



Economic losses from weather and climate-related events: EEA indicator for a decade

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Please provide the following:

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Economic losses from weather and climate-related events: EEA indicator for a decade

Introduction

The EU adaptation strategy aims to build resilience and ensure that Europe is well prepared to manage the risks and adapt to the impacts of climate change, thus minimising economic losses and other harms. Europe is facing economic losses and fatalities from weather and climate extremes every year and in all regions of Europe. The data on losses and fatalities is not yet collected or reported in sufficient quality across the EU Member States to support EU policy decisions, however private sectors companies collect the data. EEA has access to 2 of these private sources with data for 1980-2020: NatCatSERVICE from Munich Re (since 2012) and CATDAT from Risklayer (since 2021).

Key messages

- Between 1980 and 2020, total economic losses from weather and climate related events caused, economic losses of EUR 450–520 billion (in 2020 euros) and only between $\frac{1}{4}$ th and $\frac{1}{3}$ rd of these losses were insured depending on the source.
- During the same period in the EEA 32 member countries between 85 to 145 thousand fatalities were recorder depending on the source.
- Around 3% of all events are responsible for 60% of the losses. It is important to record small and medium scale events as well in order to detect the impact of climate change on losses and to support adaptation actions.
- Trends in losses do not indicate any significant change over the period 1980-2020. This can be partly attributed to large interannual variability and a reporting bias over time, in particular for small and medium events.
- Further efforts in collecting a coherent and comparable data from countries will be needed in order to present a coherent and authoritative European overview on losses and fatalities from weather and climate extremes as identified in the EU's [Green Deal](#) and the [EU Adaptation Strategy](#) in order to [close the climate protection gap](#).

Main body text

Introduction

Under the umbrella of the [European Green Deal](#), the European Commission presented in February 2021 a new [EU Adaptation Strategy](#) “Forging a climate-resilient Europe”, suggesting action for smarter, faster, more systemic adaptation and with renewed attention for the international dimension. As part of the smarter adaptation objective, more and better climate-related risk and losses data are requested as these kind of data are crucial to improve the accuracy of climate risk assessments. As a response to that objective, EEA has updated the information on economic losses using two sources of data. In this briefing, results from

[CATDAT](#) (RiskLayer GmbH) and [NatCatSERVICE](#) (MunichRe GmbH) are presented (see Box 1). The losses are presented in 3 groups of weather and climate extreme events: meteorological events (e.g. storms), hydrological events (e.g. floods) and the climatological events (e.g. heat and cold waves, droughts...). The geographical coverage is 32 [EEA member countries](#).

Past trends

For the EEA member countries, total economic losses from weather and climate-related events between EUR 450 and 520 billion (in 2020 euros) depending on the source are recorded for the period 1980-2020 (41 years) (See Figure 1). Meteorological events and hydrological events each caused between 34-44% of total losses, the climatological events caused between 22 and 24 %. The geotechnical hazards (such as earthquakes and volcanoes, not included in the figures as they are natural hazards but not part of the weather and climate related extremes), have total losses comparable to the climatological events.

Only one-quarter up to one-third of the losses were insured. Large differences in insured losses between the 3 groups of hazards exist, notably 37-54 % of the total losses for the meteorological hazards, 15-24 % for hydrological events and 7-16 % for the climatological ones (see Figure 2a and 2b).

In addition to insurance differences for different types of hazards, there are large difference between the EEA member countries. Based on the CATDAT data (Figure 3c), countries with the highest ratio of insured economic losses over total losses are Denmark, the Netherlands and Norway (48-56%) and the lowest values can be found in Croatia, Lithuania and Romania (0.5-1.5%). For NatCatSERVICE data, highest values are found in Belgium, Luxemburg and Denmark and lowest values in Lithuania, Romania and Cyprus.

The large part of the fatalities (more than 85 %) in the period 1981-2020 is attributed to heatwaves. The heatwave of 2003 caused most fatalities: between 50 and 75 % of all fatalities from weather and climate-related events over the last 4 decades. As heatwave fatalities are indirectly measured through excess mortality estimates that are also influenced by other non climatic factors, numbers between data sources differ significantly.

According to the World Meteorological Organisation, [weather-related disasters increased globally over past 50 years](#), causing more damage but fewer deaths. Almost every study of significant heatwaves since 2015 has found that probability has been significantly increased by anthropogenic climate change. The attribution of drought events to anthropogenic factors is not as clear as for heatwaves because of natural variability caused by large oceanic and atmospheric oscillations. The trends in global data on losses and fatalities are less clear in data for Europe only. Statistically, 3% of the total number of climate and weather extreme events are responsible for around 60% of the losses over the period 1980-2020 and there are large inter-annual variabilities and differences between datasets. The CATDAT data show steadily increasing average annual (inflation-corrected) total losses over the decades from EUR 10.0 billion (1981-1990) till EUR 14.7 billion (2011-2020). In the NatCatSERVICE data the highest annual losses are registered in the decade 2001-2010 with EUR 13.1 billion and no increasing linear trend is seen (see Figure 2c and 2d).

Figure 3 presents in the 2 upper maps (3a and 3b) the total economic losses per person (left) and square kilometre (right). Based on the CATDAT data, the highest losses per capita were recorded in Switzerland, Slovenia and France, and the highest losses per area (square

kilometre) were in Switzerland, Germany and Italy. In the NatCatSERVICE data the highest losses per capita are registered in Switzerland, Luxembourg and Denmark and per area in Switzerland, Malta and Luxembourg. Based on the CATDAT data the lowest values per capita were registered in Liechtenstein, Turkey and Iceland and per area in Iceland, Norway and Liechtenstein. Based on the NatCatSERVICE data the lowest values are found in Estonia, Iceland and Turkey per capita and per square kilometre.

Here a paragraph will be added about the total economic losses versus the GDP. It will refer to a map (Figure 3d, lower right panel), similar to the one presented in a previous version of the indicator on economic losses on weather and climate related events:

<https://www.eea.europa.eu/data-and-maps/figures/shares-of-total-losses-in>.

Projections

Climate change is not the only driver defining future economic losses. Increased adaptive capacity due to adaptive measures but also increased vulnerability due to economic development and (in Europe to a lower degree) demographic evolutions will define future economic, social and environmental losses from weather and climate-related events. In addition, there is a high inter-annual variability of extreme events. Modelling all these effects with sufficient accuracy is not possible. Under similar economic conditions, the impact of climate change can be estimated.

For Europe, this is for example done by the Joint Research Centre of the European Commission in the [PESETA IV](#) project. PESETA IV looks at different hazards like heat and cold waves (human impact), windstorms, water resources, droughts, river and coastal floods and wildfires, but also at different sectors and systems like forests, agriculture or energy. With climate measures in line with the Paris Agreement, 60 000 annual fatalities due to heatwaves can be avoided by the end of the century compared to a 3°C temperature increase scenario compared to the pre-industrial level and annual drought losses would be reduced by EUR 20 billion per year. For flooding, damage from river floods can be halved to around EUR 24 billion per year and economic losses from coastal flooding could be lowered by more than EUR 100 billion per year in 2100.

Other estimates can be found in the [G20 Risk Atlas](#), where for the European Union (EU-27) and the G20 countries like France, Germany, Italy or Turkey, economic impacts for different sectors are estimated under different climate scenarios. Only for river flooding and in a relatively moderate temperature increase scenarios, expected annual damages can amount to roughly EUR 21 billion by mid-century and EUR 30-40 billion end of century. Under a high emissions scenario, losses could reach over EUR 70 billion by the end of the century.

Policy context

Under the umbrella of the [European Green Deal](#), the European Commission presented in February 2021 a new [EU Adaptation Strategy](#) “Forging a climate-resilient Europe”, suggesting action for smarter, faster, more systemic adaptation and with renewed attention for the international dimension. As part of the smarter adaptation objective, more and better climate-related risk and losses data are requested as these kind of data are crucial to improve the accuracy of climate risk assessments.

While no standardised public datasets with economic losses are available for Europe based on public records from countries, the European Commission promotes public private partnerships to collect and share these data in the future. At some point in future, these public data will also become the data source for [EEA's indicator on economic losses and fatalities from weather and climate related events](#).

In May 2021, the European Commission published a [staff working document](#) "Closing the climate protection gap - Scoping policy and data gaps". In this document, macro-economic, micro-economic and data aspects are analysed to conclude that the climate protection gap is already large and may grow over time unless public authorities, the insurance sector and other stakeholders take steps to reduce it. Collecting data on total economic and insured losses in a comparable way across countries is one of the basic activities needed. There are clear links to the [EU's renewed sustainable finance strategy](#) and EIOPA's natural catastrophe dashboard (see Future work).

Losses and fatalities due to extreme events are also informing the [EU civil protection mechanism](#) and the European disaster risk management. An "[overview of natural and man-made disaster risks the European Union may face](#)" builds on information reported by national authorities in their national risk assessments (including projected impacts due to climate change) as well as on the latest available evidence from the Commission's cross-sectoral policy, operational and scientific work on disaster risk.

At the international level, the [Sendai Framework on Disaster Risk Reduction](#) (SFDRR) has 38 [indicators](#) to measure progress under the seven targets. Also the [Sustainable Development Goals](#) (SDGs) have an international indicator set where 232 unique indicators track the progress of the 169 SDG targets for the 17 SDGs. Information on economic losses and human impacts are part of the indicator framework of both the SFDRR and the SDGs.

The [Paris Agreement](#) reaffirmed the [Warsaw International Mechanism](#) for Loss and Damage as the main vehicle under the UNFCCC process to avert, minimize and address loss and damage associated with climate change impacts, including extreme weather events and slow onset events. The Paris Agreement also requested what is named the [Fiji Clearing House for Risk Transfer](#) that serves as a repository for information on insurance and risk transfer, in order to facilitate the efforts of Parties to develop and implement comprehensive risk management strategies.

The [Glasgow Climate Pact](#) agreed at the [26th Conference of the Parties \(COP26\)](#) of the United Nations Framework Convention on Climate Change (UNFCCC) acknowledges that climate change has already caused and will increasingly cause loss and damage and that, as temperatures rise, impacts from climate and weather extremes, as well as slow onset events, will pose an ever-greater social, economic and environmental threat. The pact as well acknowledges the importance of coherent action to respond to the scale of needs caused by the adverse impacts of climate change.

Future work

What started as an [EEA core set indicator](#) "Economic losses from climate-related extremes in Europe" became a product serving multiple EU policies. For several years, an adapted version of the indicator is part of the 100 indicators used to measure [EU progress on the SDGs](#) managed by Eurostat. EIOPA, the European insurance and occupational pension authority, is

mandated to develop [natural catastrophe dashboard](#). EEA provides data supporting the further development and update of this dashboard, and EEA and EIOPA are working together on developing the knowledge base on physical risks and the protection gap in Europe.

The data and indicators were a key source in the [staff working document](#) “Closing the climate protection gap - Scoping policy and data gaps” prepared by a large group of Directorates general of the European Commission and EU Agencies under the coordination by the Directorate General for Climate Action, as well as for the [staff working document](#) “Overview of natural and man-made disaster risks the European Union may face” by the Directorate General for Civil Protection and Humanitarian Aid.

Further future collaboration under development are the potential use of information in the indicators to measure the progress under the [Eighth Environmental Action Programme of the EU](#), the [Green Resilience Dashboard Indicators](#) of the Joint Research Centre and the future Fiscal Sustainability Reporting by the Directorate General for Economic and Financial Affairs.

Beyond supporting other EU services, the EEA will make methodological improvements to the work on economic losses, insured economic losses and fatalities, including aspects like

- the normalisation of losses and trend analysis;
- the combination of observed and modelled loss data;
- the distribution of losses from cascading effects;
- expanding the dataset with the west Balkans countries; and
- more detailed statistics for specific regions within Europe or single hazards (e.g. droughts in the Mediterranean).

With the publication of the EU Adaptation Strategy and the Closing the protection gap staff working document, there is a momentum to build public European datasets on total and insured economic losses and human impacts from weather and climate related events. EEA will support the Joint Research Centre, who is mandated to collect and distribute the information from public sources on, based on the knowledge gathered in this topic over the last decade. As for several reporting mechanisms on climate risks and climate change adaptation, collecting data at European level is less detailed than the information available at national or even (sub-national) regional level. The added value is in the comparability of information from different countries.

Here a paragraph will be added [with an example](#) of activities at national level, referring to a Box 2 about the activities in Germany.

Below, screenshots of figures are added for your information. All figures and maps will be drafted as EEA figures during and after the consultation phase. The table and graphs already present information for 1980-2021, while the maps present older information (until 2017 or 2019, depending on the information presented).

Box 1 – Additional data sources for EEA work on economic losses and fatalities

For a decade, the European Environment Agency (EEA) receives an extract, covering all [32 EEA member countries](#), from the [NatCatSERVICE database](#) from MunichRe GmbH under institutional agreement and where contractual terms about disclosure apply. For a long time, this was [one of the only databases](#) focussing on all natural hazards and on the total and insured losses. EEA did not get the final figures for its indicator but did the analysis on the (semi-)raw information extracted from NatCatSERVICE. Nowadays, more data are available compared to a decade ago. To be able to make more detailed analyses – and publish the results – EEA since 2021 also procures the CATDAT database from RiskLayer GmbH.

Although similar in scope, the data are not identical. Each of these datasets is constructed based on a series of explicit and implicit choices and assumptions. The “correct” dataset does not exist! There is only the expectation that each of the datasets are internally as coherent as possible. Therefore, the EEA presents in this briefing the data from both sources next to each other, without gap filling or combining the data.

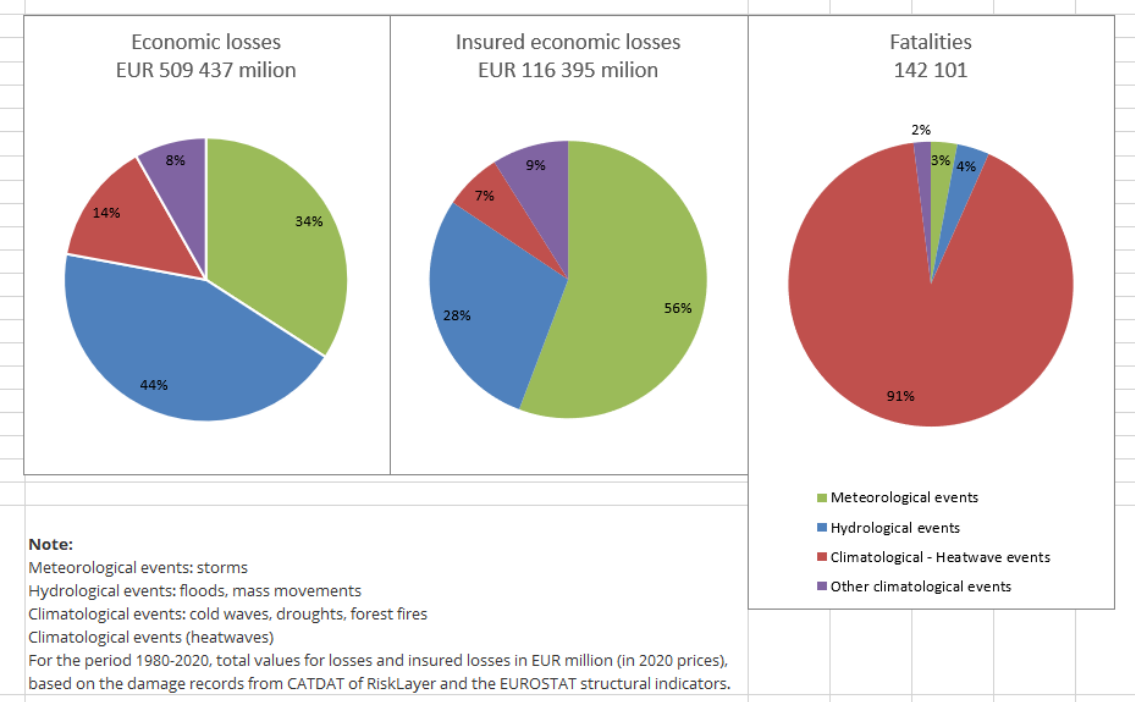
EEA always valued and continues to value the collaboration with MunichRe highly and understands the limitations that come with the data agreement. At the same time, there is a permanent and ever stronger request for more detailed analyses, presenting information for individual hazards, per decade, per regions etc. While restrictions remain on the disclosure of data, the CATDAT database creates the possibility to make these additional assessments available in the future.

Figure 1 - Impacts of extreme weather and climate related events in the EEA member countries (1980-2020)

Name	CATDAT			NatCatSERVICE		
	Losses	Insured losses	Fatalities	Losses	Insured losses	Fatalities
	<i>million EURO</i>	<i>million EURO</i>		<i>million EURO</i>	<i>million EURO</i>	
Austria	11353	2219	702	15642	4964	762
Belgium	2974	1364	4642	5589	3322	2172
Bulgaria	3798	70	211	2969	156	209
Croatia	2860	83	896	3177	76	722
Cyprus	381	7	63	388	8	81
Czechia	13888	1382	1488	12230	3969	233
Denmark	8137	4521	279	11143	6568	49
Estonia	246	36	5	140	36	10
Finland	2071	64	2	2095	438	4
France	98994	40239	26775	71371	34734	23693
Germany	107572	39775	42394	110877	52979	11131
Greece	10394	1603	4618	7741	146	2567
Hungary	5900	15	870	6317	152	709
Ireland	2968	483	62	4600	2395	71
Italy	90061	5098	21603	74834	4256	20834
Latvia	971	52	86	713	52	107
Lithuania	1359	7	70	1416	7	75
Luxembourg	596	218	170	1000	590	130
Malta	50	0	5	151	26	7
Netherlands	9288	5086	3919	9590	4664	1734
Poland	16050	1098	2121	16205	1072	1271
Portugal	13461	478	9267	8094	664	3120
Romania	13990	151	1340	12555	67	1334
Slovenia	3747	1603	311	1872	228	246
Slovakia	1497	66	103	1801	116	133
Spain	60976	2508	16181	46438	11887	14709
Sweden	3423	1047	43	4321	1268	51
Iceland	20	0	2	89	48	52
Liechtenstein	1	0	0	15	3	1
Norway	1567	754	31	3329	1794	59
Switzerland	16396	6025	2232	19909	10211	1352
Turkey	4449	343	1610	3742	504	1897

Figure 2 - Economic damage caused by weather and climate-related extreme events in EEA member countries (1980-2020)

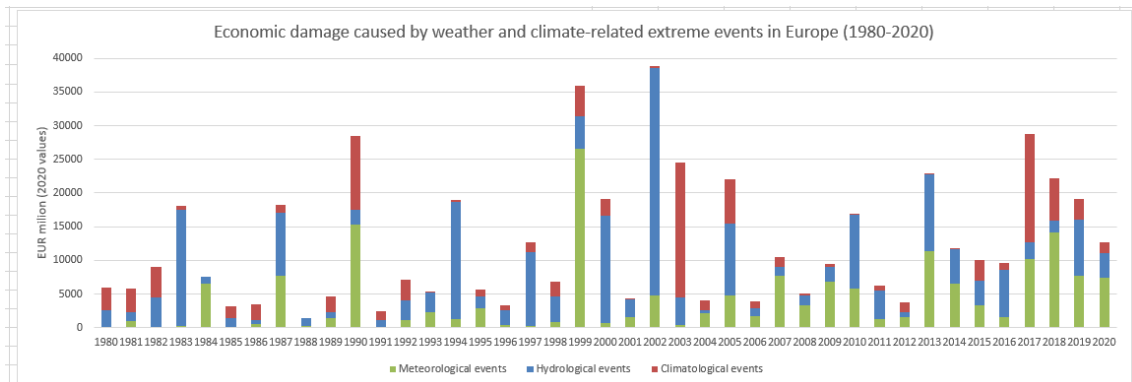
2a)



2b)



2c)



Note:

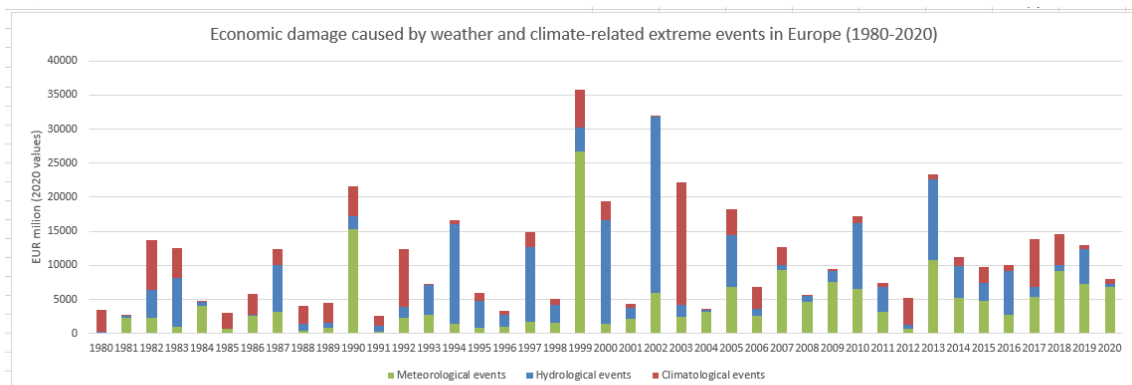
Meteorological events: storms

Hydrological events: floods, mass movements

Climatological events: heatwaves, cold waves, droughts, forest fires

For the period 1980-2020, economic losses in EUR million (in 2020 prices), based on the damage records from CATDAT of RiskLayer and the EUROSTAT structural indicators.

2d)



Note:

Meteorological events: storms

Hydrological events: floods, mass movements

Climatological events: heatwaves, cold waves, droughts, forest fires

For the period 1980-2020, economic losses in EUR million (in 2020 prices), based on the damage records from NatCatSERVICE of Munich Re and the EUROSTAT structural indicators.

Notes:

Geophysical events: earthquakes, tsunamis, volcanic eruptions

Meteorological events: storms

Hydrological events: floods, mass movements

Climatological events: cold waves, droughts, forest fires

Climatological events (heatwaves)

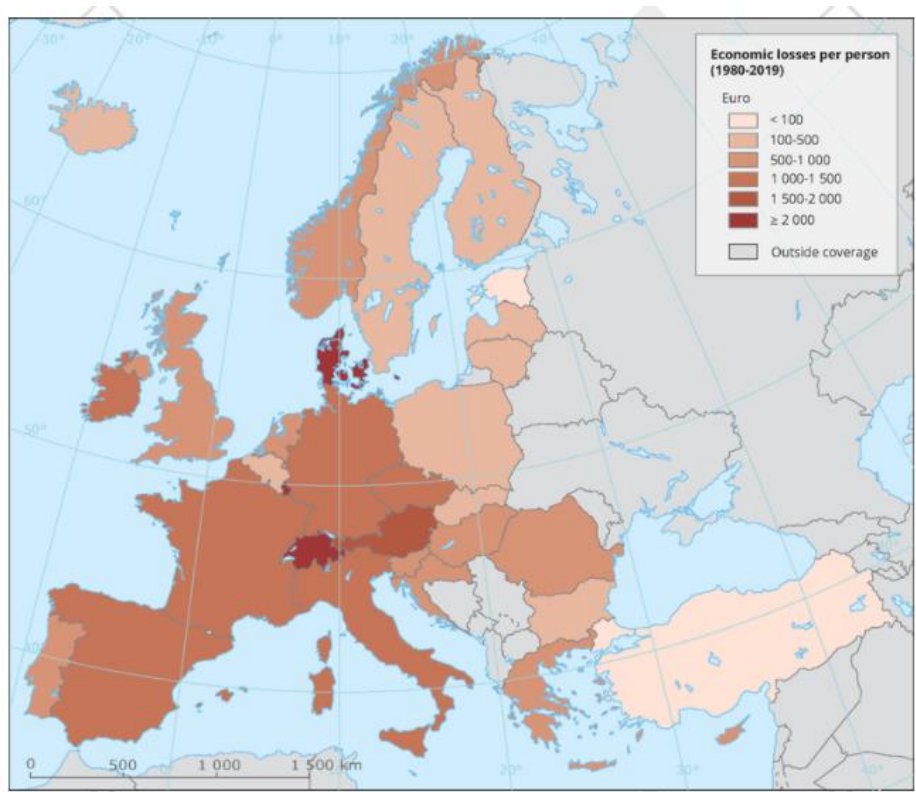
For the period 1980-2020, total values for losses and insured losses in EUR million (in 2021 prices).

Sources:

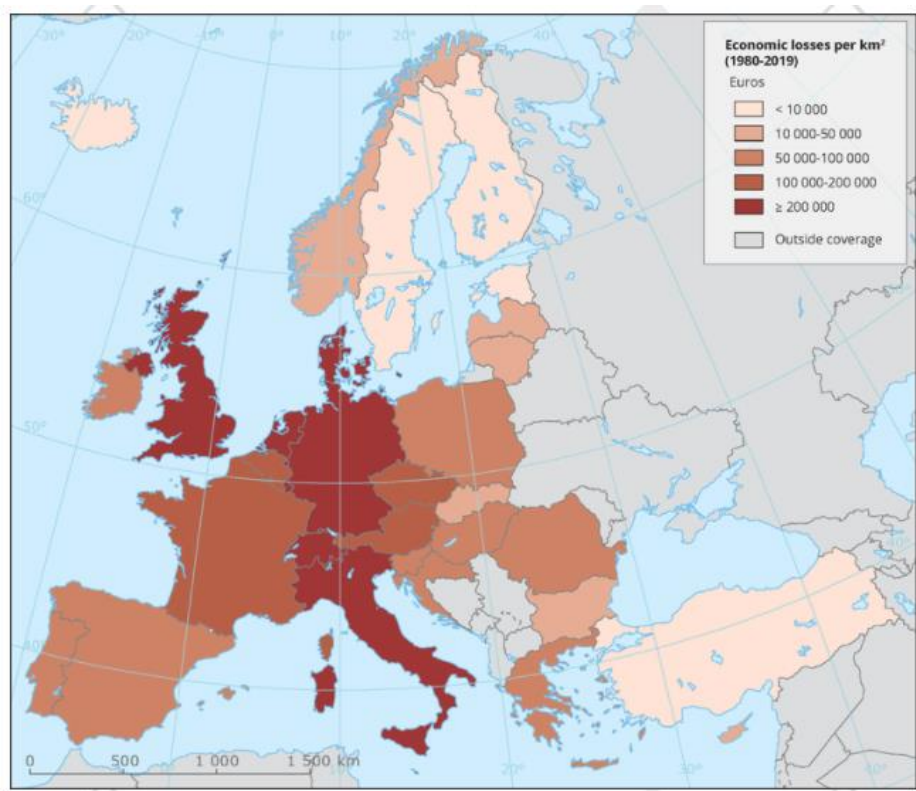
Based on the Eurostat structural indicators (all panels) and the damage records from CATDAT (RiskLayer) (left panels) and NatCatSERVICE (Munich Re) (right panels)

Figure 3 - Impacts of extreme weather and climate related events in the EEA member countries (1980-2020)

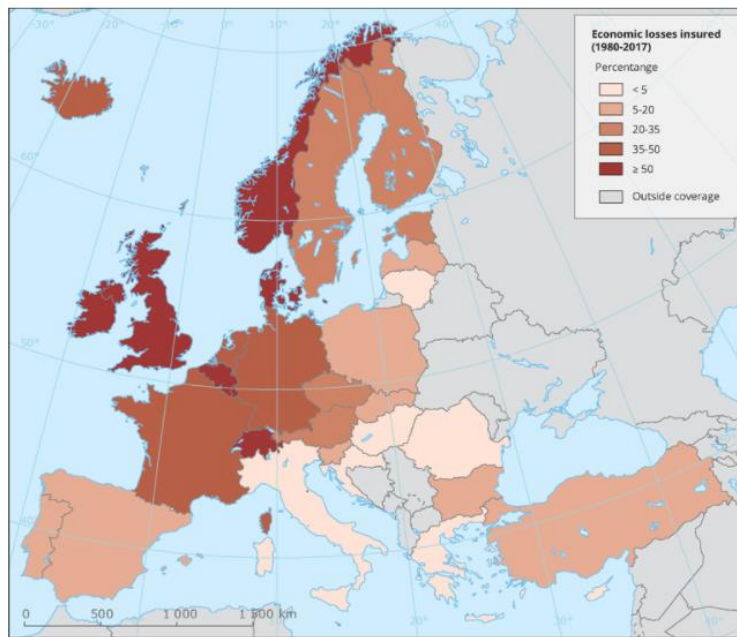
3a)



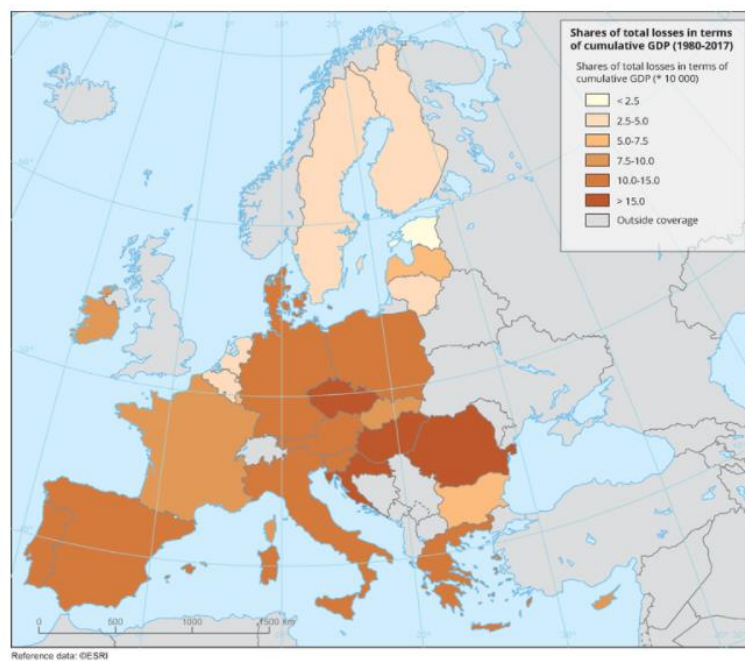
3b)



3c)



3d)



a) economic losses per capita (Euro), b) economic losses per area (sq.km) (Euro), c) insured economic losses as a fraction of total economic losses (in %) and d) total economic losses (1980-2020) as a fraction of total GDP (2006-2015) (in %)

Notes:

For the period 1980-2020, Euro values in 2021 prices.

Sources:

All panels based on damage records from CATDAT (RiskLayer) and the Eurostat structural indicators.

Box 2 - Collecting data on economic losses and fatalities in Germany

Information under development

The European Environment Agency (EEA) is an agency of the European Union. The EEA aims to support sustainable development and to help achieve significant and measurable improvement in Europe's environment, through the provision of timely, targeted, relevant and reliable information to policymaking agents and the public. For more information, visit: eea.europa.eu.

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