

THE ECONOMIC IMPACT OF CLIMATE CHANGE

Welfare losses for the EU under a high warming, end of the century scenario, are estimated to be around 1.9% of GDP (€240 billion), which would be reduced approximately by 2/3 under 2°C warming (to €79 billion). Climate impacts are largely asymmetric across regions with southern European areas undergoing relatively much larger damages. There are also relevant transboundary effects between the EU and non-EU countries across the globe, via trade flows. Effective adaptation policies are needed to reduce the risk of economic damages from climate change because mitigation alone does not eliminate the impacts.

WELFARE LOSS UNDER HIGH WARMING AND 2°C WARMING

The EU welfare loss under the high warming scenario, by the end of the century, is estimated to be around 1.9% of GDP (€240 billion) whereas it is around 0.65% (€79 billion) under the 2°C warming scenario, i.e. around two-thirds of the high warming scenario losses (Figure 1).

The larger loss under high warming is driven by greater damages from coastal flooding relative to the 2°C warming scenario. There is also a shift from welfare gain to loss from agricultural crops. Most welfare losses are substantially lower under the 2°C warming scenario compared with the high warming scenario. The exception is for heat-related mortality, where in relative terms, the welfare losses are more similar between the two climate change scenarios.

Mortality is the largest single cause of welfare loss across the EU under both climate change scenarios. It accounts for around half the loss under the high warming scenario.

In order of magnitude of loss, the next largest welfare losses under the high warming scenario come from coastal flooding, declines in labour productivity, agriculture and, lastly, inland river flooding.

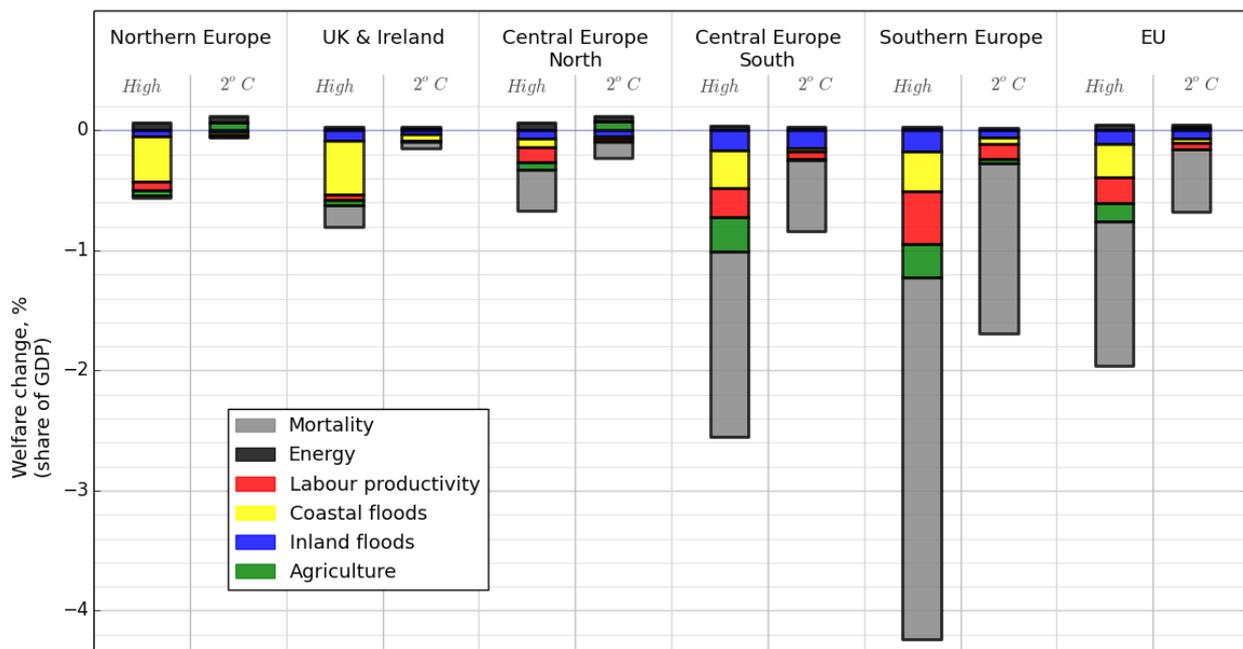
A NORTH-SOUTH DIVIDE IN WELFARE LOSS

There is a clear North-South divide in the regional distribution of welfare losses across the EU under both climate change scenarios. Most of the relative losses occur in southern regions (Central Europe South and Southern Europe). Southern Europe is projected to see the largest regional welfare loss under both scenarios: around 4.2% of GDP under high warming by the end of the century and 1.7% under 2°C warming.

GLOBAL TRANSBOUNDARY EFFECTS

Climate impacts occurring outside the EU (in the rest of the world) can affect the EU's economy because the global economy is closely interconnected. Countries buy (import) and sell (export) products and services to each other via international trade. For instance, if climate change damages the agriculture crops in China, it will also have effects on the EU economy due to those international economic connections. Climate impacts elsewhere may affect the EU's economic performance, such as imports, exports, sectoral production, employment and prices. All those economic effects will in the end affect the overall economic activity, defined in terms of GDP.

Figure 1. Welfare changes from present (% of GDP) for high warming and 2°C warming scenarios. Negative values denote a loss.



The international transboundary effects (i.e. additional impacts in the EU due to climate impacts in the rest of the world) could amount to around 40% of the EU impact in GDP terms. The magnitude of the transboundary effects depend on two aspects: the severity of climate impacts in the rest of the world regions and the intensity of trade between the regions and the EU.

Most of the transboundary effects are due to climate damages that occur in two regions: the Americas and Asia (Figure 2). Damages in the Americas account for around one-third of total GDP losses at €9.6 billion under high warming by the end of the century, and €3.3 billion under 2°C warming.

About half of the transboundary effects to the EU are due to climate change impacts on crops, which mainly affect central and southern EU regions. Another one-third of the transboundary-induced loss originates from declines in labour productivity, affecting mainly Central Europe North.

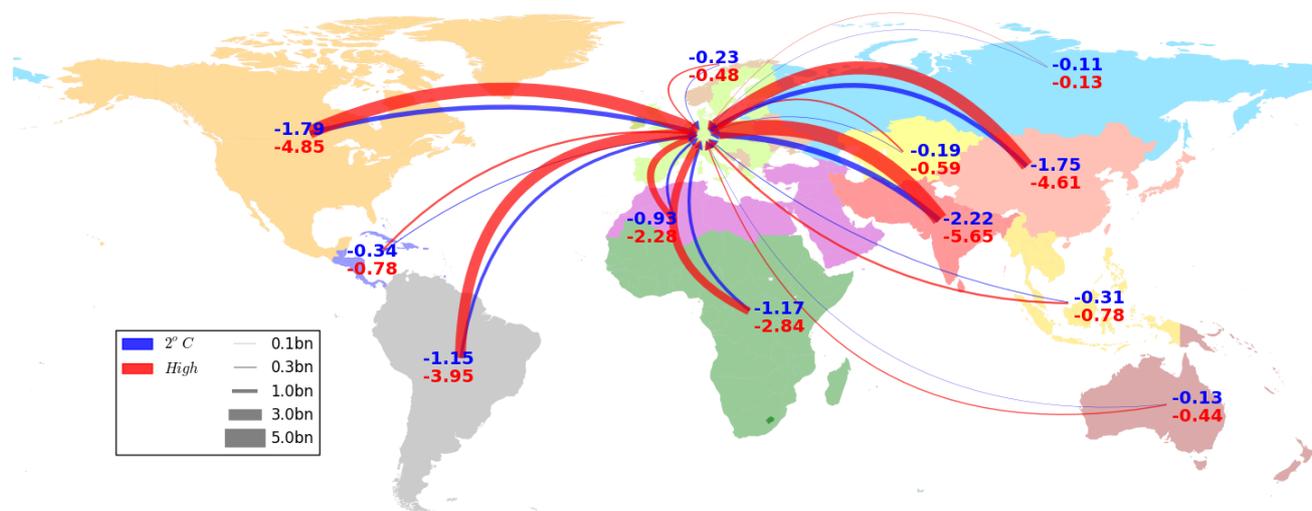
POLICY IMPLICATIONS

Coordinating pan-EU adaptation policy would help to lessen the impacts of climate change for the EU because policies would build-in resilience across the different EU regions that are projected to be impacted by transboundary effects.

The potential North-South divide of economic impacts across the EU as a result of climate change suggests that regional policies within the EU will be important. Whilst mitigation in line with the goals of the Paris Agreement (2°C warming) would reduce around two-thirds of the economic impacts, it does not eliminate them, which highlights the need for effective adaptation policy.

The potential for the EU to experience significant global transboundary effects implies that adaptation support for developing countries also makes the EU more resilient to climate change.

Figure 2. Impacts on annual EU GDP (€ billions) due to climate impacts in the rest of the world regions, via international trade (imports and exports).



APPROACH

PESETA III estimated the economic impacts of climate change as if future climate change affects the current economy (comparative static setting). Economic impacts were estimated (household consumption or welfare change) by using projections of biophysical impacts (from agriculture, energy, labour productivity, mortality due to heat-stress, coasts and river flooding) under climate change as input to a multi-sector general equilibrium model. The heterogeneous climate impact results are made comparable through a set of assumptions to integrate them in the economic model. The biophysical impacts were estimated by PESETA III except for mortality due to heat-stress, whose results come from PESETA II, with similar but different climate scenarios. Global 'transboundary effects', i.e. the effects of climate impacts that occur outside of the EU affecting the EU's different regions via international trade, were estimated for agriculture, labour productivity, energy and river flooding and are derived from climate scenarios different from those in PESETA III. The transboundary effects are in addition to losses incurred by the EU region alone.

Read more

PESETA III Task 14: Economic integration and spillover analysis. Available on our website <https://ec.europa.eu/jrc/en/peseta>