors, among other things.

Measuring only the direct mortality associated with heat waves may underestimate the true impact, while the difficulty of measuring heat impacts in isolation limits the knowledge we have.

In any case, whether through increased mortality and morbidity or through the other impacts that heat can have, **we should identify it as a major climate risk.** It is a risk that must be addressed immediately, starting with the implementation of urban cooling strategies and green infrastructure, reflective materials, natural shading, fountains and early warning systems to avoid the urban heat island effect and improve the thermal regulation of urban environments.

Droughts: a transboundary impact

We thought that droughts would have the least impact on the territory, but when we look at it more closely, it is perhaps one of the most dangerous chains of effects we can face. **In an interconnected world, the effects of droughts in other regions - especially those that supply agricultural products - will be felt in Basque consumption.**

In the Basque Country, climate models indicate an increase in erratic rainfall, which could lead to prolonged periods of water scarcity. Alava's reservoirs, which are essential for water supply and irrigation, could come under increasing pressure. Although the population is unlikely to be affected, the agricultural, livestock and industrial sectors could feel the effects of the drought directly.

But the impact on irrigation and agricultural production would not only threaten local economies, but also regional and global supply chains, with unforeseen consequences.

We can see that **it will not be easy to measure** direct and indirect **climate impacts** in the future, but it is much more difficult to anticipate them now. Some will be visible and immediate, others more structural or delayed, some synergistic and others isolated. Difficulty should not stop the fight for knowledge if it also serves to reduce climate impacts in time and form.

Getting the investments and policies needed to mitigate the effects of floods, heat waves and droughts right will depend on knowing how to tackle the problem at the right scale, so as not to cover the sun with a finger or kill the fly with a cannon.

