

KEY MESSAGES

Far greater impact on southern Europe

The magnitude of welfare losses in southern regions is estimated to be several times larger compared to northern regions.

Mitigation makes a difference

Limiting global warming to 2°C would reduce additional welfare losses by 50% compared to 3°C, while achieving the Paris goal of 1.5°C would lower additional welfare losses by 75%.

Total losses from climate change could be much larger

The assessment does not evaluate the full economic impacts of climate change in Europe as not all possible climate impacts were analysed, e.g. loss of alpine tundra and shifts in ecological domains.

About PESETA IV

The JRC PESETA IV project aims to better understand the biophysical and economic consequences of climate change. It does this by using projections of climate change for Europe from several climate models along with a set of climate change impact models. The project covers several sectors that are relevant to society and the natural environment, such as freshwater, agriculture, and coasts.

ec.europa.eu/jrc/en/peseta-iv



Welfare loss from climate change impacts

Climate change damages the capital stock and affects economic production and the welfare of households. PESETA IV conducted an economic assessment that aimed to address the question: "How would the current economy be affected if 1.5°C, 2°C and 3°C of global warming occurred today?" The economic effects of climate change on seven climate impact categories was estimated: river floods, coastal floods, agriculture, energy supply, droughts, windstorms and human mortality. Human mortality from extreme heat dominates the economic climate impacts but its contribution is strongly dependent on the monetary valuation of human life.



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Additional welfare losses due to the damages considered

Exposing the present economy to global warming of 3°C would result in an additional annual welfare loss of at least 175 €billion (1.38% of GDP) for the seven impact categories considered in PESETA IV (Figure 1). Under a 2°C scenario the additional welfare loss would be 83 €billion/year (0.65% of GDP), while restricting warming to 1.5°C would reduce the additional welfare loss to 42 €billion/year (0.33% of GDP).

Of the seven categories considered, human mortality from extreme heat dominates the aggregated economic impacts. The additional welfare loss related to mortality reaches 36, 65 and 122 €billion at 1.5°C, 2°C and 3°C global warming, respectively

The proportion of the total economic impact made up by mortality depends strongly on the economic value of life. If human mortality impacts were excluded from the loss calculations, the estimated increases in welfare losses from present in the EU+UK would become 6, 18 and 54 €billion at 1.5°C, 2°C and 3°C global warming, respectively (Figure 1).

Additional welfare losses (€ billion)		
1.5°C	2.0°C	3.0°C
With human mortality		
42	83	175
Without human mortality		
6	18	54

Figure 1. Additional annual welfare losses (€ billion) for the EU+UK from climate impacts considered in PESETA IV, with and without human mortality included in the estimation, at 1.5, 2 and 3°C global warming levels. The results represent the additional loss in welfare if the warming levels acted upon the present economy, compared to the current economy under the present climate.

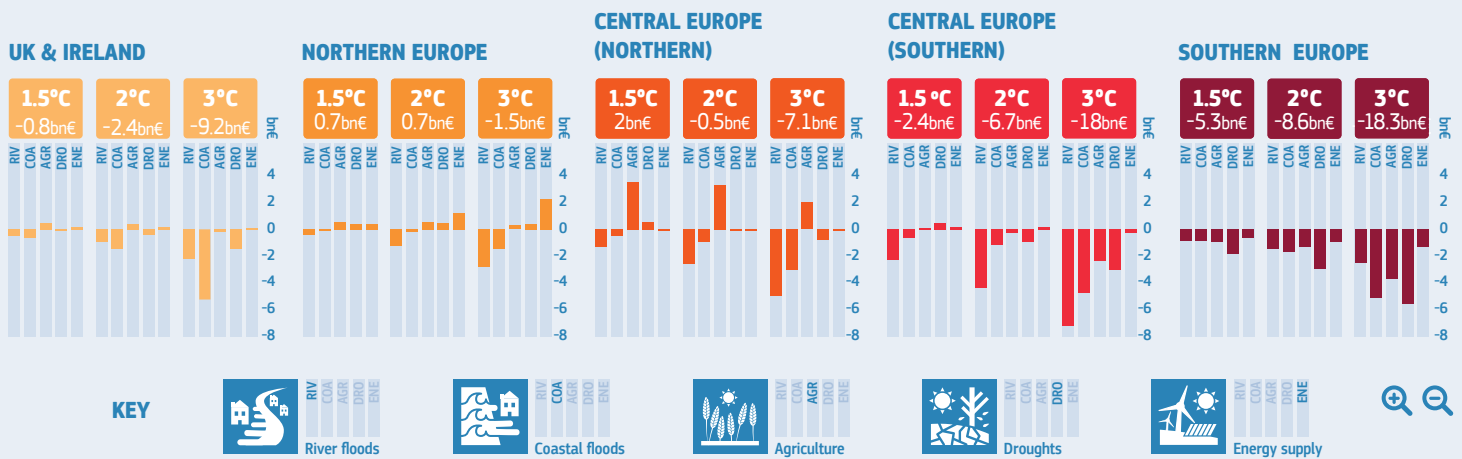


Figure 2. Regional welfare changes (€ billion) from climate impacts considered in PESETA IV, excluding human mortality, at 1.5, 2 and 3°C warming levels. The results represent the change in welfare if the warming levels acted upon the present economy, compared to the current economy under the present climate.

Sources of welfare losses

After human mortality from extreme heat, river and coastal floods are the second most significant sources of additional welfare loss in the EU+UK with global warming (Figure 2). Flooding impacts constitute 8.5 €billion of additional welfare loss with 1.5°C global warming, which increases to 16 €billion with 2°C and 40 €billion with 3°C. Sea levels will continue to rise long after climate has stabilised at a specific warming level, e.g. sea levels with 2°C in 2160 will be much higher than with 2°C in 2060. This means the coastal flood impacts projected here for a warming level are very conservative.

Changes in drought impacts, agriculture yield and energy supply lead to an increase in welfare in northern Europe but become a source of welfare reduction in southern Europe (Figure 2).

The north-south divide

There is a clear north-south divide in the regional distribution of additional welfare losses (Figure 2). The sum of impacts in northern regions are relatively small or even positive (e.g. northern Europe with 1.5°C and 2°C) as these regions experience gains from climate change for some of the categories considered (agriculture, drought, energy supply). In southern EU regions the impacts are mostly negative. As a result, aggregated welfare losses in southern regions are several times larger compared to those in the north of Europe.

Spill-over effects from climate impacts in the rest of the world

The EU is not only affected by climate change impacting upon its economy, but also indirectly through international trade with countries that also experience climate-related damages. The findings of PESETA IV confirm a more comprehensive analysis performed in PESETA III, which showed that international spill-over effects could increase the internal EU additional welfare loss by approximately 20%.

Approach

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The economic analysis assessed the valuation of damage additional to the current period, so the current direct damage is subtracted from the direct damage of the climate scenarios. PESETA IV used a multi-sector, multi-country, computable general equilibrium model called Climate assessment General Equilibrium (CaGE), which integrates various climate impacts in a consistent way. CaGE was applied in a comparative static context, where future climate affects the economy as of today.

The economic consequences were estimated in terms of welfare (consumption) changes based on direct damage estimates from the different impact categories. This includes damage to capital stock, sectoral productivity reduction, and changes in consumption.

Welfare loss is in general larger than the direct damages because it accounts for indirect effects in the rest of the sectors of the economy (e.g. agricultural yield losses impacting the agro-food industry).

Climate impacts happening in the rest of the world will also affect the EU via international trade. The possible scale of international spill-overs due to impacts in the agriculture sector in the rest of the world was simulated with the CaGE model.

Due to the limited coverage of climate impacts, the assessment does not evaluate the full economic impacts of climate change in the EU.