

CLIMATE CHANGE AND COASTAL FLOODS

One third of Europeans live within 50 km of the coast. Climate change and socio-economic dynamics could profoundly change coastal flood risk. If no adaptation measures are taken, annual flood damages could increase 20 to 50-fold due to climate change only, depending on the emissions scenario. Projected impacts are substantially higher when taking into account socio-economic development, yet global warming is the dominating factor. Although mitigation could reduce coastal flood risk, it does not eliminate it. Long-term coastal adaptation strategies are therefore needed to avoid large economic damages and displacement of populations across Europe's coastlines later this century.

PRESENT EFFECTS OF COASTAL FLOODS

Under present climate conditions, annual damages across Europe from coastal flooding is estimated at €1.25 billion (Figure 1). Half of the total damages affects three countries: the UK (31%), France (10%) and Italy (9%). 102,000 people are affected by coastal flooding annually - over half the number of people affected are in three countries: the UK (28%), Italy (12%) and Croatia (12%).

IMPACTS ASSUMING NO FUTURE SOCIO-ECONOMIC CHANGE

Assuming no change in socio-economic conditions, climate change could result in annual damages rising to €59.8 billion, and 2.1 million people affected annually across Europe, by the end of the century, under a high warming scenario (Figure 1). The main cause is sea level rise, which in turn increases the magnitude of coastal floods, such that the sea more frequently overtops existing coastal protection or natural barriers. The largest monetary damages are projected for France, UK, Norway and Italy (Figure 2).

Climate change mitigation could avoid a substantial proportion of the economic damages that occur under the high warming scenario by the end of the century. Assuming no change in socio-economic conditions, annual damages are around €54 billion less in a 2°C warming scenario than in the high warming scenario (€6.0 billion compared with

€59.8 billion; Figure 1). Furthermore, over 1.5 million less people are affected by coastal flooding every year (0.4 compared with 2.1 million people).

Figure 1. Impacts of coastal floods across Europe at the end of the century, assuming no socio-economic change.

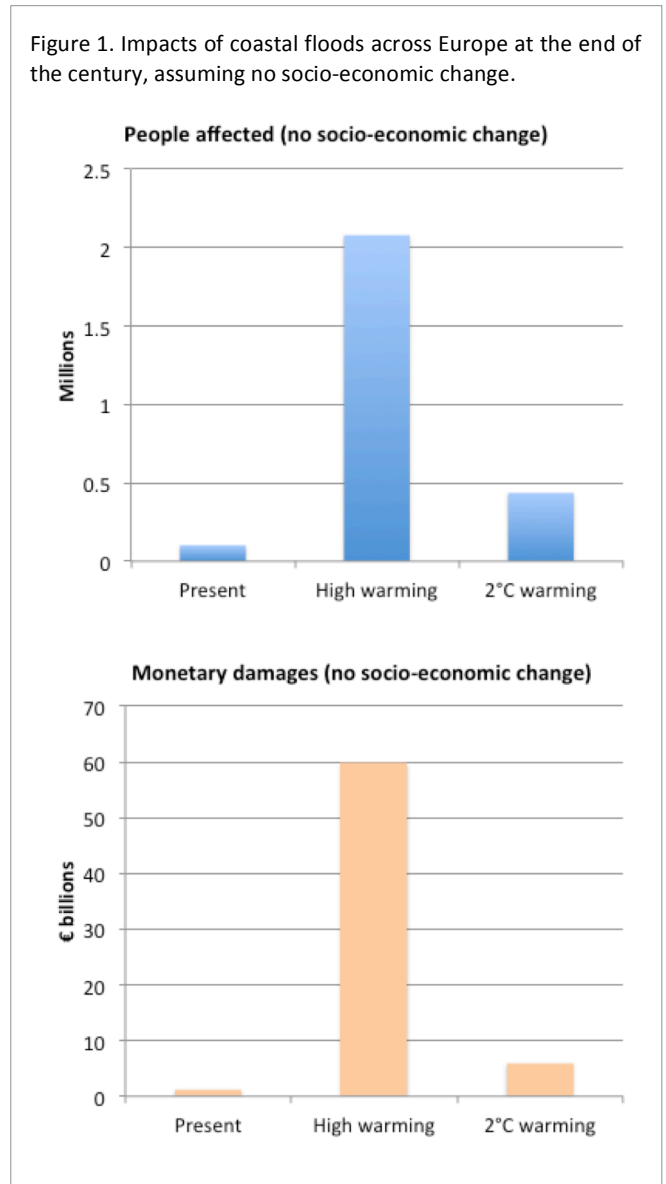
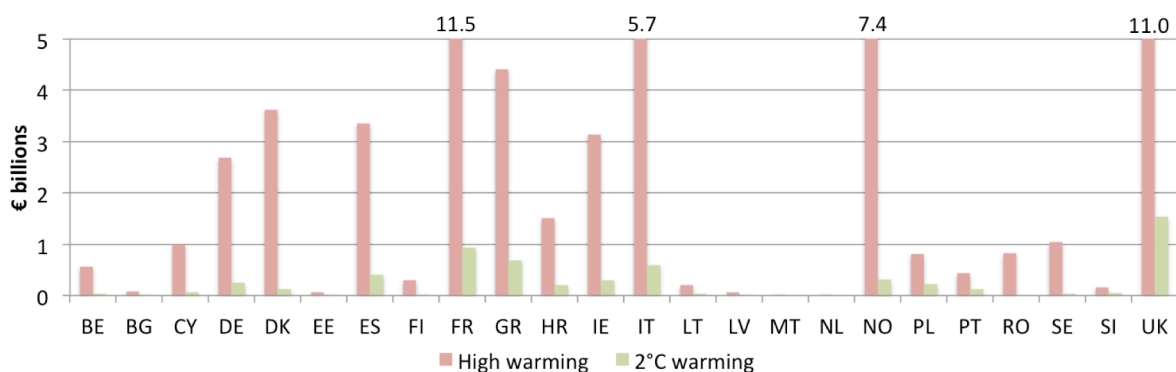


Figure 2. National-scale monetary damages from coastal floods at the end of the century, assuming no socio-economic change.



IMPACTS WITH SOCIO-ECONOMIC CHANGE

Economic growth could amplify the monetary damages caused by coastal floods, unless flood protection levels increase. This is however partially compensated by a wealthier society with more capacity to absorb impacts: the impacts under the high warming scenario are significantly larger when future socio-economic change is considered.

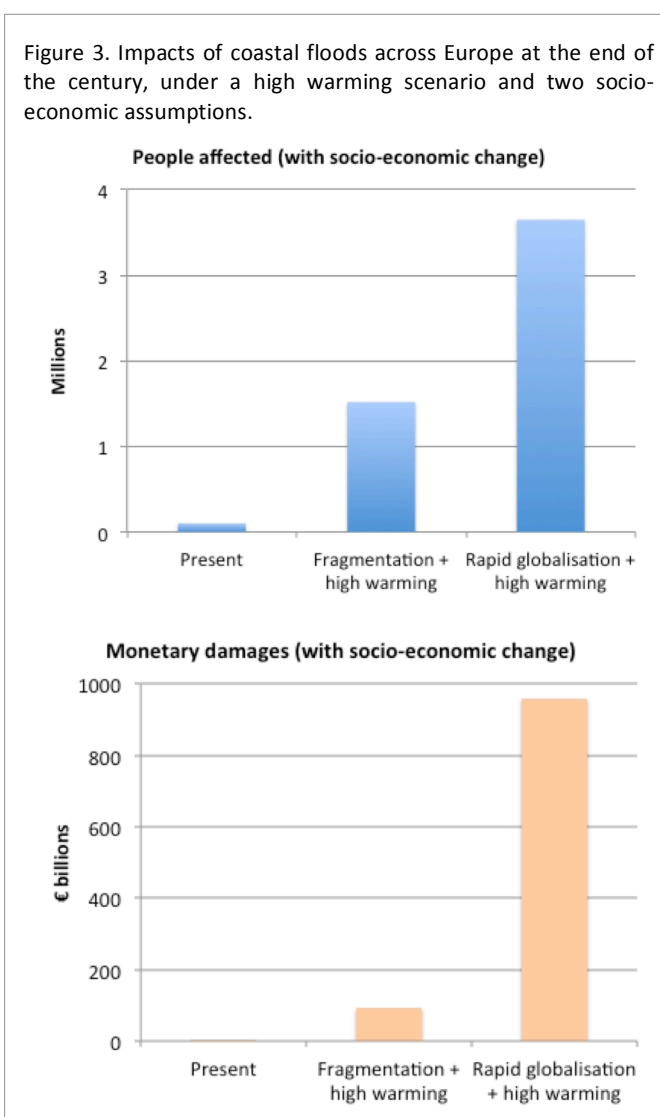
Monetary damages could be as high as €961 billion per year by the end of the century, under the socio-economic assumption that there is rapid globalisation and economic development at the expense of global environmental concern (Figure 3). As many as 3.65 million people could be affected by coastal flooding each year in this case. The impacts are so large because of the combination of an increase in coastal flooding and large increases in Gross Domestic Product (GDP) and urbanisation in coastal areas.

On the other hand, impacts are relatively smaller in a world where it is assumed that there is slow economic development and increased international fragmentation due to countries focussing on achieving their own energy and food security goals at the expense of broader-based development (Figure 3).

COASTAL ADAPTATION

The safety of European coastal societies depends on natural and human-made coastal flood protection, e.g. the capacity to buffer and absorb ocean energy through complex wave shoaling and breaking processes. Long-term coastal adaptation strategies will be needed to avoid significant economic damages and displacement of populations across Europe's coastlines. Whilst mitigation of emissions can lessen the impacts, it cannot eliminate them.

Figure 3. Impacts of coastal floods across Europe at the end of the century, under a high warming scenario and two socio-economic assumptions.



APPROACH

The approach of this PESETA III study takes into account exposure (value of assets, population and land-use exposed to coastal flooding), vulnerability, and hazard. The defined hazard is coastal floods that are caused by rising sea levels, high tides and storm surges. Projections of coastal floods for all countries in Europe with a coastline were estimated according to climate projections from a high warming emissions scenario, as well as a 2°C warming scenario. Projections of annual economic damages and people affected were produced for two cases: 1) assuming no change from present socio-economic conditions; and 2) population and GDP develop consistently with each of the two climate change scenarios (high warming and 2°C warming). In both cases it was assumed that current levels of flood protection do not change in the future. The geographical scope of the study was the EU Member States and Norway.

Read more

PESETA III Task 8: Coastal impacts. Available on our website <https://ec.europa.eu/jrc/en/peseta>