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Escalating impacts of climate extremes on critical infrastructures in Europe

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Extreme climatic events are likely to become more frequent owing to global warming. This may put additional stress on critical infrastructures with typically long life spans. However, little is known about the risks of multiple climate extremes on critical infrastructures at regional to continental scales. Here we show how single- and multi-hazard damage to energy, transport, industrial, and social critical infrastructures in Europe are likely to develop until the year 2100 under the influence of climate change. We combine a set of high-resolution climate hazard projections, a detailed representation of physical assets in various sectors and their sensitivity to the hazards, and more than 1,100 records of losses from climate extremes in a prognostic modelling framework. We find that damages could triple by the 2020s, multiply six-fold by mid-century, and amount to more than 10 times present damage of €.4 billion per year by the end of the century due only to climate change. Damage from heatwaves, droughts in southern Europe, and coastal floods shows the most dramatic rise, but the risks of inland flooding, windstorms, and forest fires will also increase in Europe, with varying degrees of change across regions. Economic losses are highest for the industry, transport, and energy sectors. Future losses will not be incurred equally across Europe. Southern and south-eastern European countries will be most affected and, as a result, will probably require higher costs of adaptation. The findings of this study could aid in prioritizing regional investments to address the unequal burden of impacts and differences in adaptation capacities across Europe.