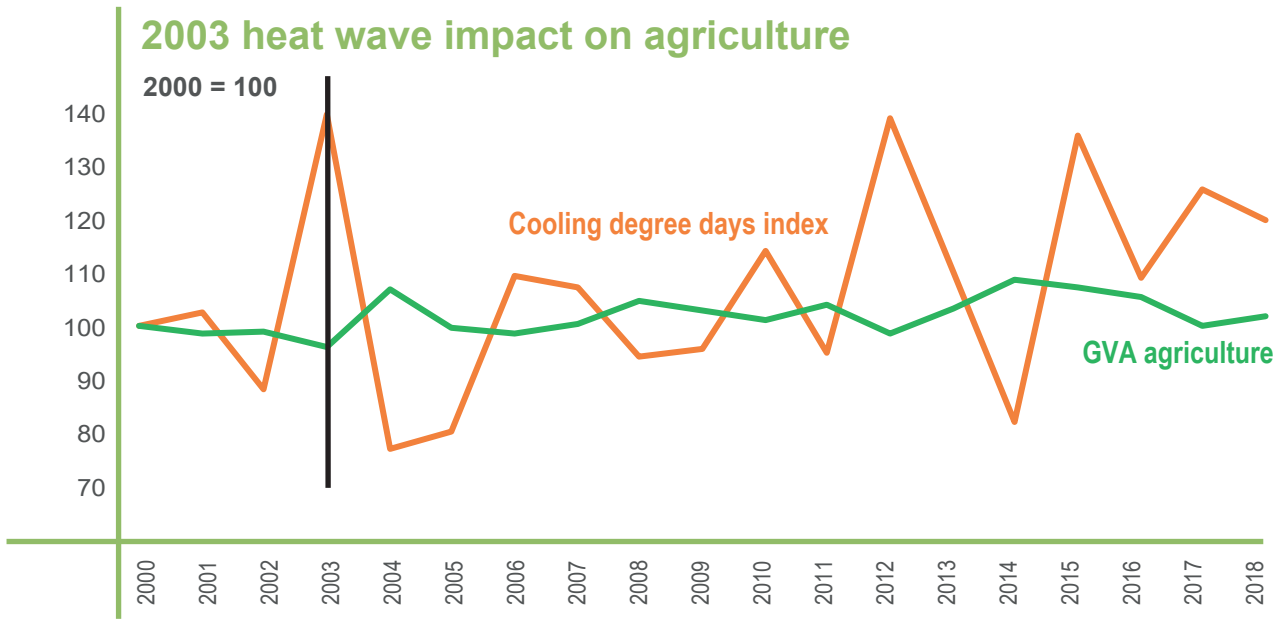
European summer heat wave of 2003

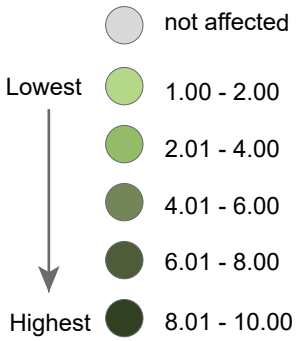
The heat wave event of 2003, arguably the hottest year in Europe up to that point (at least, since 1500), coupled with severe draught, affected more than 100 million people across a third of the European territory and cost at least EUR 8.7 billion (European Commission – DG ENV, 2012; Stott et al., 2004). The death toll was estimated to exceed 72 000 (EMDAT, 2021). The elderly population was particularly susceptible to the heat, as were those who were chronically ill or isolated from sources of aid. The heat was particularly severe in France, where the temperature remained around 37 °C for more than a week in August in some areas. The disaster was one of the ten deadliest natural disasters in Europe for the last 100 years and the worst in the last 50 years. Agriculture was the most affected sector, as the extreme weather conditions decreased the quantity and quality of the harvests. The evolution of agricultural output at European level, displayed in the graph below, illustrates this situation.

The present case study assesses resilience to this heat wave for 235 EU regions which were affected by it. We assess resistance of each region by combining the magnitude of the phenomenon (measured by means of the Cooling Degree Index) with the intensity of the impact (in terms of excess deaths and drop in agricultural output). Three dimensions (magnitude, intensity and resistance) are illustrared by comparing the value of each variable during the heat wave to its average during the 3 years prior to the shock.

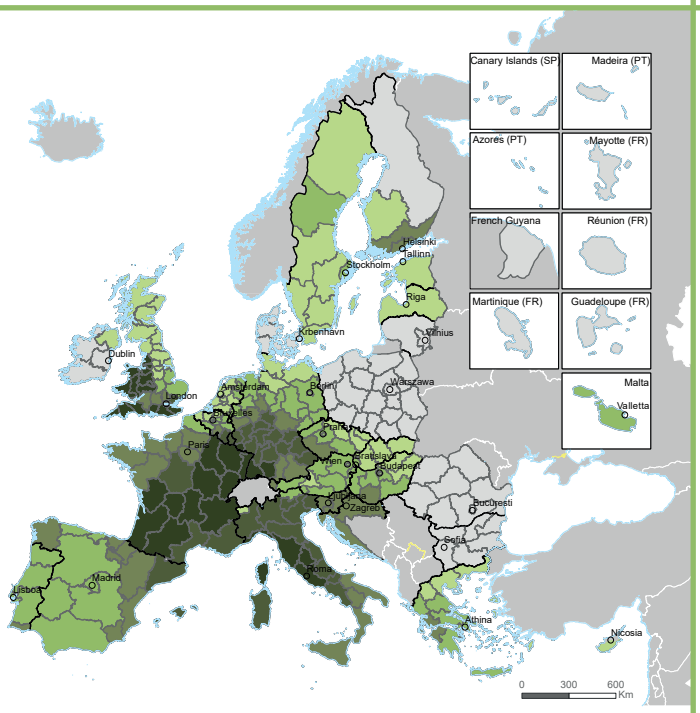


The European Atlas of Resilience
Bănică, A.; Eva, M.; Iațu, C.; Nijkamp, P.; Pascariu, G.C. (Editors)
ISBN 978-606-714-665-3 | EDITURA UNIVERSITĂŢII „ALEXANDRU IOAN CUZA” DIN IAŞI

Magnitude

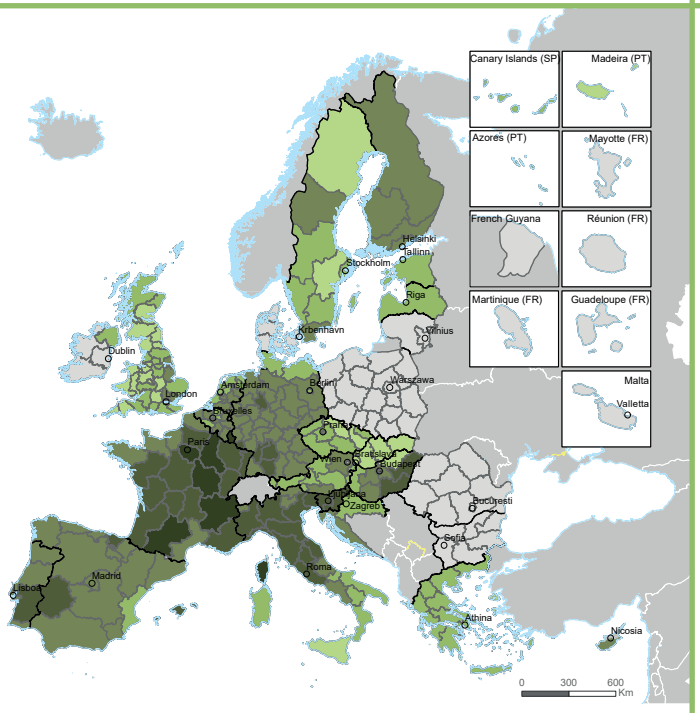


Very high magnitudes were concentrated in most of France, in western Italy and in the southern parts of Great Britain and Germany. High values are found in central and northern Italy, western Germany and southern and central France. Medium and low values characterize the peripheral regions of Europe.



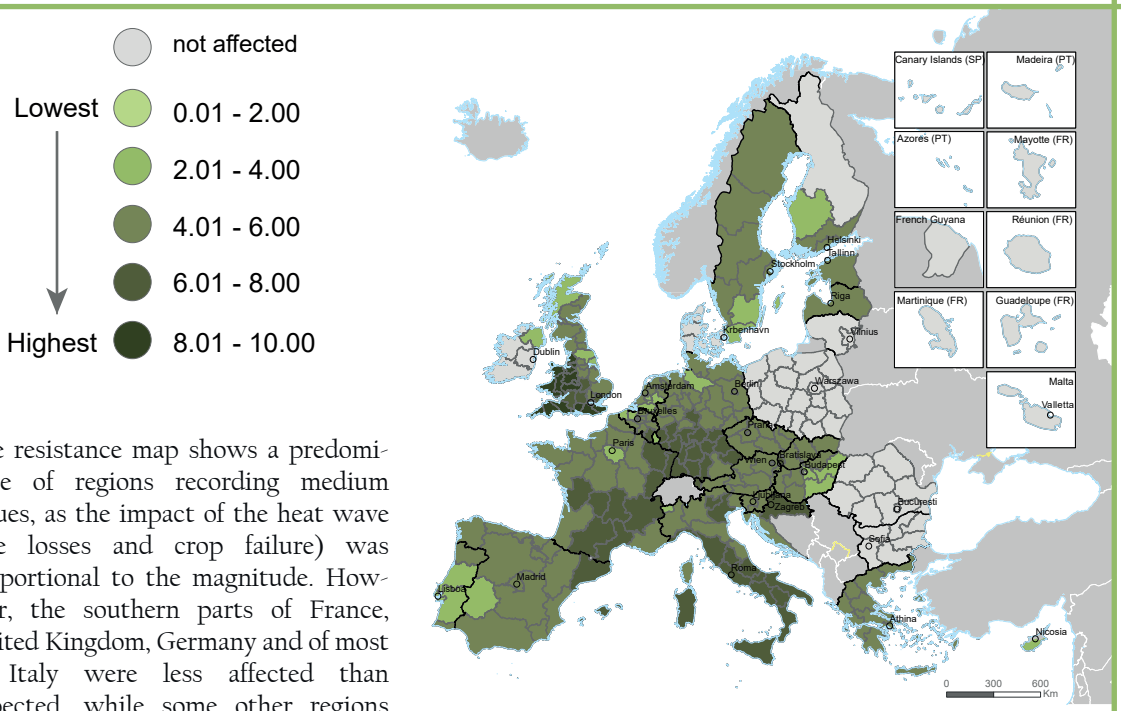
Intensity

The intensity indicator reveals a visible concentration of high values in France, Spain and Italy. There are fewer regions with very high values. However, the regions with high values cover almost the entire France and more than half of Italy, but also numerous regions in other countries (Spain, Portugal, Germany, Hungary and even Sweden and Finland).



The European Atlas of Resilience
Bănică, A.; Eva, M.; Iațu, C.; Nijkamp, P.; Pascariu, G.C. (Editors)
ISBN 978-606-714-665-3 | EDITURA UNIVERSITĂŢII „ALEXANDRU IOAN CUZA” DIN IAŞI

Resistance



The resistance map shows a predominace of regions recording medium values, as the impact of the heat wave (life losses and crop failure) was proportional to the magnitude. However, the southern parts of France, United Kingdom, Germany and of most of Italy were less affected than expected, while some other regions (including metro-regions of Paris, Budapest, London, etc.) were over-impacted.

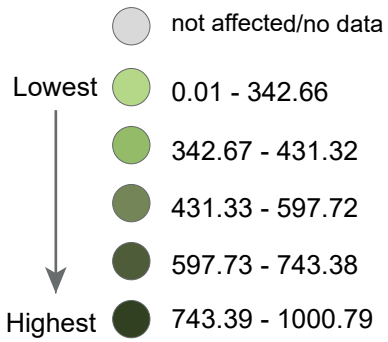
As far as the explanatory forces for the differentiated impact are concerned, the age of the population is the most important one (García-Herrera et al., 2010). At the same time, according to the same study, the excess death rate was in general higher for women (70%) than for men (30%), partly due to the lower number of men in the elderly population, and partly because older women also tend to suffer more from problems of thermoregulation than men. Social class status of the victims is another significant factor, with lower social class groups being more at risk (social class status was positively linked to housing with less air-conditioning and fewer rooms, which may have been decisive, as more rooms provide a greater potential to find a cooler place within the home.

While individual characteristics are very important for a better resistance to heat waves, some contextual factors also play a major role in reducing the impact of a heatwave: green and blue urban infrastructure, primary health care, support services for elderly population, irrigation systems for crops etc. The two maps on the right display two of these potential resilience drivers.

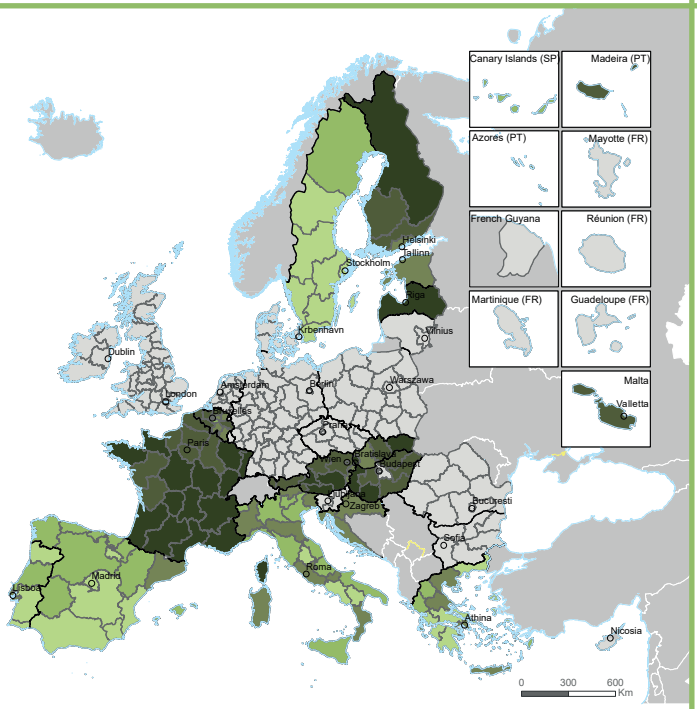
Besides its catastrophic impact, the European summer heat wave of 2003 contributed to increasing the awareness on climate change issues. It also marked a turning point in the design and implementation of European prevention plans, which until then had been notably absent. At present, most European cities possess extreme temperature prevention and alert plans, which come into operation when weather forecasts indicate that the safety thresholds are likely to be exceeded (Stein et al., 2016). The new alert systems and the increased social awareness lowers the probability that a new heat wave with identical characteristics (intensity and duration) will have the same severe impact on human mortality, even if housing conditions do not change dramatically in the near future. Nevertheless, the current challenges related to climate change increase the chances that even worse heat wave events could appear in the future, with a higher frequency, which means that even more awareness and structural proactive measures should be taken into consideration.

The European Atlas of Resilience
Bănică, A.; Eva, M.; Iațu, C.; Nijkamp, P.; Pascariu, G.C. (Editors)
ISBN 978-606-714-665-3 | EDITURA UNIVERSITĂŢII „ALEXANDRU IOAN CUZA” DIN IAŞI

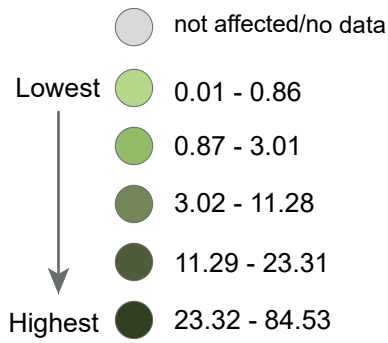
No of beds in hospitals per 100 000 inhabitants



Some regions – such as those in central and southern France, Finland and several Central-European countries are better prepared, while others – mostly in Sweden, Spain, Portugal, Italy and Greece record a lower density of beds in hospitals. This pattern suggests a higher vulnerability of regions in Southern countries, especially if we take into consideration the demographic ageing tendency of these countries.



Percentage of irrigated land



As far as the irrigated crops are concerned, an opposite spatial pattern can be noticed: southern regions of Europe (which are also the most vulnerable to heatwaves) tend to have higher shares of irrigated land. However, our analysis revealed a significant impact of the heatwave on some regions of other countries, such as Great Britain, Germany or France (see the map of intensity on page 95), which are not so well prepared for protecting crops.