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Global warming could cost Europe up to €65 billion a year

If the climate expected in the 2080s occurred today, the EU would face yearly GDP losses between €20 and €65 billion, depending on the temperature increase in Europe (2.5°C to 5.4°C). This result takes into account four aspects that are highly sensitive to climate changes: agriculture, river flooding, coastal systems and tourism. This is the estimation published today in a report of the European Commission's Joint Research Centre (JRC). The PESETA study also shows different regional impacts of climate change across the EU. Damages would occur mainly in Southern and Central Europe, while Northern Europe would be the sole region to benefit, in economic terms and for the aspects studied, from climate change.

The final report of the PESETA project (Projection of economic impacts of climate change in sectors of the European Union based on bottom-up analysis), makes an assessment of the annual economic impacts of climate change in Europe in agriculture, river flooding, coastal systems and tourism without considering adaptation policies.

In PESETA, several temperature and sea level rise scenarios for the 2080s are considered for Europe, with temperature increases ranging from 2.5°C to 5.4°C and sea level rise scenarios varying between 48 and 88 cm.

The research estimates that the overall damage to the EU economy (GDP loss) would be between €20 and €65 billion per year. The economic well-being (welfare) of Europeans, which has historically grown at around 2% yearly, would improve less due to global warming. A temperature rise by 2.5°C could reduce welfare by 0.2% whereas a rise by 5.4°C could halve the approximate annual EU welfare growth..

The overall cost of global warming could be, however, much higher, as the study only focuses on four sectors of the economy and does not take into account non-market impacts in fields like biodiversity and ecosystems or natural disasters.

Economic impact by sector in overall EU (Figure 2)

Although aggregated estimates mask large sectoral and regional variability, under the worst case scenario (5.4°C scenario with a high sea level rise), losses would occur in this order:

- coastal systems: sea floods and migration costs would decrease annual welfare by 0.46% and would affect an additional 775 000 to 5.5 million people every year in comparison to today's figures;
- agriculture: production losses due to an annual fall of 10% in crop yields would equal -0.32%; and
- river flooding would affect an additional 250 000 to 400 000 people every year and would decrease annual welfare by 0.24%, mainly due to damages in buildings (between €7.7 billion and €15 billion cost a year).

Tourism would be the only sector with a virtually neutral result at aggregated UE level (0.04%); however, wide differences across regions are expected.

Impacts by regions in 2080s (Figure 3)

To ease interpretation, climate change impacts in the EU have been aggregated for five regions: Northern Europe, British Isles, Central Europe North, Central Europe South and Southern Europe (Figure 1). The assessment covers all EU countries, with the exception of Luxemburg, Malta and Cyprus, and combines climate data, physical impact and economic models.

Spain, Portugal, Italy, Greece and Bulgaria (Southern Europe) present the highest welfare losses, ranging between 0.3% and 1.6% per year. The impact of climate change is negative in all sectors, with a sharp deterioration in the scenario with the highest temperature increase (5.4°C). Agriculture would suffer the biggest damages losing up to 25% of yields and tourism revenues could diminish up to €5 billion per year.

Central Europe would also be negatively affected by climate change, but to a lesser extent. **Germany, Belgium, the Netherlands and Poland (Central Europe North)** would have annual welfare losses between 0.3% and 0.7%. The major negative impact would be damages to coastal systems with up to 2.4 million people affected by sea floods in addition to today. River flooding could cost up to €5 additional billion yearly. However, the projected impact on tourism is positive (up to €4 billion additional revenue).

Welfare losses in **France, Austria, Czech Republic, Slovakia, Hungary and Romania (Central Europe South)** would be in a range between 0.1% and 0.6%. River flooding and impacts to coastal systems are also the causes of the most important damages expected in the region. Tourism, however, would benefit from climate change, with up to €10 billion in additional revenues for the warmest scenario.

In **Ireland and the United Kingdom** welfare loss would be similar to Central Europe, except for the 5.4°C scenario with a high sea level rise of 88cm, where the welfare loss would reach an annual 1.3%, mainly due to impacts to coastal systems. River flooding effects are quite negative in all scenarios, but results for tourism are positive, with up to €4.5 billion additional revenues.

Denmark, Sweden, Finland, Estonia, Latvia and Lithuania (Northern Europe) would be the only EU area with welfare gains in all scenarios, ranging between 0.5% and 0.7% yearly, mainly thanks to the large positive impacts in the agricultural sector, fewer river flooding damages and higher tourism revenues. However, sea floods could affect more than 250 000 people in addition per year.

Background information

Preliminary results of the PESETA project have been used by the European Commission for the White paper "Adapting to climate change: towards a European framework for action" (COM/2009/0147) in April this year, as well as for the JRC-EEA (European Environment Agency) Reference Report "Impacts of Europe's changing climate" (2008).

When interpreting the results, it has to be noted, however, that PESETA delivers a first approximation to the estimation of climate change damages, subject to many uncertainties in future climate characteristics and future economic structure.

Links

PESETA report: <http://ipts.jrc.ec.europa.eu/>
 PESETA website: <http://peseta.jrc.ec.europa.eu/>
 European Commission White paper on adaptation: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52009DC0147:EN:NOT>
 Impacts of Europe's changing climate:
http://ec.europa.eu/dgs/jrc/downloads/jrc_reference_report_2008_09_climate_change.pdf

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Figure 1: Welfare changes according to the different scenarios and sectors (%)

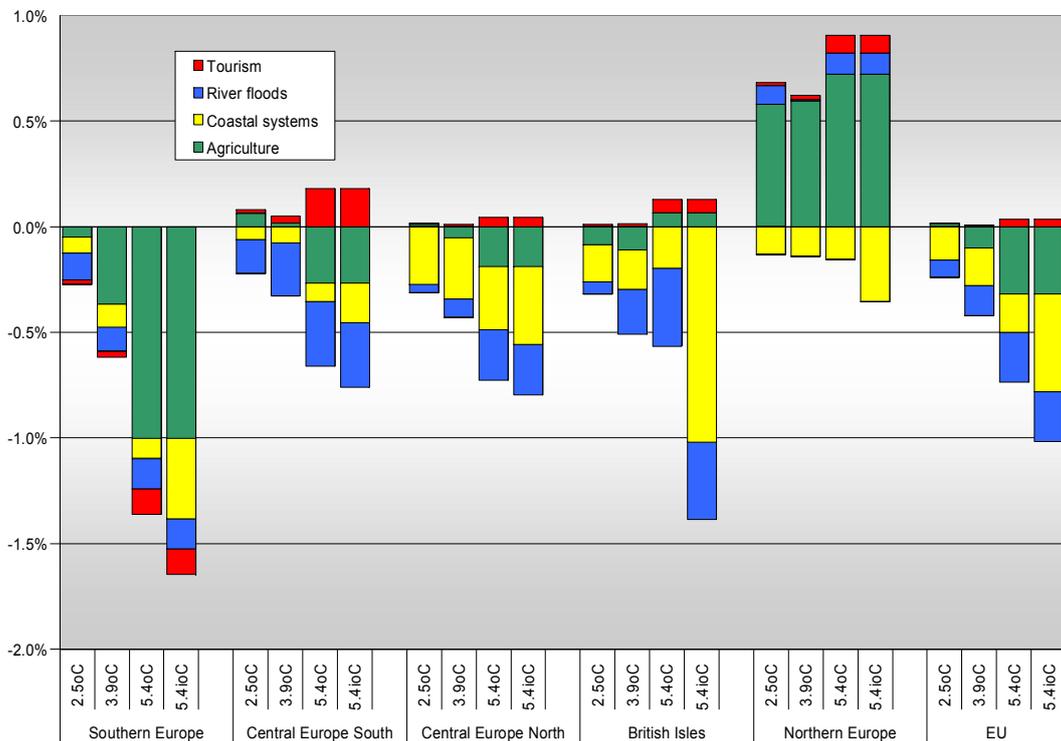


Figure 2: Summary of the results for the EU

<i>Climate Change Scenarios</i>					
	2.5°C	3.9°C	4.3°C	5.4°C	5.4°C high SLR
Δ Temperature (°C) *	2.51	3.86	4.06	5.36	5.36
Δ Precipitation (%) *	1.01	0.98	1.02	0.98	0.98
SLR (cm)	49	56	51	59	88
<i>Annual Physical Impacts (changes)</i>					
	2.5°C	3.9°C	4.3°C	5.4°C	5.4°C high SLR
Agriculture ‡					
Yields (%)	3	-2	3	-10	-10
River floods †					
Affected Population (1000s/year)	276	318	251	396	396
Economic damage (million €)	7,728	11,469	8,852	15,032	15,032
Coastal systems (non adaptation) ††					
People flooded (1000s/year)	775	1,225	851	1,353	5,552
Tourism **					
Bed nights (%)	1	1	6	7	7
Tourism expenditure (million €)	1,858	3,262	13,360	15,268	15,268
Human Health (country-specific function) *					
Heat-mortality rate (per 100,000)	12	22	19	33	33
Cold-mortality rate (per 100,000)	-21	-37	-39	-52	-52
<i>Annual Welfare Impacts (not considering human health)</i>					
	2.5°C	3.9°C	4.3°C	5.4°C	5.4°C high SLR
Agriculture	0.01%	-0.10%	0.02%	-0.32%	-0.32%
River floods	-0.08%	-0.14%	-0.13%	-0.24%	-0.24%
Coastal systems (non adaptation)	-0.16%	-0.18%	-0.17%	-0.18%	-0.46%
Tourism	0.00%	0.01%	-0.02%	0.04%	0.04%
TOTAL	-0.22%	-0.42%	-0.29%	-0.70%	-0.98%

*Increase in the period 2071–2100 compared to 1961–1990. ‡Yield changes compared to 1961–1990 period and weighted by the country agriculture value added. †Differences compared to the 1961–1990 period. ††Differences compared to 1995.
**Differences compared to 2005.

Figure 3: Annual economic impacts in agriculture, river basins, tourism and coastal systems for 2080s climate change scenarios in the current European economy

European regions*	Southern Europe	Central Europe South	Central Europe North	British Isles	Northern Europe	EU
<i>Economic impacts as estimated by the agriculture model</i>						
Welfare Change (%)‡						
2.5°C	-0.05	0.06	0.01	-0.09	0.58	0.01
3.9°C	-0.37	0.02	-0.05	-0.11	0.59	-0.10
4.3°C	-0.15	-0.01	0.04	0.09	0.56	0.02
5.4°C	-1.00	-0.27	-0.19	0.06	0.72	-0.32
GDP Change (%)‡						
2.5°C	-0.13	0.11	-0.02	-0.10	0.81	0.02
3.9°C	-0.52	0.06	-0.06	-0.11	0.85	-0.09
4.3°C	-0.22	0.00	0.05	0.12	0.76	0.04
5.4°C	-1.26	-0.28	-0.17	0.16	1.09	-0.29
<i>Economic impacts as estimated by the river flooding model</i>						
Welfare Change (%)‡						
2.5°C	-0.13	-0.16	-0.04	-0.06	0.09	-0.08
3.9°C	-0.11	-0.25	-0.09	-0.21	0.01	-0.14
4.3°C	-0.09	-0.15	-0.13	-0.20	0.07	-0.13
5.4°C	-0.14	-0.31	-0.24	-0.37	0.10	-0.24
GDP Change (%)‡						
2.5°C	-0.01	-0.01	0.00	0.00	0.00	-0.01
3.9°C	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
4.3°C	0.00	-0.01	-0.01	-0.01	0.00	-0.01
5.4°C	0.00	-0.01	-0.02	-0.02	0.00	-0.01
<i>Economic impacts as estimated by the coastal system model</i>						
Welfare Change (%)‡						
2.5°C	-0.07	-0.06	-0.27	-0.17	-0.13	-0.16
3.9°C	-0.11	-0.08	-0.29	-0.19	-0.14	-0.18
4.3°C	-0.09	-0.06	-0.28	-0.18	-0.14	-0.17
5.4°C	-0.10	-0.09	-0.30	-0.20	-0.15	-0.18
5.4°C High Range IPCC SLR (88cm)	-0.38	-0.19	-0.37	-1.02	-0.35	-0.46
GDP Change (%)‡						
2.5°C	-0.05	-0.05	-0.38	-0.23	-0.11	-0.19
3.9°C	-0.05	-0.05	-0.41	-0.24	-0.12	-0.20
4.3°C	-0.05	-0.05	-0.39	-0.23	-0.11	-0.20
5.4°C	-0.05	-0.05	-0.42	-0.25	-0.13	-0.21
5.4°C High Range IPCC SLR (88cm)	-0.04	-0.06	-0.50	-0.26	-0.16	-0.24
<i>Economic impacts as estimated by the tourism model</i>						
Welfare Change (%)‡						
2.5°C	-0.02	0.02	0.01	0.01	0.01	0.00
3.9°C	-0.03	0.03	0.01	0.01	0.02	0.01
4.3°C	-0.08	-0.11	0.03	0.05	0.07	-0.02
5.4°C	-0.12	0.18	0.04	0.06	0.08	0.04
GDP Change (%)‡						
2.5°C	-0.01	0.00	0.00	0.00	0.00	0.00
3.9°C	-0.01	0.01	0.00	0.00	0.00	0.00
4.3°C	-0.03	-0.03	0.01	0.01	0.02	-0.01
5.4°C	-0.05	0.03	0.02	0.01	0.02	0.01

*European regions: Southern Europe (Portugal, Spain, Italy, Greece, and Bulgaria), Central Europe South (France, Austria, Czech Republic, Slovakia, Hungary, Romania, and Slovenia), Central Europe North (Belgium, The Netherlands, Germany, and Poland), British Isles (Ireland and UK), and Northern Europe (Sweden, Finland, Estonia, Latvia, and Lithuania).
‡Household welfare and GDP are compared to the 2010 values of the baseline scenario.