

# Extreme climate events in Europe: rising economic losses can lead to greater sovereign ratings divergence



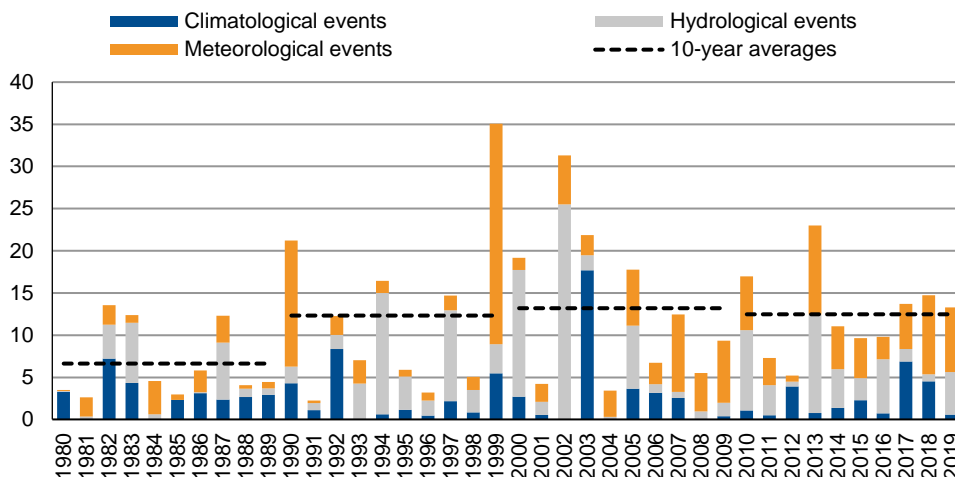
Scope  
Ratings

**Extreme climate events constitute an important environmental challenge for governments. Temperature extremes, heavy rain, floods and droughts all pose serious risks to human life and economic activity in Europe. Such events are likely to become more frequent and severe with some countries more affected than others. In this report, we explore the materiality of physical environmental risks for sovereign ratings in selected European countries.**

Natural disaster risks constitute an important component of Scope's assessment of a sovereign's environmental risk profile. The economic losses from extreme weather and climatic events represent the main natural hazard risk in European Environmental Agency (EEA) member countries. Such events, including extreme temperatures, heavy rain and droughts, lead to estimated economic costs of EUR 446bn (3% of 2019 GDP) in 1980-2019, averaging more in the three most recent decades than in 1980-89 (**Figure 1**).

In the absence of mitigating investments, these costs are expected to grow in the coming years and to varying degrees across Europe. While efforts to address changes in climate are accelerating in the region, the adverse impact of extreme climate events could increasingly present a credit challenge for sovereign ratings as effects become more severe and pervasive, potentially leading to rating divergence.

**Figure 1. Economic damage caused by extreme climatic events in EEA countries**  
EUR bn



Source: EEA, Scope Ratings GmbH

The main conclusions from our analysis are:

- Costs due to extreme weather events have had marginal macroeconomic impacts in Europe thus far but are becoming increasingly material for sovereign risk.
- Europe is generally less exposed to natural risks than other regions, though there are wide variations across countries. Southern Europe is the most exposed region from direct impacts of natural hazards, due to droughts and coastal floods, followed by countries in Central and Eastern Europe, due mostly to inland floods.
- Southern Europe is further exposed due to indirect effects given that Mediterranean economies are highly dependent on those sectors that are most likely going to be affected by extreme weather, such as travel and tourism.
- Policy responses are accelerating, supported by EU institutions, providing a good opportunity to address challenges, but countries most exposed are not the ones allocating the most resources to address these challenges.

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## Economic impacts of climate-related extremes across EEA

Natural hazards are the main environmental challenges that sovereigns face. The greatest natural hazard risk in EEA member countries – European Economic Area countries plus Turkey – that governments have to contend with relates to temperature extremes, heavy precipitation, floods and droughts.

**81% of natural-disaster losses due to climate extremes 1980-2019**

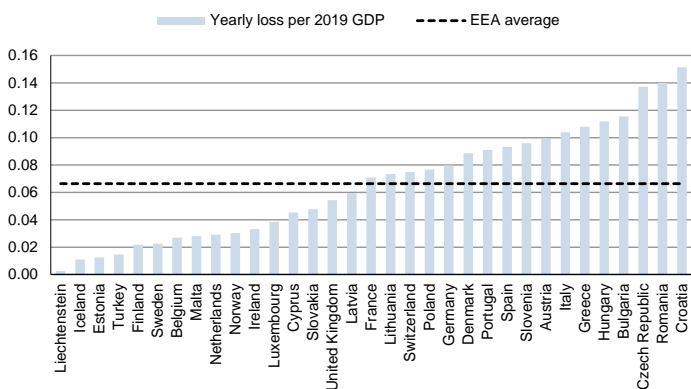
Between 1980 and 2019, climate-related extremes accounted for around 81% of total economic losses caused by natural hazards in EEA member countries, with cumulative losses adjusted for inflation amounting to EUR 446 billion. This is equivalent to EUR 11.1bn per year and represents around 0.07% of the 2019 GDP for EEA countries.

**Total economic impact of climate extremes has been limited to date**

It is difficult to analyse trends in economic losses given that the incidence of bad weather and natural disasters such as forest fires vary hugely from year to year with most of economic losses concentrated in a few extreme events. Germany committed EUR 30bn to fund reconstruction efforts after the July 2021 floods that devastated parts of Western Europe while the Greek government announced EUR 500 to fund relief and compensation for people who have lost homes and property in this summer's wildfires<sup>1</sup>.

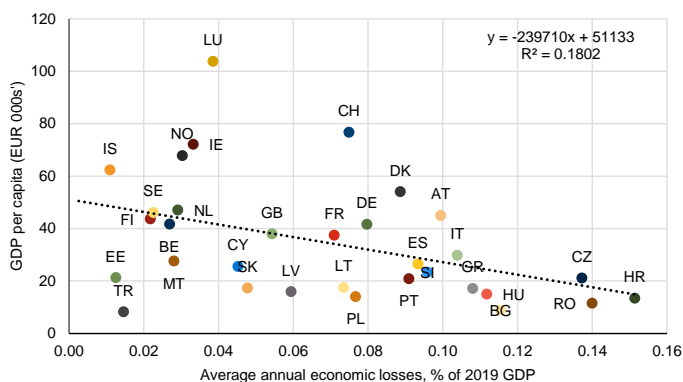
The macroeconomic relevance of extreme climatic events for EEA countries over 1980-2019 was limited, though it varied considerably across countries (see [Appendix I](#) for full overview). CEE countries such as Croatia, Romania, the Czech Republic, Bulgaria and Hungary were the most affected, with average annual economic losses from climate extremes over 1980-2019 ranging from 0.11% to 0.15% of GDP, well above the 0.07% EEA average (**Figure 2**). Overall, lower income countries tend to have suffered the highest costs from severe climate events in the past (**Figure 3**).

**Figure 2. Economic cost of extreme climate-related events**  
Average yearly losses (1980-2019) in % of 2019 GDP



Source: European Environment Agency, Scope Ratings GmbH

**Figure 3. Economic cost per GDP versus wealth levels**  
EUR 000s<sup>1</sup> (vertical axis); % of 2019 GDP (horizontal axis)



Source: European Environment Agency, IMF, Scope Ratings GmbH

**Extreme climate events are likely to become more frequent and severe**

Global warming is predicted to increase the likelihood of severe impacts for people and ecosystems leading to an upsurge in extreme events<sup>2</sup> and associated economic and fiscal damage for sovereigns. The European Commission estimates that the impact of global warming of 3°C in selected sectors would result in an annual welfare loss of EUR 175bn (1.4% of GDP) across the EU and United Kingdom compared with current conditions (**Figure 4**).<sup>3</sup> Most of the estimated economic impact would be due to rising human mortality from more extreme temperatures.

<sup>1</sup> See Federal Ministry of Finance (2021), [Federal government and Länder support flood-hit regions](#); Reuters (2021), [Greek PM approves 500 mln euro budget for wildfire relief reforestation](#).

<sup>2</sup> Intergovernmental Panel on Climate Change (2014), [Fifth Assessment Report](#).

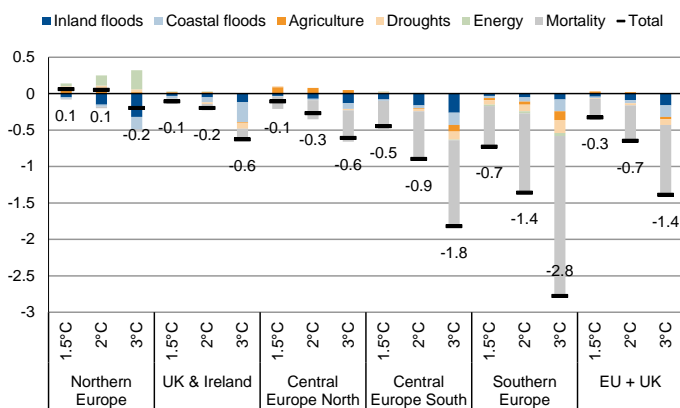
<sup>3</sup> European Commission (2020), [JRC Technical Report – Economic analysis of selected climate impacts](#).

## Southern Europe most exposed due to droughts, coastal floods

Southern Europe is more exposed with the magnitude of overall welfare losses being several times higher than for northern countries, driven by droughts and coastal floods. Similarly, CEE countries also appear more exposed, but driven mostly by inland floods. These findings are similar to those highlighted in the [ECB's economy-wide climate stress test](#), which highlights that firms exposed to high physical risk are predominantly concentrated in the south of Europe.

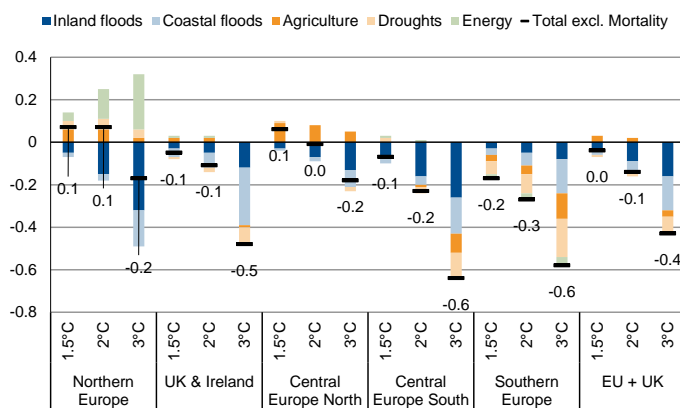
Excluding the losses linked to increased mortality (for which estimates vary greatly depending on the assumption for the monetary value of life), the overall annual welfare loss would amount to 0.4% of GDP (**Figure 5**). More recently, the European Commission has estimated that GDP losses due to the negative effects of heatwaves on human productivity will increase five-fold from 0.2% on average over 1981-2010 to 1.14% in the 2060s<sup>4</sup>.

**Figure 4. Annual welfare changes from selected climate impacts in the EU and UK**  
% of GDP



Source: European Commission – PESETA IV, Scope Ratings GmbH

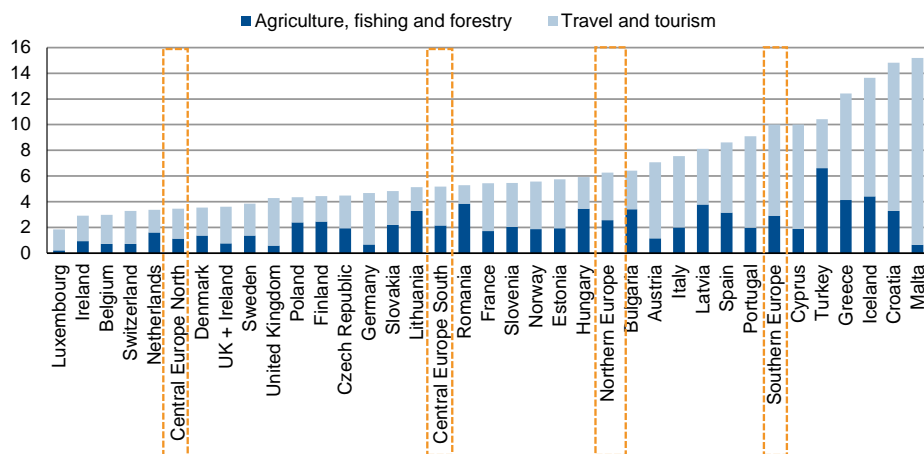
**Figure 5. Annual welfare changes from selected climate impacts in the EU and UK (excl. mortality)**  
% of GDP



Source: European Commission – PESETA IV, Scope Ratings GmbH

Still, these estimates account only for the direct impact of changes in climate. Second-round effects that include the possible impact on sectors that are arguably most vulnerable to physical risks such as fishing, forestry or tourism, are not included.

**Figure 6. Contributions of agriculture, fishing, forestry and tourism to GDP, 2020**  
% of GDP



Source: World Bank, Scope GmbH

<sup>4</sup> García-León, D et al. (2021), [Current and projected regional economic impacts of heatwaves in Europe](#), Nature Communications

### Tourism among sectors vulnerable to extreme weather

While we do not estimate the risk of climate change on these sectors, we do note that Mediterranean economies are highly dependent on precisely those sectors that are most likely going to be affected by more extreme weather. The total contribution of agriculture, fishing, forestry and tourism to GDP stands at around 10% for Southern European countries versus 6% in Northern Europe, 5% in Central Europe South and 3% in Central Europe North (**Figure 6**).

Coastal tourism is particularly at risk given the disruptions associated with severe storms to transport, power and water supplies that the sector relies on. Similarly rising temperatures may result in shifts in tourist flows as climate conditions become more favourable in Northern countries at the expense of Southern regions. Tourism activity could thus decline in Southern Europe, adversely impacting these countries' economic activities.

### Climate-related disasters and sovereign risk

### ESG risks form stand-alone pillar of Scope's methodology

Scope Ratings was the first leading rating agency to systematically include ESG considerations under a stand-alone risk pillar in our [Sovereign Rating Methodology](#), recognising that environmental risks are a growing area of concern and increasingly relevant for sovereign credit risk. One crucial component of our environmental risk assessment is the exposure of sovereigns to natural disaster risks which can amplify sovereign risk through three main transmission channels<sup>5</sup>.

- *The economic channel:* natural disasters and extreme weather can lead to disruption of economic activity, damage critical infrastructure, and weigh on labour supply and productivity due to loss of human life and migration.
- *The fiscal channel:* climate-related disasters can affect government finances given their adverse impact on tax revenue; fiscal cost given the required spending on mitigation and adaptation policies; additional contingent risks due to the destruction of public assets, damage to SOE balance sheets and public health implications.
- *The financial stability channel:* natural disasters are a major source of systemic risk for financial institutions and can quickly destabilise financial markets. This could be the case, for example, in case of physical damage of assets and/or supply chain disruptions resulting in asset impairment, and thus losses on bank's balance sheets.

Our quantitative assessment of natural disaster risks uses the World Risk Index (WRI) which captures not only the exposure to natural hazards but also considers countries' respective ability to cope and adapt to these events. It also incorporates emerging risks of climate change, due to a rise in sea levels for instance, which have not yet materialised but pose a long-term risk for several economies. This indicator is complemented by a qualitative assessment of the governments' willingness and ability to mitigate these risks.

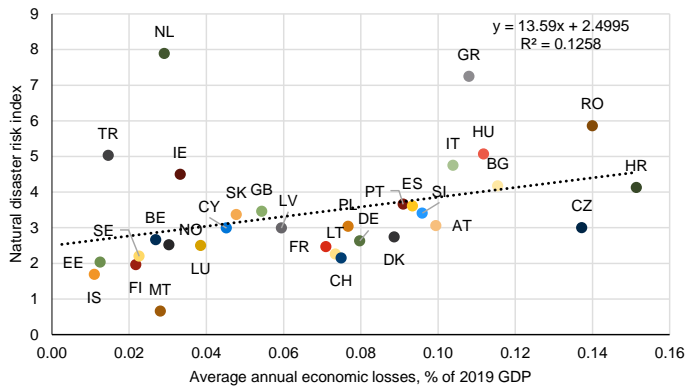
### European sovereigns score well on physical risks

We note that, in an international context, European sovereigns generally score well on our physical risk metric. Natural disaster risks appear to affect mostly Asian, Latin American, African and Caribbean sovereigns while they remain, on average, more contained for European economies (see [previous Scope research](#)).

In general, we find a clear correlation between the WRI and historic economic losses from extreme climate events though with some notable exceptions (**Figure 7**). For instance, the Netherlands (AAA/Stable), which has suffered relatively moderate economic losses over the last forty years (1.1% of 2019 GDP), is the most exposed country in Europe according to the WRI due to the substantial challenge posed by rising sea levels given that a quarter of the country rests below sea level.

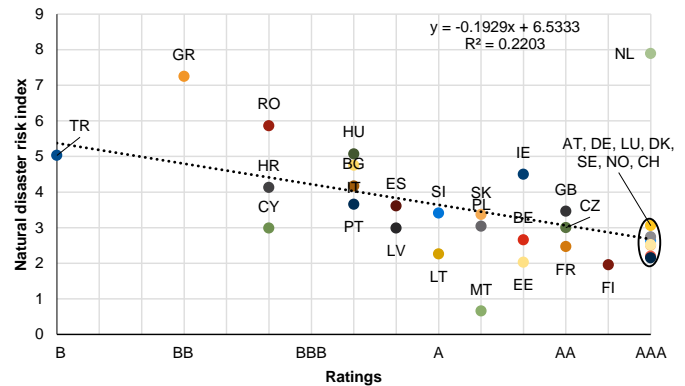
<sup>5</sup> See Volz, U et al. (2020), [Climate Change and Sovereign Risk](#); Bolton, P et al. (2021), [Resilience of the Financial System to Natural Disasters](#).

**Figure 7. Natural risk index vs extreme climate event costs**  
% of 2019 GDP (horizontal axis); Index score (vertical axis)



Source: World Risk Institute, European Environment Agency, Scope Ratings GmbH

**Figure 8. Natural risk index vs Scope's sovereign ratings**  
Ratings (horizontal axis); Index score (vertical axis)



Source: World Risk Institute, Scope Ratings GmbH

While our ratings already incorporate a forward-looking assessment of natural risks that sovereigns face, the importance of such risks for sovereign creditworthiness will grow over time as extreme weather events become more frequent and severe. They are also likely to increasingly interact with other risk pillars as climate risks spill over into economic and fiscal performance as well as financial stability. The pervasiveness of natural risk could thus lead to greater rating divergence given that the countries which most exposed to natural risks – such as Turkey (B/Negative), Greece (BB+/Stable), or Romania (BBB-/Stable) – tend to have lower ratings by Scope, except for the Netherlands (Figure 8).

## Policy response to natural risks: accelerating efforts supported by the EU institutional architecture

Pressure on governments to mobilise resources, enact reform

Against this backdrop, it is crucial that governments mobilise resources and implement reforms that reduce their exposure to natural risks and enhance their capacity to cope with climate extremes. As Figure 9 shows, countries that have been affected the most by climate events in the past do not spend more on environmental protection. Other factors such as citizen's views on the seriousness of environmental issues, sovereigns' respective fiscal space and their interaction with domestic political dynamics also play a role in determining countries' climate policy actions.

EU strategic plans support more ambitious climate policies

In 2021, the EU adopted its European Green Deal and the new EU Strategy on Adaptation to Climate Change to facilitate the transition towards a carbon-neutral, climate-resilient and resource-efficient economy. EU leaders have thus agreed to earmark at least 37% of EU funding received under the Recovery and Resilience Facility while the European Commission has proposed that at least 25% of the EU's multiannual budget be geared towards climate action over 2021-27<sup>6</sup>.

Limited correlation between exposure to natural risks and climate spending

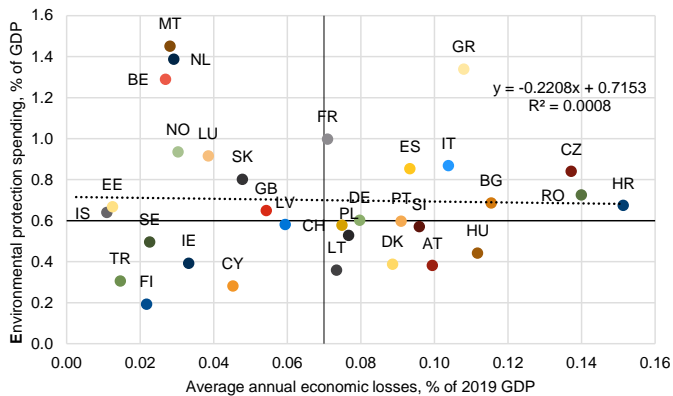
The recovery plans announced to date do not show that countries' exposure to and historical costs from natural disasters necessarily influenced their allocation of the recovery and resilience funds. The interaction between physical risks and political priorities at the national level thus remain limited overall in a European context. Similarly, transition risks as measured via economies' dependence on CO<sub>2</sub>, also played a minor role.

According to Bruegel data, National Recovery and Resilience Plans submitted by EU member states include over EUR 232bn (1.7% of EU GDP) in spending on the green transition (see Appendix II for an overview). Bruegel estimates that the green spending share amounts to 48% of total spending on average across the EU, ranging from 34% in

<sup>6</sup> European Commission, Supporting climate action through the EU budget.

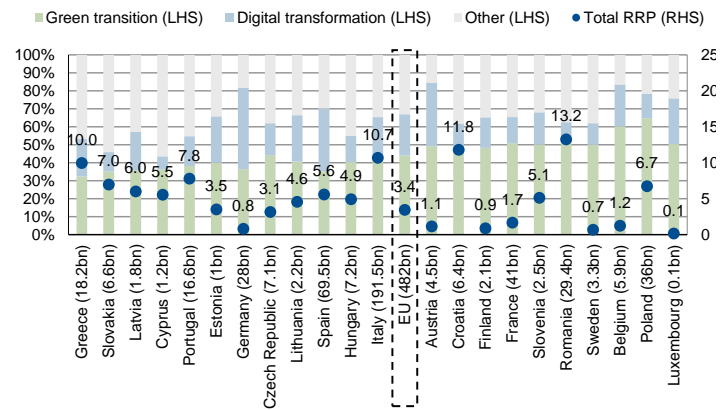
Greece – one of the most affected countries in terms of economic losses – to 64.8% in Luxembourg (Figure 10).

**Figure 9. Environmental protection expenditure, 2019**  
% of GDP



Note: Axes cross at the median values for the country sample.  
Source: European Environment Agency, IMF, Scope Ratings GmbH

**Figure 10. Composition of EU Recovery and Resilience Plans**  
% of total spending (LHS), % of 2019 GDP (RHS)



Note: The Bruegel database was last updated in July 2021. This figure reports headline spending and does not consider overlaps between green and digital spending.  
Source: Bruegel, Scope Ratings GmbH

## Recovery plans are mostly focused on the green transition not climate adaptation

We note that an external assessment of national recovery plans by the Green Recovery Tracker finds that many governments are in danger of missing their 37% climate spending targets under the taxonomy defined by RRF regulations<sup>7</sup>. In addition, green spending under EU recovery plans mostly relate to climate via investments to support sustainable transport (18% of total), clean technologies and renewables (11%), and building energy efficiency (10%) rather than climate adaptation projects.

Such investments will support the transition to lower carbon economies, mitigating physical risks in the long-run but have a limited impact on the costs associated with natural disasters in the near to medium-run. This also reflects, in our view, the general expectation that the introduction of policies to enable the transition toward a greener economy today should reduce physical risks in the long term.

Still, climate adaptation should feature in government budgeting and reform programmes to help policymakers better assess climate-related fiscal risks. This can include comprehensive vulnerability assessments which comprise scenario analysis of climate change and provide for mitigation planning. Some have called for the adoption of climate risk analysis in public finances, accounting for expected damages from extreme weather events as contingent liabilities<sup>8</sup>.

## France published first “green budget”

European countries have begun including climate considerations in their budgetary frameworks. The French government, for example, published its first “green budget” which not only identifies expenditure that supports the green transition but also assesses spending that is damaging to the environment. Still, more efforts are needed to truly bolster the resilience of European economies to climate change. Implementation of national adaptation strategies has only just begun, and few countries have started to monitor, report and evaluate adaptation policies and actions at the national level while more transparency is needed on the effect of climate change on public finances.

<sup>7</sup> The Green Recovery Tracker assesses the contribution of EU member states’ national recovery plans to the green transition. The assessment is based on a quantitative and qualitative analysis conducted in partnership with local experts. To mirror the approach used by the European Commission in the assessment of national recovery plans, “very positive” measures are fully counted towards the green spending share, while “positive” measures are weighted using a coefficient of 40%. The relevant coefficient for each measure is combined with the associated costs, summing them up to derive an overall green spending share.

<sup>8</sup> Zenios, S. (2021), *The risks from climate change to sovereign debt in Europe*.



## Appendix I. Overview of economic costs of extreme weather and climate events in EEA countries, 1980-2019

Country	Cumulative losses (EUR m)	Average yearly loss (EUR m)	Loss per sq. km (EUR)	Loss per capita (EUR)	Cumulative loss per 2019 GDP	Yearly loss per 2019 GDP	Insured losses (EUR m)	Insured losses (% of total)	Fatalities	Fatalities per 100,000 inhabitants
Austria	15,415	395	183,777	1,911	3.9%	0.10%	5,010	33%	601	6.8
Belgium	5,000	128	163,788	480	1.0%	0.03%	3,002	60%	2,172	18.9
Bulgaria	2,758	71	24,989	342	4.5%	0.12%	145	5%	206	3.0
Switzerland	19,108	490	462,758	2,627	2.9%	0.07%	9,831	51%	1,158	13.5
Cyprus	393	10	42,447	566	1.8%	0.05%	8	2%	81	9.1
Czech Republic	11,991	307	152,039	1,157	5.4%	0.14%	3,888	32%	227	2.1
Germany	107,445	2,755	300,649	1,329	3.1%	0.08%	51,235	48%	11,110	13.4
Denmark	10,810	277	251,892	2,016	3.5%	0.09%	6,369	59%	49	0.8
Estonia	137	4	3,026	97	0.5%	0.01%	36	26%	10	0.8
Greece	7,689	197	58,232	728	4.2%	0.11%	148	2%	2,550	23.8
Spain	45,329	1,162	89,594	1,080	3.6%	0.09%	11,681	26%	14,679	31.4
Finland	2,037	52	6,019	394	0.8%	0.02%	433	21%	4	0.1
France	67,524	1,731	106,642	1,099	2.8%	0.07%	33,503	50%	23,491	36.1
Croatia	3,202	82	56,582	719	5.9%	0.15%	77	2%	722	17.8
Hungary	6,362	163	68,390	622	4.4%	0.11%	149	2%	707	7.2
Ireland	4,617	118	66,146	1,155	1.3%	0.03%	2,409	52%	71	1.4
Iceland	95	2	925	335	0.4%	0.01%	52	54%	52	14.6
Italy	72,534	1,860	240,122	1,254	4.1%	0.10%	3,439	5%	20,735	34.7
Liechtenstein	6	0	35,206	175	0.1%	0.00%	3	60%	0	0.0
Lithuania	1,398	36	21,415	416	2.9%	0.07%	7	1%	74	2.6
Luxembourg	954	24	368,769	2,118	1.5%	0.04%	562	59%	130	21.2
Latvia	705	18	10,923	302	2.3%	0.06%	52	7%	104	5.4
Malta	149	4	471,098	382	1.1%	0.03%	26	17%	7	1.6
Netherlands	9,205	236	221,581	584	1.1%	0.03%	4,433	48%	1,733	10.0
Norway	3,697	95	11,419	809	1.2%	0.03%	1,996	54%	42	0.8
Poland	15,966	409	51,061	421	3.0%	0.08%	1,058	7%	1,252	3.3
Portugal	7,591	195	82,310	743	3.5%	0.09%	650	9%	3,118	30.3
Romania	12,118	311	50,832	560	5.5%	0.14%	66	1%	1,322	6.8
Sweden	4,205	108	9,588	468	0.9%	0.02%	1,230	29%	47	0.5
Slovenia	1,819	47	89,750	909	3.7%	0.10%	226	12%	243	11.7
Slovakia	1,750	45	35,694	329	1.9%	0.05%	114	6%	125	2.3
Turkey	3,862	99	4,929	60	0.6%	0.01%	544	14%	1,751	2.1
United Kingdom	53,605	1,374	215,683	894	2.1%	0.05%	37,278	70%	3,546	5.3
<b>EEA countries total</b>	<b>499,476</b>	<b>12,807</b>	<b>N/A</b>	<b>821</b>	<b>2.7%</b>	<b>0.07%</b>	<b>179,660</b>	<b>33%</b>	<b>92,119</b>	<b>15.1</b>

Source: European Environment Agency, Scope Ratings GmbH

## Appendix II. Overview of national resilience and recovery plans

Country	Clean Technologies and renewables	Energy efficiency of buildings	Sustainable transport and charging stations	Roll-out of rapid broadband services	Digitalisation of Public administration	Data cloud capacities and sustainable processors	Education and Training to support digital skills	Other green	Other digital	Uncategorised	Grand Total	% of GDP
Austria	0.7	0.3	0.8	0.9	0.2	0.1	0.5	0.3	0.2	0.4	4.5	0.2%
Belgium	0.6	1.1	0.9	0.1	0.6	0.0	0.9	1.1	0.1	0.6	5.9	0.2%
Croatia	0.5	0.8	0.4	0.1	0.4	0.1	0.2	1.5	0.2	2.2	6.4	5.0%
Cyprus	0.4	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.5	1.2	3.1%
Czech Republic	2.2	0.9	0.1	0.3	0.5	0.4	2.2	0.0	0.0	0.5	7.1	1.2%
Estonia	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.3	1.0	1.2%
Finland	0.4	0.3	0.1	0.1	0.2	0.0	0.2	0.2	0.0	0.5	2.1	0.3%
France	3.7	7.3	6.8	0.2	3.0	1.8	7.4	2.3	0.4	8.0	41.0	0.6%
Germany	3.3	2.5	5.9	2.2	7.9	0.8	1.5	0.0	1.9	2.0	28.0	0.2%
Greece	1.8	2.8	1.0	0.6	2.5	0.1	2.4	0.8	0.4	5.8	18.2	5.0%
Hungary	0.8	0.2	1.8	0.0	0.1	0.0	1.5	0.4	0.6	1.9	7.2	2.5%
Italy	15.1	19.4	35.4	12.7	12.4	1.0	21.2	18.2	0.5	55.5	191.5	4.0%
Latvia	0.1	0.2	0.3	0.1	0.4	0.0	0.1	0.0	0.0	0.6	1.8	2.6%
Lithuania	0.3	0.2	0.3	0.1	0.3	0.0	0.1	0.1	0.1	0.7	2.2	1.7%
Luxembourg	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0%
Poland	13.5	0.0	7.3	4.9	4.5	0.2	1.4	0.0	0.0	4.1	36.0	1.5%
Portugal	1.2	1.3	1.0	0.3	0.9	0.0	1.7	1.6	1.3	7.3	16.6	3.5%
Romania	4.5	2.4	8.8	0.0	1.1	0.8	3.9	1.9	1.1	4.9	29.4	5.2%
Slovakia	0.8	0.7	0.8	0.0	1.1	0.0	1.6	0.0	0.0	1.5	6.6	3.8%
Slovenia	0.2	0.1	0.3	0.1	0.2	0.0	0.3	0.4	0.1	0.8	2.5	1.8%
Spain	4.7	6.8	13.2	10.6	5.4	0.0	7.3	4.0	11.2	6.2	69.5	2.1%
Sweden	0.0	0.4	0.1	0.2	0.0	0.0	0.5	1.1	0.2	0.7	3.3	0.3%
EU total	55.0	47.8	86.0	33.5	42.1	5.3	54.9	34.0	18.4	105.1	482.0	3.4%

Source: Bruegel, Scope Ratings GmbH





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