



CLIMATE CHANGE THREATENS EUROPEAN TOURISM: ASSESSING ECONOMIC COSTS AND URGENT ACTIONS

**Now is the time for bold, decisive measures to
mitigate climate risks and ensure the resilience and
sustainability of the EU tourism sector.**

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Abstract

This report highlights the urgent need for action to address the impacts of climate change on the tourism sector in the European Union (EU). Failing to act has dire consequences, including significant economic losses, environmental degradation, social disruptions, and reputational risks. Reputable studies and international treaties emphasize the urgency of proactive measures to mitigate climate risks and promote sustainable tourism development. With the temperature increase surpassing the targets set by the Paris Agreement, assertive action is imperative to ensure the resilience and sustainability of the EU tourism sector.

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1- Introduction

A multifaceted landscape emerges when examining the economic **costs of inaction** on climate change for the tourism sector within the European Union (EU).

Coastal regions along the Mediterranean and Atlantic coastlines, integral to the EU's tourism appeal, face imminent threats from sea-level rise and extreme weather events. Venice in Italy and the Balearic Islands in Spain serve as stark examples, susceptible to flooding and erosion that strain local economies and **deter future investments in tourism infrastructure**. Moreover, the EU's rich natural attractions, from Alpine glaciers to Mediterranean coral reefs, face degradation due to climate change.

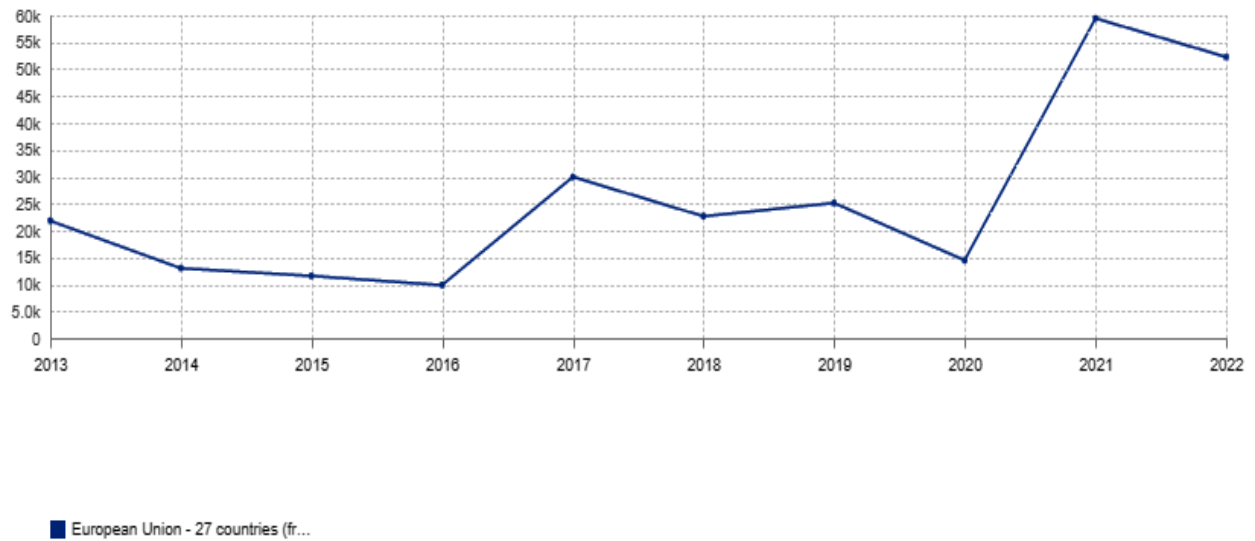
The consequences extend beyond environmental loss, impacting tourist numbers and revenues. **Climate change disrupts seasonal tourism** activities across the EU, affecting winter sports in the Alps and Pyrenees and altering outdoor pursuits like hiking and wildlife watching continent-wide. Furthermore, rising temperatures pose health risks, particularly in Southern European destinations like Spain and Italy, leading to increased healthcare costs and decreased tourist confidence. Coastal tourism infrastructure, crucial for the EU's economic well-being, faces **vulnerability from sea-level rise** and **storm surges**, necessitating heavy investments in protective measures.

The tourism industry shoulders the **financial burden of rising insurance premiums**, reflecting heightened climate-related risks. **Reputational damage** looms for EU destinations perceived as neglecting climate action, impacting tourist perceptions and visitation rates. **Economic dependence on tourism**, particularly in Southern and Mediterranean countries, underscores the profound socio-economic consequences of declining tourist numbers and spending.

Coordinated efforts at the national, regional, and EU levels are imperative to address these challenges. Investing in climate resilience, promoting sustainable tourism practices, and transitioning to low-carbon economies are vital steps to **mitigate the economic costs of inaction and ensure the long-term sustainability** of the EU's tourism industry.

Climate related economic losses by type of event - values at constant 2022 prices

Time frequency: Annual
Statistical information: Annual value
Stock or flow: Losses
Unit of measure: Million euro



Source of data: European Environment Agency (EEA) (online data code: cli_iad_loss)
Last update: 17/04/2024 23:00

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Figure 1 – Climate related economic losses 2013 – 2022

Source: Eurostat

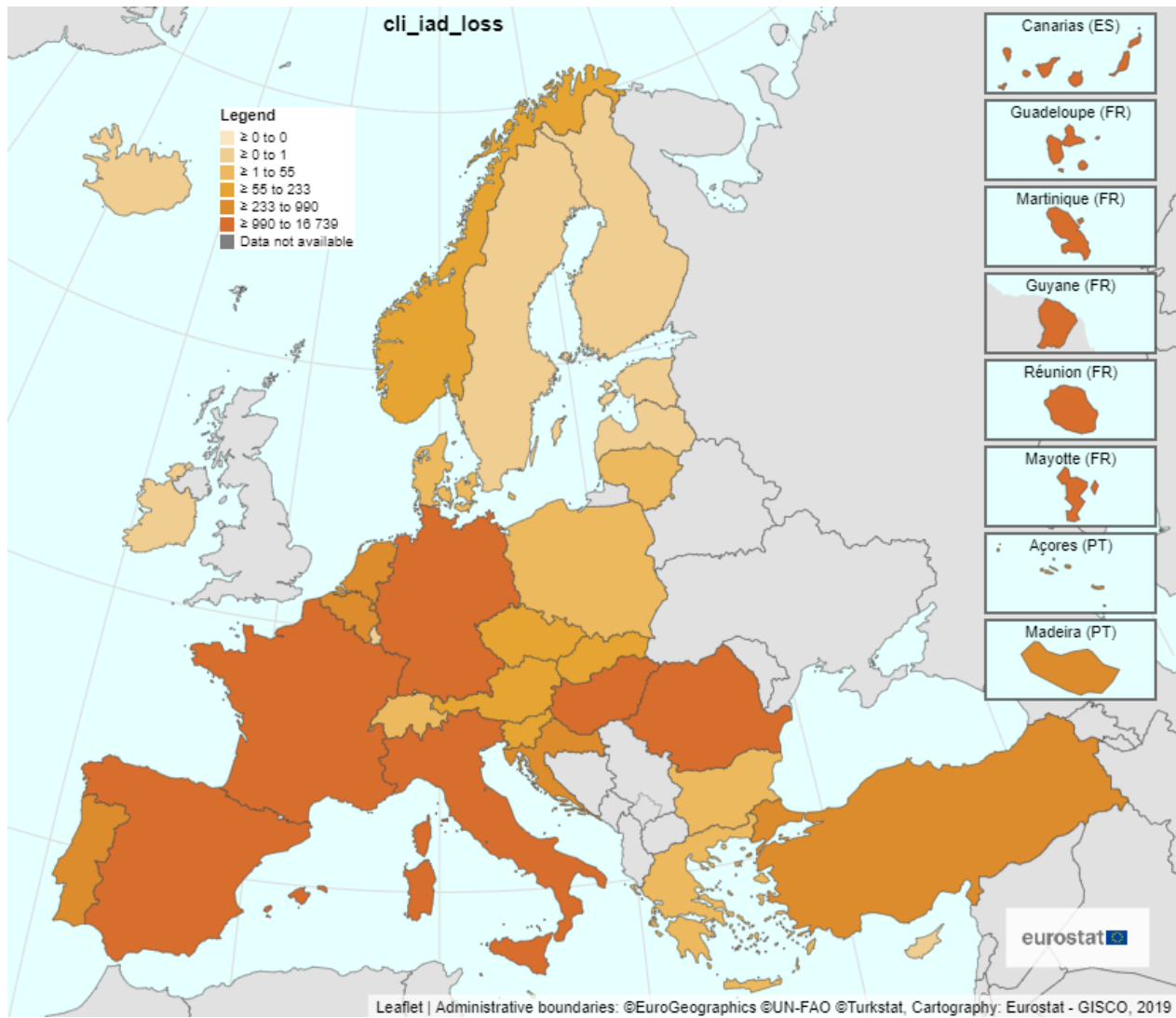


Figure 2 - Map of climate related economic losses 2013 - 2022

Source: Eurostat

2- Understanding the Economic Impact of Climate Change on European Tourism

2.1- Yearly economic damage resulting from extreme weather events in the EU.

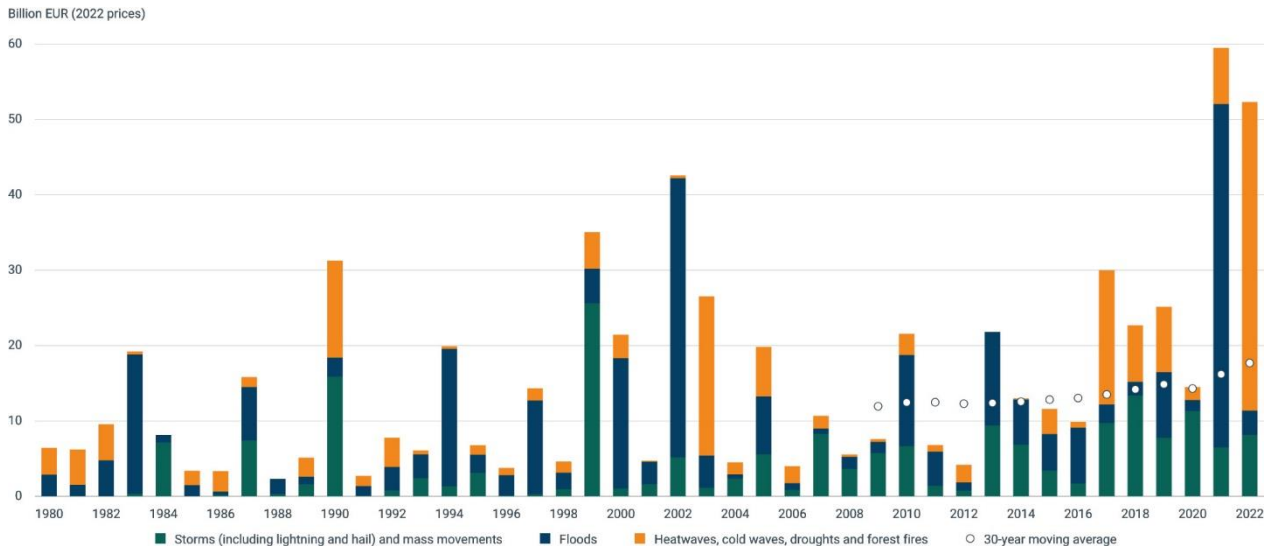


Figure 3 Annual Economic Losses from Weather-Related Extremes in EU

Between 1980 and 2022, climate-related extreme events resulted in an approximate **EUR 650 billion** economic toll in the EU (in 2022 currency values).

Hydrological hazards, primarily floods, accounted for nearly 43% of this total, while **meteorological** hazards, including storms, lightning, hail, and **mass movements**, represented around 29%. Among climatological hazards, **heatwaves** contributed to roughly 20% of the overall losses, with the remaining approximately 8% attributed to **droughts, forest fires, and cold waves** combined.

Notable costly events during this period include:

- the 2021 flooding in Germany and Belgium (EUR 44 billion)
- the 2022 compound drought and heat events across Europe (EUR 40 billion)
- the 2002 flood in central Europe (EUR 34 billion)
- the 1999 storm Lothar in Western Europe (EUR 17 billion)
- the 2003 EU-wide drought and heatwave (EUR 17 billion)
- the 2000 flood in France and Italy (EUR 14 billion), all calculated at 2022 price levels.

Source: [European Environment Agency](#)

2.2- Future Economic Costs of Climate Change

In the realm of climate change research, forecasting the economic repercussions of extreme weather events remains a daunting challenge. A recent study sheds light on the intricacies of this endeavor, employing a Monte Carlo procedure that delves into climate model projections, empirical models with varied lags, and model parameter estimates. This comprehensive approach seeks to grapple with the multifaceted uncertainties inherent in projecting future climate damages.

The findings reveal a startling reality: projected global damages remain remarkably similar across the most extreme emission scenarios until 2049, as discerned through rigorous statistical analysis. This suggests that the climate damages anticipated within this timeframe are already set in motion, attributable to past emissions and the spectrum of future emission scenarios deemed socio-economically plausible.

The repercussions are profound. Globally, a **permanent income reduction averaging 19%** (population-weighted average) is anticipated compared to a baseline devoid of climate change impacts. This reduction, falling within the likely range of 11-29% as classified by the Intergovernmental Panel on Climate Change (IPCC), marks a significant setback in economic prosperity. Notably, this income decline persists across most regions, including North America and Europe, with median reductions of approximately 11%, while South Asia and Africa bear the brunt, facing median income reductions of about 22%.

Under the scenario of Shared Socio-economic Pathway 2 (SSP2), depicting a middle-of-the-road trajectory of future income development, **global annual damages in 2049** are projected at a staggering **38 trillion 2005 international dollars**, with a likely range of **19-59 trillion**. This sobering figure underscores the urgency of proactive measures to mitigate climate change impacts and bolster resilience in vulnerable regions.

Moreover, the study highlights the importance of adopting robust methodologies in assessing climate impact persistence. By navigating between empirical specifications assuming pure growth or level effects, the preferred specification provides a conservative estimate that lies between these extremes.

As the world grapples with the looming specter of climate change, these projections serve as a stark reminder of the imperative to act decisively. From policymakers to global leaders, the call to prioritize climate resilience and sustainability grows ever more urgent. Only through concerted efforts and forward-thinking initiatives can we hope to mitigate the profound economic costs projected for our future.

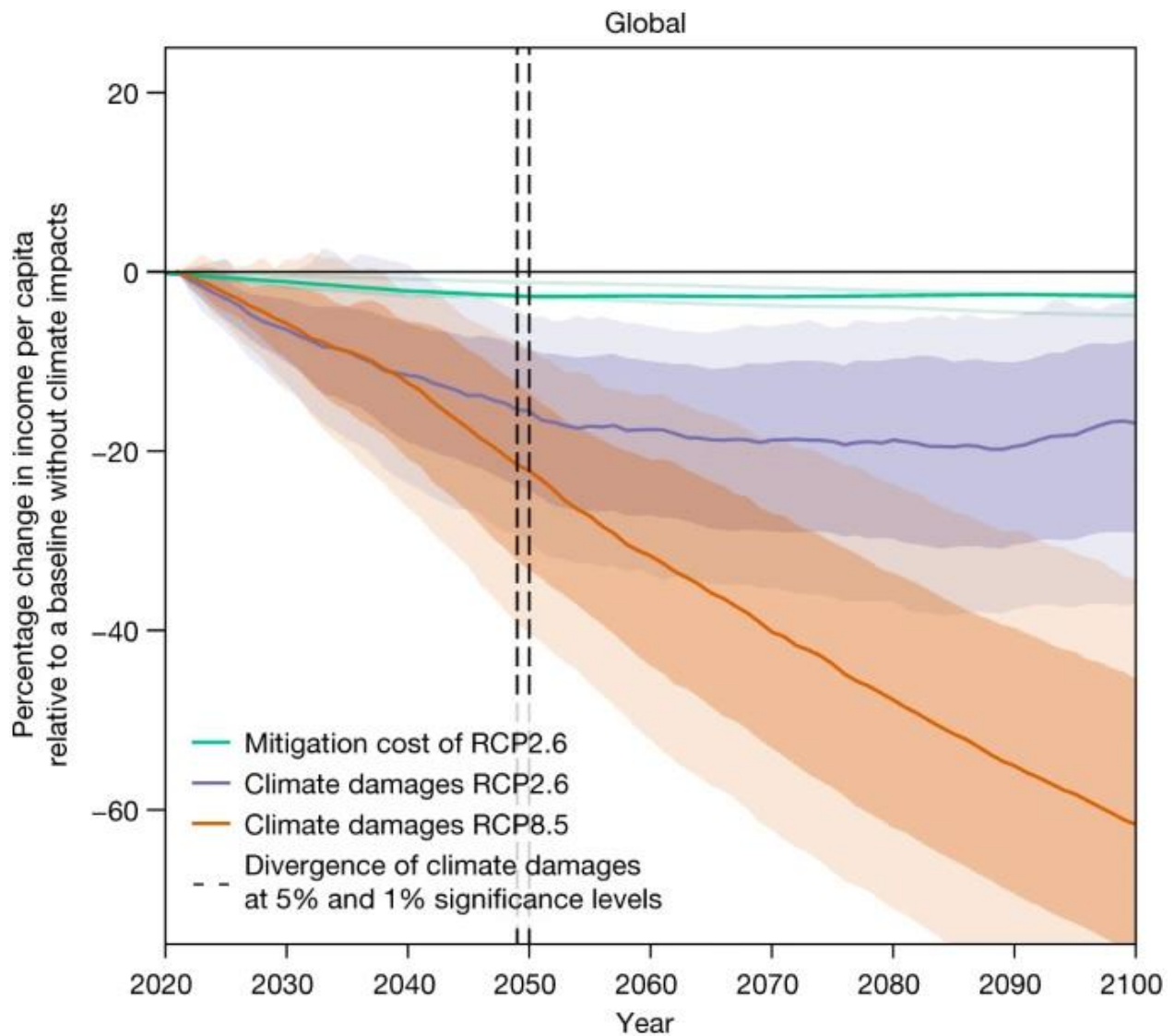
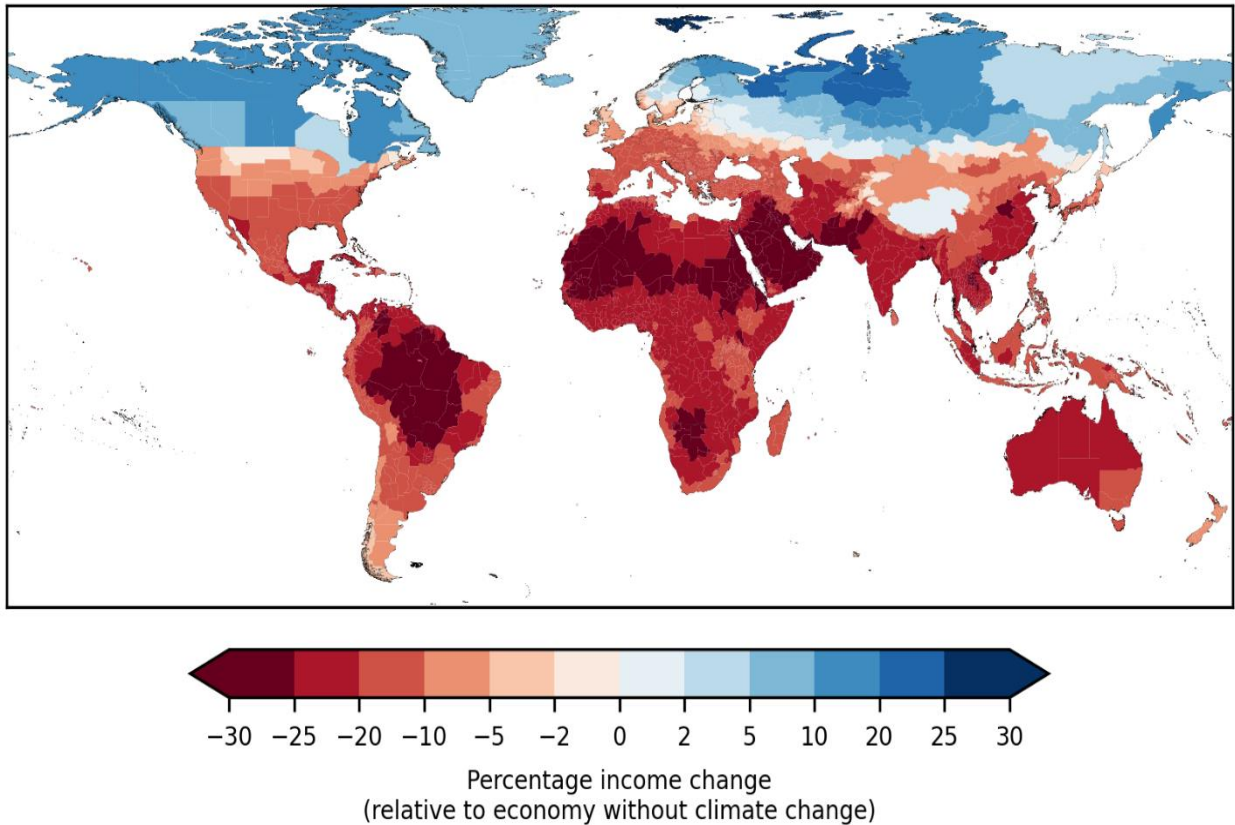


Figure 4 Estimates of the projected reduction in income per capita.

Damages already outweigh mitigation costs!

We compare the damages to which the world is committed over the next 25 years to estimates of the mitigation costs required to achieve the Paris Climate Agreement. Taking estimates of mitigation costs from the three integrated assessment models (IAMs) in the IPCC AR6 database²³ that provide results under comparable scenarios (SSP2 baseline and SSP2-RCP2.6, in which RCP stands for Representative Concentration Pathway), we find that the median committed climate damages are larger than the median mitigation costs in 2050 (six trillion in 2005 international dollars) by a factor of approximately six.



Significant decreases in income are anticipated across many regions, including North America and **Europe**, with South Asia and Africa facing the most severe impacts. These reductions stem from climate change's effects on key factors crucial for economic development, such as agricultural output, labor efficiency, and infrastructure integrity. The global annual damage will reach **\$38 trillion by 2050, with a probable range of \$19-59 trillion**. These damages primarily arise from escalating temperatures, alongside alterations in precipitation patterns and temperature fluctuations. Additionally, factoring in other weather extremes like storms or wildfires could exacerbate the situation further.

Source: Kotz, M., Levermann, A. & Wenz, L. *The economic commitment of climate change*. *Nature* 628, 551–557 (2024). <https://doi.org/10.1038/s41586-024-07219-0>.

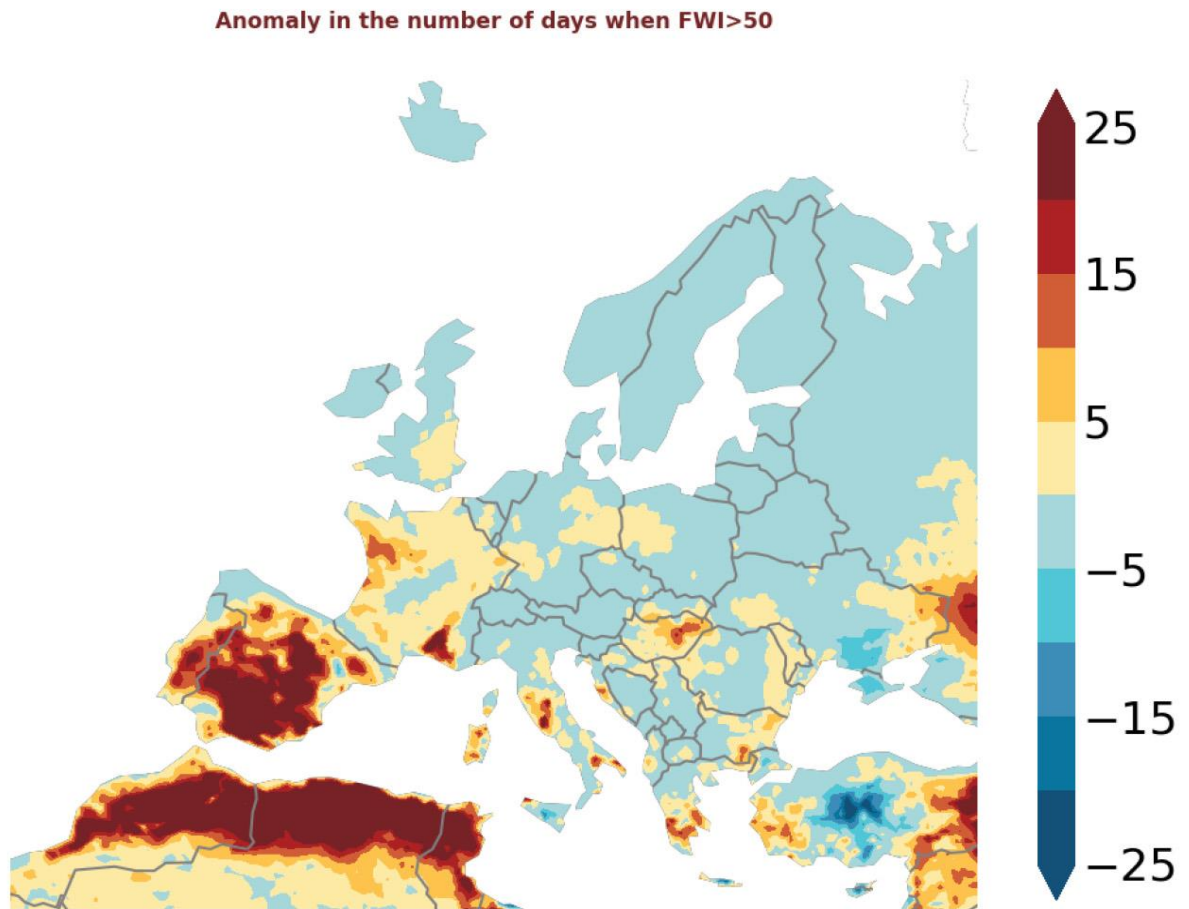
3- Physical Impact of Climate Change on Tourism

3.1- Physical Damage

Physical damage caused by climate change poses significant risks to tourism infrastructure in various European Union (EU) countries, particularly in coastal and mountainous regions. Here are some examples illustrating the impact of climate change on physical damage within the EU tourism sector.

- 1. Coastal Vulnerability Across Europe:** Numerous EU countries face coastal erosion and flooding risks due to climate change. For instance, in Portugal, the Algarve region's sandy beaches, a major draw for tourists, are under threat from rising sea levels and storm surges. Beach erosion not only affects tourism but also endangers coastal infrastructure, such as hotels and restaurants. Similarly, Croatia's Adriatic coastline, dotted with historic towns like Dubrovnik, is vulnerable to erosion and inundation, impacting its UNESCO World Heritage sites and coastal tourism activities.
- 2. Nordic Challenges in Scandinavia:** Climate change impacts are evident even in northern European countries like Sweden and Finland. In Sweden, the iconic [Icehotel in Jukkasjärvi](#) faces uncertainties as warming temperatures affect the stability of its ice structures. Additionally, Lapland's winter tourism, centered around activities like husky sledding and Northern Lights viewing, is at risk due to decreasing snow cover. Finland's Baltic Sea archipelago, a haven for summer tourists, is susceptible to storm damage and shoreline retreat, threatening its rustic cottages and eco-tourism ventures.
- 3. Flood Risks in the Low Countries:** Belgium and the Netherlands, with their extensive coastlines and low-lying terrain, are particularly vulnerable to sea-level rise and flooding. Belgian seaside resorts like Knokke-Heist are investing in coastal defenses to protect against erosion and storm surges. Meanwhile, the Netherlands' iconic windmills and tulip fields are at risk from inundation, highlighting the need for innovative water management solutions. Amsterdam, a major European tourist hub, faces threats to its historic canal system and cultural heritage sites due to climate-related flooding.
- 4. Mountainous Concerns in Central Europe:** Alpine countries such as Austria and Switzerland are witnessing dramatic changes in their [mountain landscapes](#). Austria's Tyrolean villages, known for their ski slopes and alpine charm, are adapting to shorter winter seasons and unpredictable snowfall patterns. In Switzerland, the melting glaciers of the Jungfrau region are affecting not only the iconic Jungfrauoch railway but also the region's tourism-dependent economy. Moreover, extreme weather events like flash floods pose risks to mountain communities and outdoor recreation activities across the Alps.
- 5. Mediterranean Pressures in Southern Europe:** Southern European countries like Italy and Greece are grappling with the impacts of climate change on their coastal and island tourism hotspots. Italy's Amalfi Coast, celebrated for its rugged cliffs and picturesque

villages, faces threats from coastal erosion and landslides, endangering its historic landmarks and luxury resorts. Greece's Cycladic islands, including Santorini and Mykonos, are at risk from sea-level rise and heatwaves, affecting tourism infrastructure and traditional lifestyles. Additionally, wildfires in Mediterranean countries like Spain and Portugal pose dangers to rural tourism areas and natural reserves, necessitating robust fire prevention measures and emergency response strategies.



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Figure 5 Anomaly in the number of days in 2022 with Fire Weather Index > 50, relative to the average for the 1991–2020 reference period. These conditions are when ‘critical’ fires, those above 10,000 ha.

Persistent drought and extreme temperatures throughout the summer months resulted in a substantial increase in the number of days with FWI above 50 in southwestern areas. In Mediterranean Europe, such FWI values identify ‘extreme’ fire danger.

Data source: FWI based on ERA5. [Credit: Copernicus EMS/ECMWF.](#)

3.1.1 - Case: snow precipitations

In the year 2022, significant portions of western Europe grappled with notable precipitation deficits at the start of the year. This was characterized by substantially lower-than-average total rainfall and a reduced frequency of wet days. Specifically, in January, regions most affected included the northwestern area of the Iberian Peninsula, France, the United Kingdom, Ireland, Italy, and southeastern Europe. Throughout February, this trend persisted across these regions, except for the United Kingdom and Ireland, where rainfall exceeded seasonal averages. The diminished winter precipitation was attributed to anomalies in atmospheric circulation associated with a positive phase of the North Atlantic Oscillation. By March, the deficiency in precipitation had extended across much of Europe, with particularly severe shortages observed, notably along the Alps. The Iberian Peninsula, particularly its Mediterranean coast, stood out as the sole region experiencing precipitation levels above the seasonal average during this time frame in 2022.

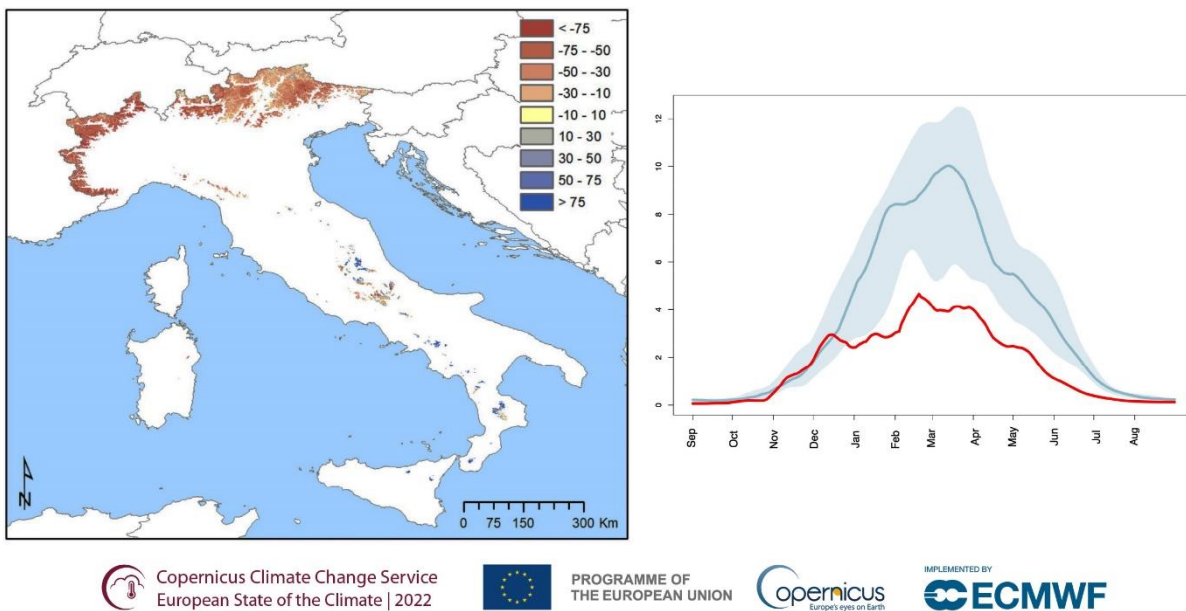
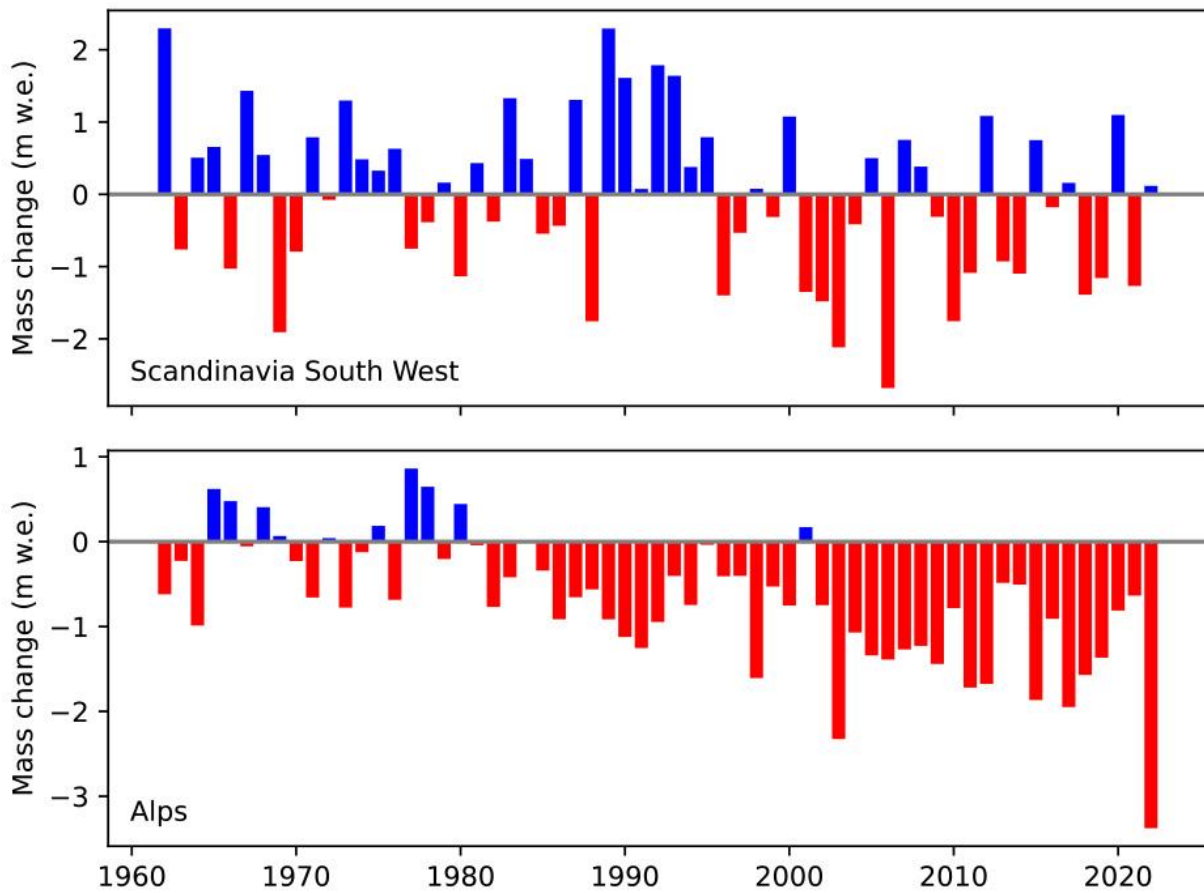


Figure 6 Snow water equivalent in the Italian Alps: 2022 anomaly.

Snow water equivalent in the Italian Alps: 2022 anomaly (%) relative to the average for the 2010–2021 reference period (left); and from 1 September 2021 to 31 August 2022 (right), with volume (Gm³, red line), 2010–2021 median (blue line) and the upper and lower terciles (shaded area).

Data source: CIMA Research Foundation. Credit: European Commission Joint Research Centre/CIMA Research Foundation.



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Figure 7 Annual glacier ice mass changes in 'metre water equivalent (m w.e.)' in southwestern Scandinavia (top) and in the European Alps (bottom) from 1962 to 2022 for glaciers with long-term records.

Data source: CIMA Research Foundation. Credit: European Commission Joint Research Centre/CIMA Research Foundation.

3.2- Loss of Natural Attractions

The loss of natural attractions due to climate change presents a pressing challenge for the tourism sector across the European Union (EU). From coral collapse in the Mediterranean to glacial retreat in the Alps, iconic landscapes and biodiversity hotspots are facing unprecedented threats. As warming temperatures, ocean acidification, and extreme weather events intensify, countries like Spain, Italy, Switzerland, and Finland are witnessing declines in marine ecosystems, alpine glaciers, and wildlife populations. These changes not only diminish the scenic beauty and ecological diversity of natural areas but also undermine the appeal of tourism destinations that rely on outdoor recreation, wildlife viewing, and eco-tourism experiences. In this context, understanding the specific examples of loss of natural attractions within the EU is crucial for informing adaptive strategies, conservation efforts, and sustainable tourism practices aimed at preserving valuable ecosystems and safeguarding the long-term viability of the tourism industry.

1. **Coral collapse in the Mediterranean:** The Mediterranean Sea, a popular destination for diving and snorkeling, is experiencing coral bleaching events due to rising water temperatures and ocean acidification. Countries like Spain, Italy, and Greece are witnessing declines in coral reef health, impacting marine biodiversity and underwater tourism experiences. For instance, the Calanques National Park in France and the Cala d'Hort Marine Reserve in Spain's Balearic Islands are grappling with coral degradation, affecting their appeal to eco-tourists and scuba divers.
2. **Glacial Retreat in the Alps:** The European Alps, known for their majestic glaciers and alpine landscapes, are facing rapid glacial retreat due to global warming. Countries like Switzerland, Austria, and France are witnessing the loss of iconic glaciers such as the Aletsch Glacier and the Mer de Glace. This not only diminishes the scenic beauty of alpine regions but also affects activities like glacier trekking and mountaineering. For example, the Mont Blanc Massif, shared by France and Italy, is experiencing significant glacier melt, posing challenges for tourism operators and alpine guides.
3. **Wildlife Decline in the Baltic Sea:** The Baltic Sea region, encompassing countries like Sweden, Finland, and Estonia, is witnessing declines in marine biodiversity and wildlife populations due to climate change impacts such as warming waters and habitat degradation. Iconic species like the Baltic ringed seal and the Baltic herring face threats from changing environmental conditions, affecting ecotourism opportunities and nature-based experiences. Efforts to conserve marine ecosystems, such as the Archipelago National Park in Finland and the Stockholm Archipelago in Sweden, are crucial for maintaining tourism appeal and supporting local livelihoods.
4. **Migratory Bird Patterns in the Danube Delta:** The Danube Delta, spanning countries like Romania and Ukraine, is a haven for birdwatchers and nature enthusiasts. However, climate change is altering migratory patterns and habitats for bird species such as pelicans, herons, and terns. Changes in water levels and vegetation composition impact bird populations and nesting sites, influencing birdwatching tourism opportunities in the

region. Sustainable management of wetlands and river deltas is essential for preserving the ecological integrity of the Danube Delta and sustaining its appeal as a birdwatching destination.

5. **Forest Fires in Southern Europe:** Southern European countries like Portugal, Spain, and Italy are experiencing more frequent and intense forest fires due to hotter and drier conditions exacerbated by climate change. Protected areas such as Portugal's Peneda-Gerês National Park and Spain's Sierra de Guadarrama are at risk from wildfires, threatening valuable ecosystems and natural attractions. The loss of forest cover and biodiversity not only affects ecotourism activities like hiking and wildlife viewing but also undermines efforts to promote sustainable tourism practices in fire-prone regions.

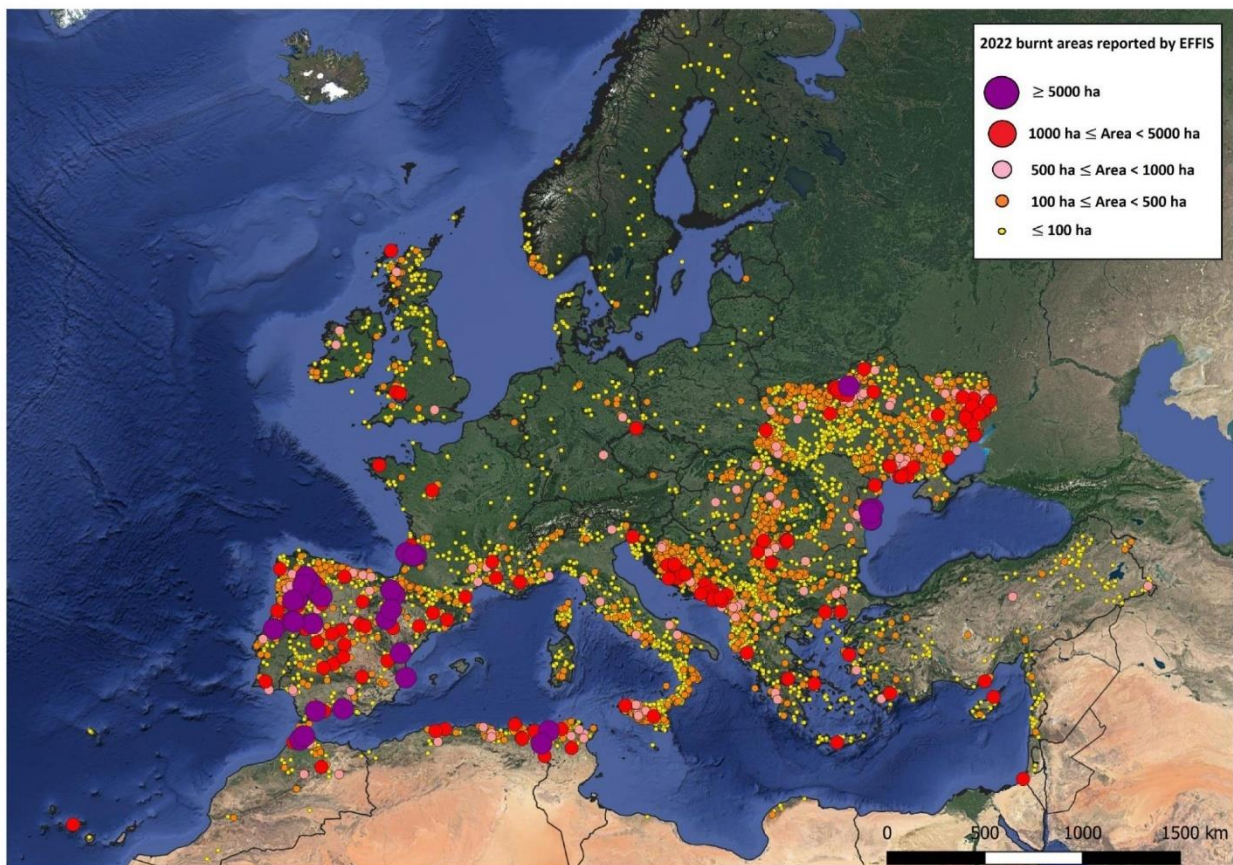


Figure 8 Distribution and extent of burnt areas across Europe and the Mediterranean in 2022.

Data source: European Forest Fire Information System (EFFIS). Credit: EFFIS/Copernicus EMS.

3.3- Impact on Activities

Climate change is reshaping outdoor recreational activities across the European Union (EU), posing challenges for tourism operators, adventure seekers, and nature enthusiasts. As shifting weather patterns, altered ecosystems, and extreme events become more frequent, activities like skiing in the Alps, hiking in the Pyrenees, and beach holidays along the Mediterranean coast are experiencing disruptions.

Some examples of impact on activities:

1. **Skiing in the Alps:** The European Alps, renowned for their pristine slopes and world-class ski resorts, are experiencing shorter winter seasons and unpredictable snowfall patterns due to climate change. Countries like France, Austria, and Switzerland are witnessing declines in snowpack, affecting skiing and snowboarding opportunities. Resorts like Chamonix in France and St. Anton in Austria are investing in snowmaking technology to compensate for reduced natural snowfall, but the long-term viability of alpine tourism is uncertain.
2. **Hiking in the Pyrenees:** The Pyrenees Mountain range, stretching between France and Spain, is a popular destination for hiking, mountaineering, and outdoor adventure. However, changing weather patterns and habitat shifts are impacting hiking trails, wildlife habitats, and alpine ecosystems. Extreme weather events, such as heatwaves and flash floods, pose risks to hikers and disrupt outdoor activities. Sustainable management of mountain landscapes and adaptation measures are necessary to ensure the safety and enjoyment of visitors in the Pyrenees.
3. **Beach Holidays in the Mediterranean:** The Mediterranean coast, spanning countries like Spain, Italy, and Greece, attracts millions of tourists seeking sun, sea, and sand each year. However, rising temperatures and sea levels, coupled with coastal erosion and pollution, are affecting beach quality and water sports activities. Destinations like the Costa del Sol in Spain and the Amalfi Coast in Italy face challenges from beach erosion, seawater contamination, and heat-related health risks for tourists. Sustainable coastal management practices and eco-friendly tourism initiatives are vital for preserving the allure of Mediterranean beach destinations.
4. **Cycling in the Benelux:** The flat terrain and scenic landscapes of Belgium, the Netherlands, and Luxembourg make them popular destinations for cycling enthusiasts. However, climate change-induced heatwaves and extreme rainfall events pose risks to cyclists and disrupt cycling tourism routes. Infrastructure improvements, such as bike lanes and cycle-friendly accommodations, are needed to enhance safety and comfort for cyclists in the Benelux countries.
5. **Birdwatching in the Danube Delta:** The Danube Delta, located in Romania and Ukraine, is a UNESCO World Heritage site and a haven for birdwatchers due to its rich biodiversity and wetland habitats. However, changes in migratory patterns, habitat loss, and pollution

threaten bird populations and diminish birdwatching experiences. Conservation efforts and habitat restoration initiatives are essential for preserving the ecological integrity of the Danube Delta and sustaining birdwatching tourism in the region.

3.3.1 - Case: Restoring European Seas

Marine ecosystems are vital components of our planet's natural capital, providing crucial ecosystem services and supporting biodiversity. However, these ecosystems are under immense pressure due to the combined threats of climate change and biodiversity loss. Despite the ongoing global pandemic, urgent action is needed to address these crises and restore the health of our oceans.

In a [new report](#), **BirdLife** shares 12 innovative ideas for marine restoration activities aimed at tackling the challenges faced by our seas. Currently, alarming statistics paint a grim picture of the state of European seas:

- 65% of protected seabed habitats are in unfavorable conservation status.
- in the Mediterranean, 80% of assessed fish stocks are overexploited.
- An estimated 200,000 seabirds are caught in fishing gear each year in Europe.

Destructive fishing practices have significantly contributed to the depletion of marine biodiversity, including the loss of seafloor habitats and shifts in the distribution of key ecosystems like seagrass meadows and kelp forests. The urgency to halt this decline and restore degraded marine ecosystems cannot be overstated.

The European Union (EU) has established key legislation, such as the Birds Directive, the Habitats Directive, and the Marine Strategy Framework Directive, to address these issues. The updated EU Biodiversity Strategy will include legislation to set legally binding restoration targets, reflecting the urgency of the situation.

With the new EU Recovery and Resilience Facility in place, there is an opportunity to prioritize marine restoration in national Recovery and Resilience Plans (RRPs). Decisions made now will have long-lasting impacts on the health and resilience of our oceans.

Marine restoration activities offer numerous benefits, including the preservation of marine ecosystem services, carbon sequestration, and support for sustainable blue economies. Active restoration efforts, focusing on carbon-rich ecosystems like seagrass beds and shellfish reefs, can deliver significant carbon sequestration benefits compared to terrestrial habitat restoration.

Research has shown that restoration and conservation efforts can also generate employment opportunities across various sectors, including marine construction and tourism. Furthermore, these efforts help rebalance the interests of coastal communities, creating lasting assets and increasing resilience against future challenges such as climate change.

Ultimately, a combination of active manipulation and passive natural recovery strategies will be needed to restore marine ecosystems effectively. By prioritizing marine restoration activities and

implementing targeted conservation measures, we can work towards securing a healthy, safe, and resilient future for our oceans and coastal communities.

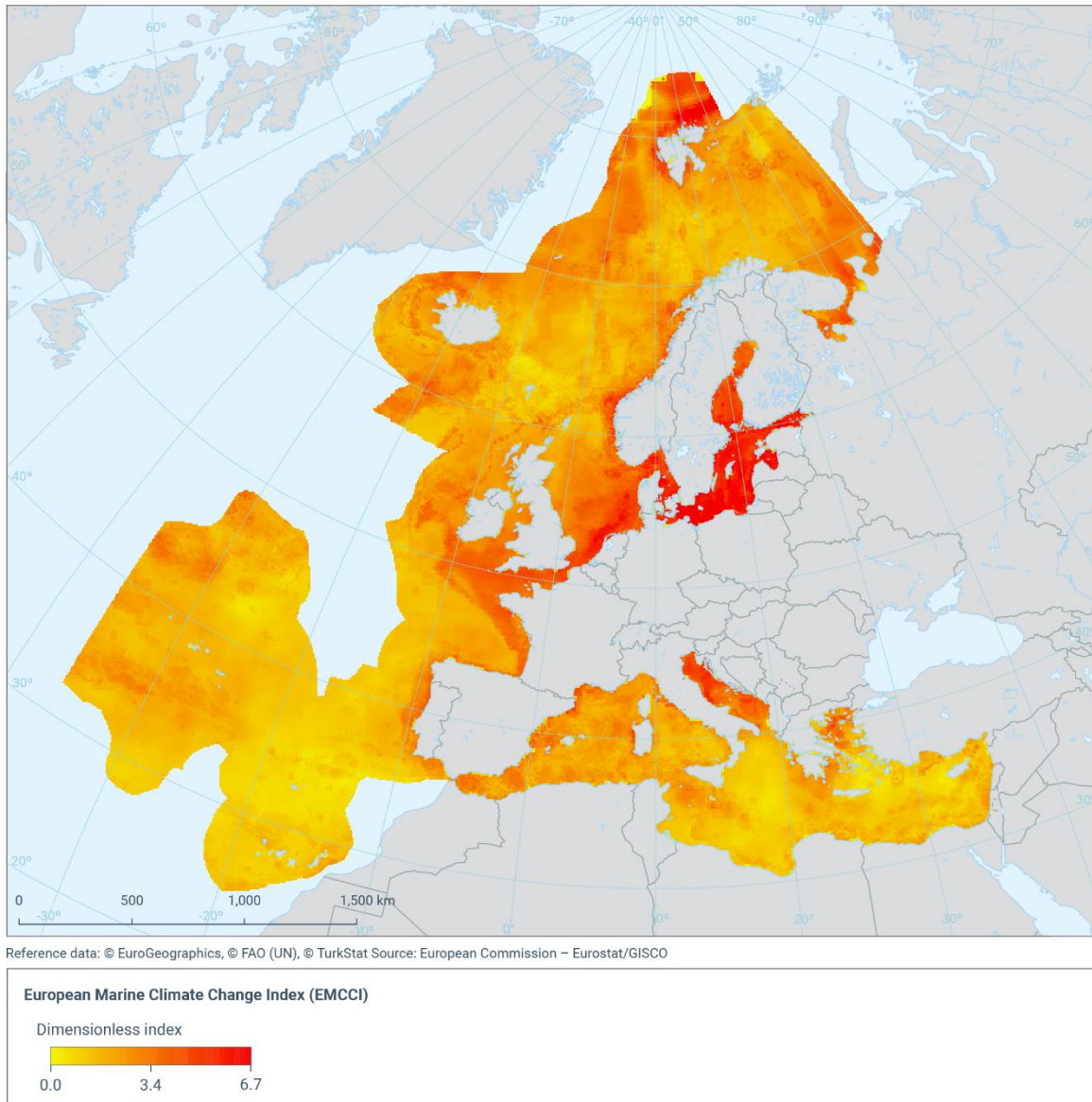


Figure 9 European Marine Climate Change Index

The index shows areas where ecosystem components are subject to relatively greater impacts from climate-related stressors.

Sources : ETC/ICM; see Murray et al. (2023) on methodology.

4- Health and Safety Concerns

4.1- Health Risks

As climate change progresses, it brings about a myriad of health risks for tourists across the European Union (EU), challenging the safety and well-being of travelers exploring the diverse landscapes and cultural attractions of the region. From heat-related illnesses in southern Europe to vector-borne diseases in coastal areas, understanding and addressing these health risks is essential for ensuring the resilience and sustainability of the EU tourism sector.

Impact on Health Risks:

1. **Heatwaves in Southern Europe:** Southern European countries like Spain, Italy, and Greece are experiencing more frequent and intense heatwaves due to climate change. Tourists, particularly the elderly and those with pre-existing health conditions, are at risk of heat-related illnesses such as heat exhaustion and heatstroke. Popular destinations like Rome, Athens, and Barcelona see spikes in hospital admissions during heatwaves, highlighting the importance of public health interventions and heat mitigation strategies for tourists.
2. **Air Pollution in Urban Centers:** Major EU cities like London, Paris, and Berlin face challenges from air pollution exacerbated by climate change. High levels of particulate matter and ground-level ozone can exacerbate respiratory conditions and pose health risks for tourists, especially those with asthma or allergies. Sustainable transportation initiatives, such as promoting cycling and walking, are crucial for reducing exposure to air pollution and improving air quality in urban tourism hotspots.
3. **Vector-borne Diseases in Coastal Areas:** Climate change is expanding the habitat range of disease-carrying vectors like mosquitoes and ticks, increasing the risk of vector-borne diseases in coastal regions of the EU. Countries like Portugal, Croatia, and Greece are witnessing outbreaks of diseases such as West Nile virus and Lyme disease, impacting tourist destinations near water bodies and forested areas. Enhanced surveillance and vector control measures are essential for protecting tourists and mitigating the spread of vector-borne diseases in coastal ecosystems.
4. **Water Contamination in Recreational Areas:** Climate change-induced extreme weather events, such as heavy rainfall and flooding, can lead to water contamination in recreational areas across the EU. Tourist destinations like lakes, rivers, and coastal beaches may experience pollution from sewage overflow, agricultural runoff, and industrial discharge during heavy rain events. Waterborne pathogens and pollutants pose health risks for tourists engaging in water-based activities like swimming, boating, and fishing. Water quality monitoring and pollution prevention measures are critical for safeguarding public health and promoting safe recreation in natural water bodies.
5. **Mountain Safety in Alpine Regions:** Alpine regions of the EU, including the French Alps, Swiss Alps, and Italian Dolomites, attract millions of tourists for skiing, hiking, and

mountaineering. However, climate change-induced changes in snowpack stability and glacier retreat pose safety risks for outdoor enthusiasts. Avalanches, rockfall, and glacier crevasses are becoming more unpredictable, necessitating enhanced risk management and safety protocols for tourists engaging in mountain activities. Education, training, and access to real-time weather and avalanche information are essential for minimizing accidents and injuries in alpine tourism destinations.

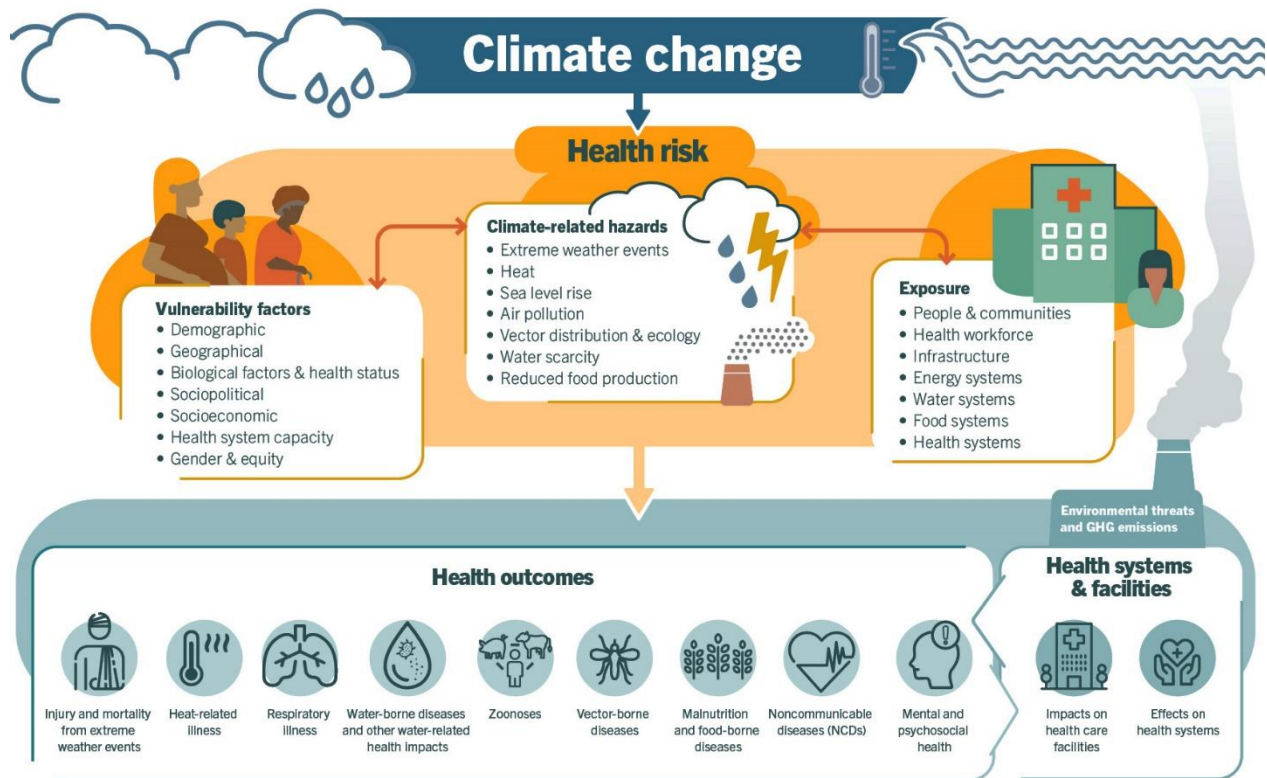


Figure 10 An overview of climate-sensitive health risks.

Source: WHO - <https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health>

Climate change is impacting public health in various ways, including through an uptick in fatalities and illnesses stemming from more frequent extreme weather events like heatwaves, storms, and floods. Additionally, it disrupts food systems, heightens the prevalence of zoonotic diseases, and exacerbates issues related to food, water, and vector-borne illnesses, as well as mental health concerns. Moreover, climate change is eroding many factors that contribute to overall well-being, such as livelihoods, social equality, and access to healthcare and support systems. These health risks associated with climate change disproportionately affect vulnerable and marginalized

groups, including women, children, ethnic minorities, impoverished communities, migrants, the elderly, and individuals with pre-existing health conditions.

WHO data indicates 2 billion people lack safe drinking water and 600 million suffer from foodborne illnesses annually, with children under 5 bearing 30% of foodborne fatalities. Climate stressors heighten waterborne and foodborne disease risks. In 2020, 770 million faced hunger, predominantly in Africa and Asia. Climate change affects food availability, quality and diversity, exacerbating food and nutrition crises.

4.2- Infrastructure Vulnerability

The vulnerability of tourism infrastructure to the impacts of climate change is a pressing concern across the European Union (EU), as extreme weather events, sea-level rise, and changing precipitation patterns threaten the resilience and functionality of key assets such as hotels, transportation networks, and cultural landmarks. Understanding the specific challenges faced by EU countries in safeguarding their tourism infrastructure is crucial for implementing adaptation measures and ensuring the long-term sustainability of the tourism sector.

Impact on Infrastructure Vulnerability:

- 1. Coastal Infrastructure in the Netherlands:** The Netherlands faces significant risks to its coastal infrastructure, including roads, railways, ports, and flood defenses, due to sea-level rise and storm surges. For instance, the [Maeslantkering](#) storm surge barrier in Rotterdam, one of the largest movable structures in the world, is critical for protecting the city and its port from flooding. Additionally, coastal highways, such as the N211 in South Holland, are vulnerable to erosion and inundation, necessitating regular maintenance and upgrades to withstand climate-related hazards.
- 2. Transportation Networks in Alpine Regions:** The European Alps are crisscrossed by a network of roads, railways, and cable cars that support tourism and facilitate access to mountain resorts and villages. However, climate change-induced hazards such as landslides, rockfall, and avalanches pose risks to transportation infrastructure. For example, the Brenner Pass, a major transit route between Italy and Austria, is susceptible to closures and disruptions during extreme weather events, impacting cross-border trade and tourism.
- 3. Historic Sites and Cultural Heritage in Venice, Italy:** Venice's historic city center, a UNESCO World Heritage site, contains numerous landmarks and cultural treasures that are vulnerable to flooding and subsidence. Infrastructure such as bridges, palaces, and churches are at risk of damage from rising water levels and saltwater intrusion. The iconic Rialto Bridge and St. Mark's Square are particularly susceptible to inundation during high tides, highlighting the need for adaptive measures such as elevation platforms and flood barriers to protect Venice's cultural heritage.
- 4. Coastal Roads and Bridges in Spain:** Coastal regions of Spain, including Catalonia and Andalusia, are home to vital transportation links such as highways, bridges, and ports that support tourism and economic development. However, these infrastructure assets are exposed to erosion, storm damage, and sea-level rise. For example, the A-7 coastal highway, which runs along the Mediterranean coast, is vulnerable to flooding and landslides during heavy rainfall events, disrupting traffic flow and posing safety risks for travelers.
- 5. Railway Infrastructure in France's Riviera:** The French Riviera, a popular tourist destination known for its glamorous resorts and scenic coastline, relies on railway

infrastructure to connect cities like Nice, Cannes, and Monaco. However, coastal railways are susceptible to erosion and landslides, particularly in areas where tracks run close to the shoreline. For instance, the Côte d'Azur railway line, which hugs the Mediterranean coast, requires ongoing maintenance and reinforcement to withstand climate-related hazards and ensure passenger safety.

Expected annual damage to critical infrastructure in European regions, due to climate change, by the end of the century (million EUR)³

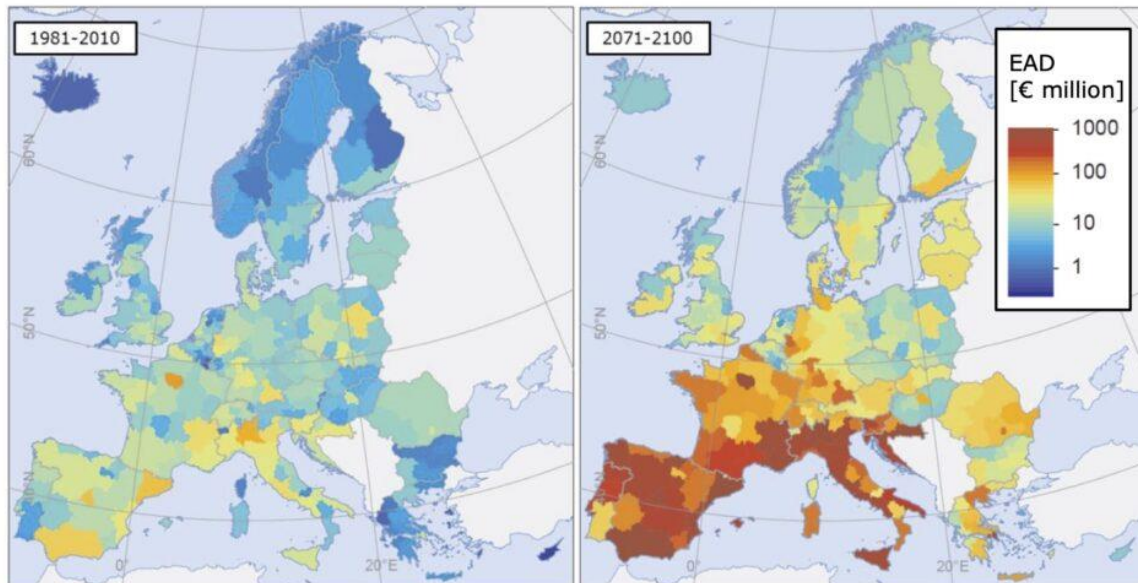


Figure 11 Expected annual damage to critical infrastructure in European regions.

Source: Image from the 2018 Report from the Commission to the European Parliament and the Council on the implementation of the EU Strategy on adaptation to climate change.

5- Financial Consequences and Risk Management

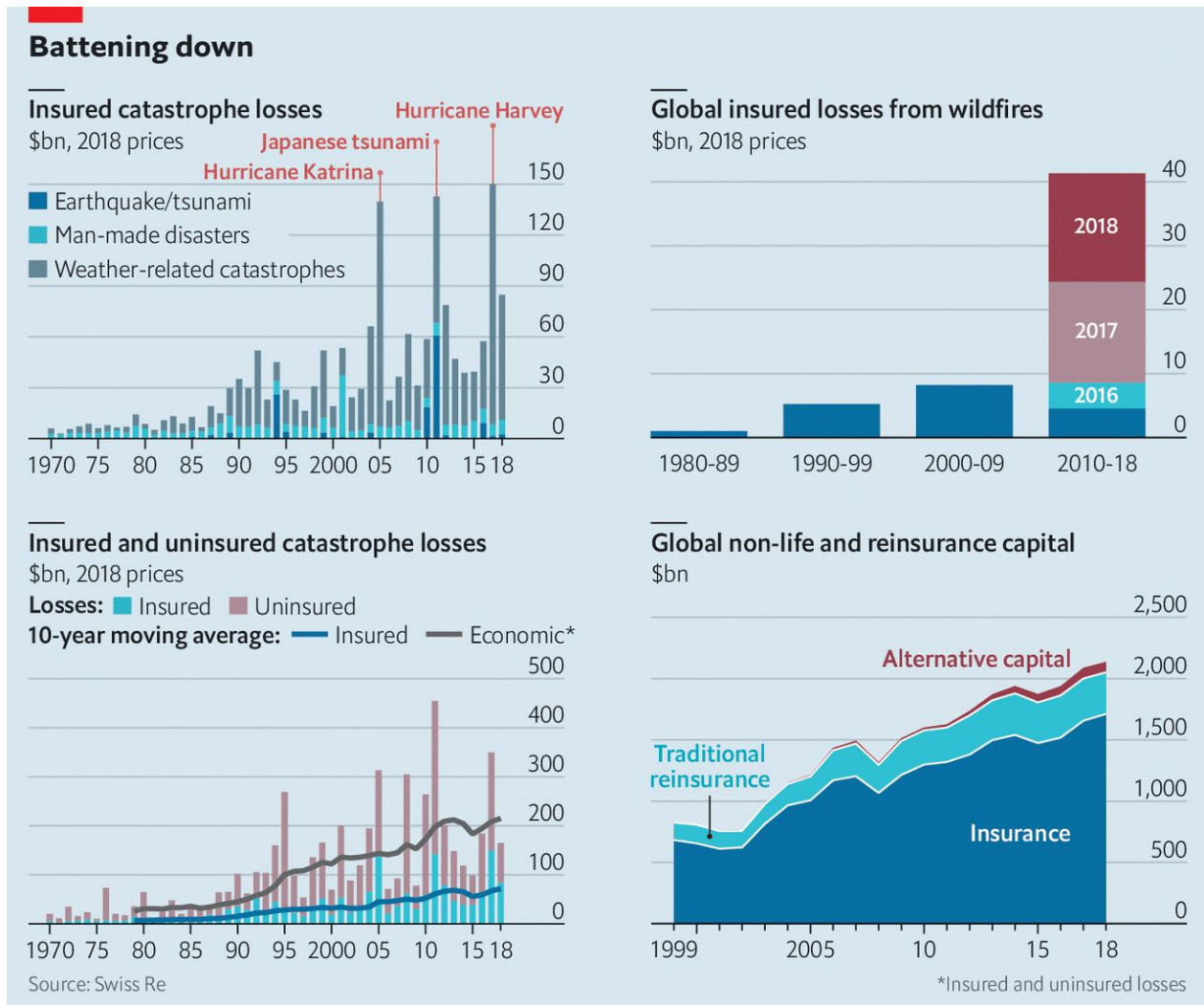
5.1- Insurance Costs

The escalating costs of insurance in the EU tourism sector due to climate change impacts underscore the need for proactive risk management strategies, regulatory interventions, and public-private partnerships to ensure the affordability and availability of insurance coverage for tourism businesses.

1. **Flood Insurance in the United Kingdom (UK):** Tourism businesses in flood-prone areas of the UK, such as coastal towns and river valleys, face challenges in obtaining affordable flood insurance coverage. The Flood Re scheme, introduced under the Water Act 2014, aims to make flood insurance more accessible and affordable for residential properties. However, commercial properties, including hotels and attractions, may still struggle to secure comprehensive coverage. Regulatory measures, such as Flood Risk Management Plans required under the Flood Risk Regulations 2009, provide guidelines for flood risk assessment and mitigation but may not fully address the insurance needs of tourism businesses.
2. **Natural Disaster Insurance in Greece:** Greece is exposed to various natural hazards, including earthquakes, wildfires, and coastal erosion, which pose risks to tourism infrastructure and operations. The Greek government has enacted legislation, such as Law 4152/2013 on Disaster Management, to improve disaster preparedness and response. However, tourism businesses may face challenges in obtaining adequate insurance coverage against these perils. Regulatory reforms, such as amendments to the Insurance Law (Law 4364/2016), may impact insurance costs and coverage options for tourism enterprises, requiring adaptation and risk management strategies.
3. **Storm Damage Coverage in Coastal Spain:** Coastal regions of Spain, including Catalonia and Valencia, are vulnerable to storm surges and beach erosion, which can result in property damage and business interruptions for tourism operators. The Spanish Insurance Contract Act (Law 50/1980) governs insurance contracts and obligations, including coverage for natural disasters. Tourism businesses may need to comply with regional regulations, such as coastal development plans and building codes, to mitigate risks and qualify for insurance coverage. However, regulatory enforcement and insurance market dynamics may influence the availability and affordability of storm damage insurance for tourism enterprises.
4. **Extreme Weather Events in Central Europe:** Central European countries like Germany and Austria are experiencing more frequent and intense extreme weather events, impacting tourism infrastructure and operations. The German Insurance Contract Act (Versicherungsvertragsgesetz) and Austrian Insurance Supervision Act (Versicherungsaufsichtsgesetz) regulate insurance contracts and supervision, including provisions for natural catastrophe coverage. Tourism businesses may face higher insurance premiums and deductibles as insurers adjust pricing models to reflect climate-related risks.

Regulatory initiatives, such as the German Climate Adaptation Act (Klimaanpassungsgesetz), aim to enhance resilience and risk management in response to climate change impacts but may have limited immediate effects on insurance costs for tourism operators.

- Liability Insurance for Adventure Tourism in the Alps:** Adventure tourism activities in the European Alps, such as skiing and mountaineering, entail risks of accidents and injuries, requiring liability insurance coverage for tourism operators. The Austrian Federal Act on Insurance Contracts (Versicherungsvertragsgesetz) and Swiss Federal Act on Insurance Supervision (Versicherungsaufsichtsgesetz) govern insurance regulations and liability standards. Tourism businesses may need to adhere to industry-specific regulations, such as safety standards for ski resorts and adventure sports operators, to mitigate liability risks and maintain insurance coverage. However, insurance premiums for adventure tourism may be influenced by market dynamics, risk assessments, and claims history, making it essential for operators to implement risk management measures and adhere to legal requirements.



The Economist

Figure 12 Insured vs uninsured costs – Source: The Economist

5.1.1 - Case: Insuretech

The insurance industry is facing a formidable challenge due to climate change, with mounting losses year after year. According to reinsurer Swiss Re, natural catastrophes led to a global economic loss of \$270 billion last year, with insured losses consistently rising by 5% to 6% annually over the past few decades (San-Miguel-Ayanz et al., 2023). As weather-related events become more extreme, insurers are grappling with unprecedented risks that threaten their viability in the long term.

To address these challenges, the insurance industry is turning to technology-driven solutions offered by a new wave of **insurtech startups**. These startups aim to revolutionize risk assessment and mitigation, offering insurers the tools they need to navigate the evolving landscape of climate risks.

1. **Enhancing Risk Assessment:** Insurers are increasingly investing in innovative approaches to better understand and quantify climate risks. Avanta Ventures, the investment arm of CSAA insurance, is focusing on predictive analytics and risk modeling to improve underwriting accuracy (Matei et al., 2023). By leveraging advanced technologies such as artificial intelligence and drone-based imagery, companies like Cape Analytics are providing insurers with real-time insights into property risk, enabling more informed decision-making (Gibson et al., 2007).
2. **Mitigating Climate Risks:** Reinsurers are taking a proactive approach to risk mitigation, investing in technologies that aim to reduce the impact of climate change. Munich Re Ventures, for instance, is backing startups focused on decarbonization efforts, such as Zanskar, which uses AI to identify geothermal resources, and Twelve, which converts CO₂ into industrial chemicals (COACCH, 2018).
3. **Addressing Insurance Accessibility:** One of the biggest challenges facing insurers is ensuring accessibility to insurance coverage, particularly in high-risk areas. The emergence of insurtech startups like Kin, which provides insurance for areas prone to natural disasters, demonstrates a commitment to expanding coverage where traditional insurers have withdrawn (Climate Change & Tourism in Europe).
4. **Harnessing Advanced Data Analytics:** New insurtech models are leveraging cutting-edge data analytics to develop more accurate risk prediction models. Delos Insurance Solutions, for instance, utilizes satellite imagery and machine learning algorithms to assess wildfire risk in real time, enabling insurers to proactively manage their exposure (Bas Amelung & Alvaro Moreno, 2009).
5. **Embracing Climate Prediction Models:** With climate change rendering historical data obsolete, insurtech startups are shifting towards predictive modeling based on climatological trends. Salient Predictions, for example, analyzes ocean salinity levels to forecast rainfall patterns, offering insurers valuable insights into future climate risks (Climate Change: Implications for Tourism).

6. **Consultative Approach:** The future of insurance lies in providing consultancy services that empower customers to mitigate their risks effectively. By offering tailored risk management strategies and incentivizing proactive measures, insurers can enhance their value proposition and foster long-term relationships with policyholders (European Agenda for Tourism 2030).
7. **Resilience Amid Downturn:** Despite market uncertainties, the insurtech sector remains resilient, driven by its ability to address critical industry challenges. While valuations may fluctuate, the long-term growth potential of insurtech startups remains promising, with opportunities for innovation and disruption (Keynote speech by Frank Elderson).

The convergence of climate change and technological innovation is reshaping the insurance industry. By embracing insurtech solutions and adopting a proactive approach to risk management, insurers can navigate the complexities of climate risks and ensure a sustainable future for the industry.

5.2- Reputational Damage

Reputational damage poses a significant risk to the tourism industry in the European Union (EU) as climate change impacts become more visible and widespread. Negative publicity stemming from environmental degradation, social controversies, and perceived inaction on sustainability issues can tarnish the image of tourist destinations, leading to loss of visitor trust, reduced bookings, and long-term economic repercussions. Understanding the specific examples and implications of reputational damage in the EU tourism sector is essential for implementing proactive communication strategies, fostering stakeholder engagement, and promoting sustainable tourism practices.

Impact on Reputational Damage:

1. **Plastic Pollution in Coastal Destinations:** Coastal destinations across the EU, such as beaches in Spain, Greece, and Italy, are grappling with the problem of plastic pollution, which poses environmental and reputational risks. Images of litter-strewn shorelines and marine debris circulated on social media and news outlets can deter potential tourists and damage the reputation of affected destinations. Tourism authorities and local governments are increasingly implementing measures to address plastic waste, such as bans on single-use plastics and beach clean-up campaigns, to safeguard the image and attractiveness of coastal tourism destinations.
2. **Wildlife Exploitation in Tourist Attractions:** Wildlife tourism attractions, including zoos, aquariums, and animal sanctuaries, face scrutiny over ethical concerns related to animal welfare and conservation practices. Instances of animal mistreatment or exploitation, such as elephant riding in Southeastern Europe or dolphin captivity in Portugal, can trigger public backlash and damage the reputation of tourism operators and destination management organizations. Transparency, responsible tourism guidelines, and certification schemes, such as the Global Sustainable Tourism Council's Animal Welfare Guidelines, are essential for mitigating reputational risks and building trust with visitors.
3. **Cultural Appropriation in Festivals and Events:** Cultural festivals and events in the EU, such as Oktoberfest in Germany and Carnival in Spain, attract millions of tourists annually but may face criticism for cultural appropriation or misrepresentation. Insensitive portrayals of ethnic stereotypes or disrespectful behavior towards local customs and traditions can provoke negative reactions from both residents and visitors, leading to reputational damage for event organizers and host communities. Engaging with cultural stakeholders, promoting diversity and inclusion, and adopting cultural sensitivity training are key strategies for preventing reputational harm and fostering positive cultural exchange in tourism events.
4. **Labor Exploitation in Hospitality Sector:** The hospitality sector in the EU, including hotels, restaurants, and tour operators, may face reputational risks associated with labor exploitation and unethical employment practices. Reports of wage theft, poor working conditions, and human rights violations, particularly among migrant workers and seasonal

employees, can tarnish the reputation of tourism businesses and destination brands. Adopting fair labor practices, ensuring employee rights and welfare, and participating in industry certification programs, such as the International Tourism Partnership's Human Rights Due Diligence Framework, are essential for safeguarding reputation and fostering trust with consumers.

5. **Greenwashing in Sustainable Tourism Marketing:** [Greenwashing](#), or the misleading portrayal of unsustainable practices as environmentally friendly, undermines trust and credibility in sustainable tourism initiatives. Examples of greenwashing in the EU tourism sector may include exaggerated claims of carbon neutrality or eco-friendly certifications without meaningful environmental improvements. Consumers are increasingly vigilant and discerning, relying on independent verification and third-party certifications, such as the EU Ecolabel or Green Key, to assess the authenticity of sustainability claims. Transparent reporting, accountability mechanisms, and stakeholder engagement are critical for combating greenwashing and maintaining the integrity of sustainable tourism efforts in the EU.

5.2.1 - Case: Transforming EU Tourism Buildings for Sustainable Growth

Hotel buildings are classified as one of the highest energy consumption building categories, alongside offices and retail spaces. In countries like the UK, USA, and Spain, these sectors represent a significant portion of total energy consumption, with hotels alone accounting for a substantial share. For instance, in Spain, hotels contribute to 85% of total energy consumption within the hospitality sector (Eurostat Database).

The intensive energy usage in hotel buildings primarily stems from services such as air conditioning, hot water, and laundry, often facilitated by inefficient equipment powered by fossil fuels like oil and liquefied petroleum gas (LPG). Additionally, hotel buildings, designed for year-round use and offering various amenities like restaurants, swimming pools, and conference rooms, further contribute to their high energy demand. Guests' expectations for thermal and visual comfort, coupled with the indiscriminate use of amenities, exacerbate energy consumption, leading to significant CO₂ emissions and inflated operational costs (European Environment Agency).

Notably, the energy consumption index of hotels in tropical regions correlates closely with average monthly temperatures, predominantly influencing the use of air conditioning systems (European State of the Climate 2022). HVAC systems, typically powered by electricity, incur the highest consumption rates in hotels situated in warmer climates, amplifying energy demands and environmental impacts.

Addressing these challenges requires a concerted effort to enhance energy efficiency across EU tourism buildings. Compliance with EU energy performance standards, mandated by regulations like the Energy Performance of Buildings Directive (EPBD), is imperative. By embracing energy-efficient technologies and practices, such as efficient HVAC systems, insulation, and smart building

management systems, hotels can significantly reduce energy consumption and mitigate environmental impacts (IPCC, 2021).

Moreover, investment in renewable energy sources, such as solar panels and geothermal systems, presents opportunities for hotels to decarbonize their operations and achieve long-term sustainability (Keynote speech by Frank Elderson, ECB).

The economic rationale for energy efficiency in EU tourism buildings is compelling. Studies have shown that every euro invested in energy efficiency yields significant returns over the building's lifecycle (COACCH, 2018). By capitalizing on EU funding mechanisms, including the European Structural and Investment Funds (ESIF) and the Recovery and Resilience Facility, stakeholders can leverage financial support to implement energy efficiency upgrades and drive operational savings (European Commission).

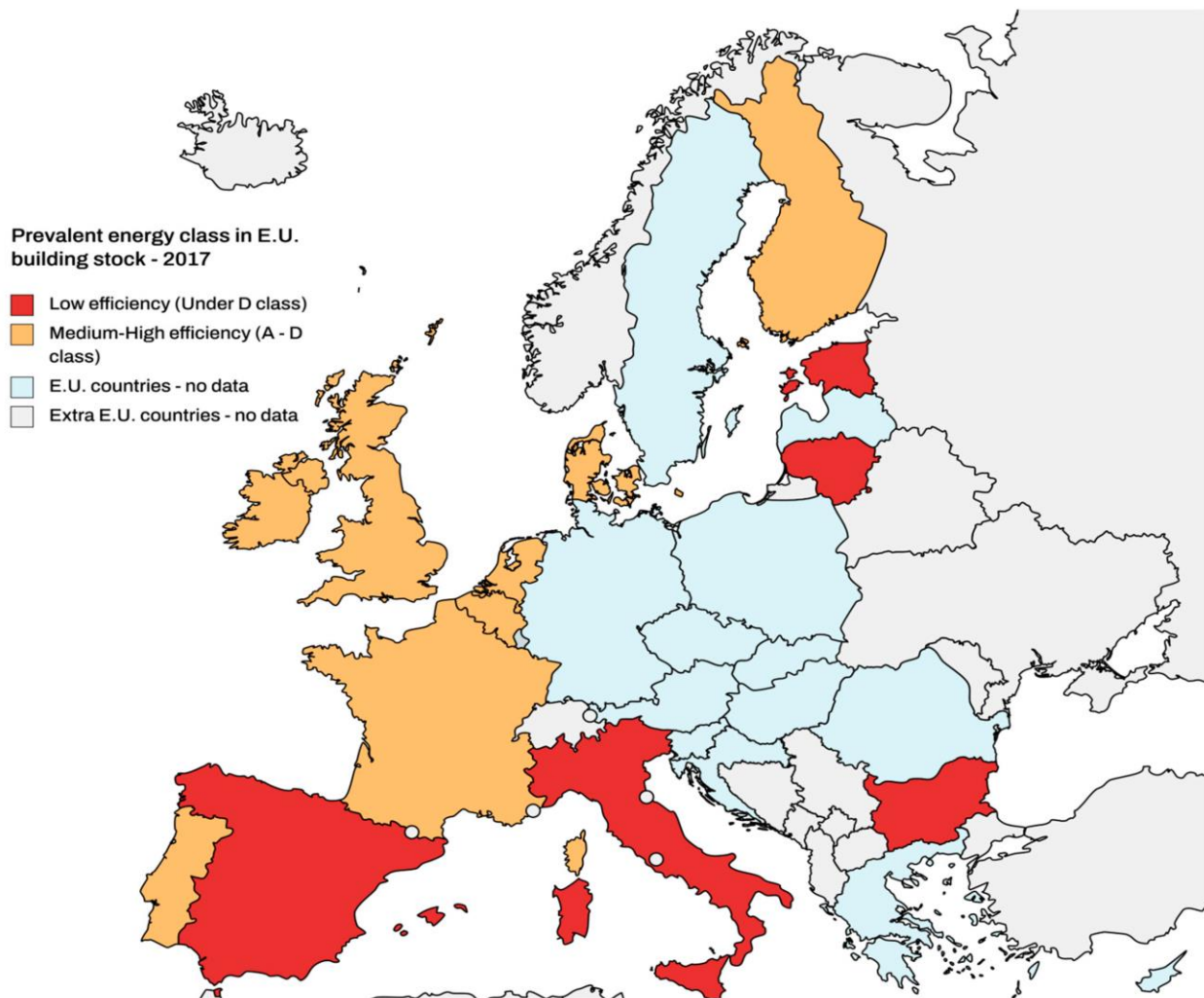


Figure 13 European map with the prevalence of building stock: low efficiency (under D class) and medium-high efficiency (A–D class).

Source: map created by Fabio Gualandri and Aleksandra Kuzior - Faculty of Organization and Management, Silesian University of Technology, Zabrze, Poland with Mapchart.net based on BPIE data.

6- Dependency and Adaptation

6.1- Economic Dependence

Economic dependence on tourism is a double-edged sword for many regions in the European Union (EU). While tourism contributes significantly to local economies, providing employment opportunities and driving infrastructure development, overreliance on this sector can render communities vulnerable to external shocks, such as economic downturns or climate-related disruptions. Understanding the specific examples and implications of economic dependence on tourism is crucial for fostering diversification, resilience, and sustainable development in EU regions.

Impact on Economic Dependence:

1. **Island Tourism in Greece:** Greece's numerous islands, including Santorini, Mykonos, and Crete, heavily rely on tourism as a primary source of income. While tourism contributes substantially to the economy, accounting for over 20% of the country's GDP, it also exposes island communities to economic vulnerabilities. For example, the economic downturn caused by the COVID-19 pandemic disproportionately affected Greek islands, where tourism-related activities form the backbone of local livelihoods. Overreliance on seasonal tourism and limited diversification in economic activities increase the susceptibility of island economies to external shocks and fluctuations in tourist demand.
2. **Coastal Tourism in Spain:** Spain's coastal regions, such as the Costa del Sol and the Balearic Islands, are major tourist destinations, attracting millions of visitors each year. Tourism plays a vital role in driving economic growth and employment in these areas, supporting a wide range of businesses, including hotels, restaurants, and recreational facilities. However, economic dependence on tourism leaves coastal communities vulnerable to factors beyond their control, such as currency fluctuations, geopolitical tensions, and natural disasters. Diversification efforts, such as promoting sustainable agriculture, cultural heritage tourism, and innovation hubs, are essential for reducing reliance on seasonal tourism and enhancing economic resilience in coastal regions.
3. **Alpine Tourism in Austria:** Austria's Alpine regions, renowned for their scenic landscapes and winter sports facilities, rely heavily on tourism revenue to sustain local economies. Ski resorts like St. Anton am Arlberg and Kitzbühel attract visitors from around the world, generating employment and business opportunities in hospitality, retail, and outdoor recreation sectors. However, the dependence on snow-based tourism makes Alpine communities susceptible to the impacts of climate change, such as shorter ski seasons and variability in snowfall patterns. Economic diversification strategies, including investments in green technology, renewable energy, and nature-based tourism, are crucial for reducing reliance on winter tourism and fostering long-term sustainability in Alpine regions.
4. **Rural Tourism in Portugal:** Rural areas of Portugal, such as the Douro Valley and Alentejo region, rely on tourism as a key driver of economic development and rural revitalization.

Agritourism, wine tourism, and ecotourism activities contribute to job creation, infrastructure improvements, and cultural preservation in rural communities. However, economic dependence on tourism exposes rural areas to risks associated with seasonality, market fluctuations, and infrastructure constraints. Sustainable tourism initiatives, such as farm-to-table experiences, nature conservation projects, and community-based tourism ventures, can help diversify rural economies and reduce vulnerability to external shocks.

- Historical and Cultural Tourism in Italy:** Italy's rich cultural heritage and historical landmarks, including cities like Rome, Florence, and Venice, attract millions of tourists each year, supporting a thriving tourism industry. However, economic dependence on cultural tourism leaves Italian cities vulnerable to overcrowding, overtourism, and cultural commodification. The COVID-19 pandemic highlighted the fragility of Italy's tourism-dependent economy, prompting calls for sustainable tourism management and diversification strategies. Investing in cultural infrastructure, promoting off-peak travel, and supporting creative industries can help mitigate the risks of economic dependence on tourism while preserving Italy's cultural legacy for future generations.

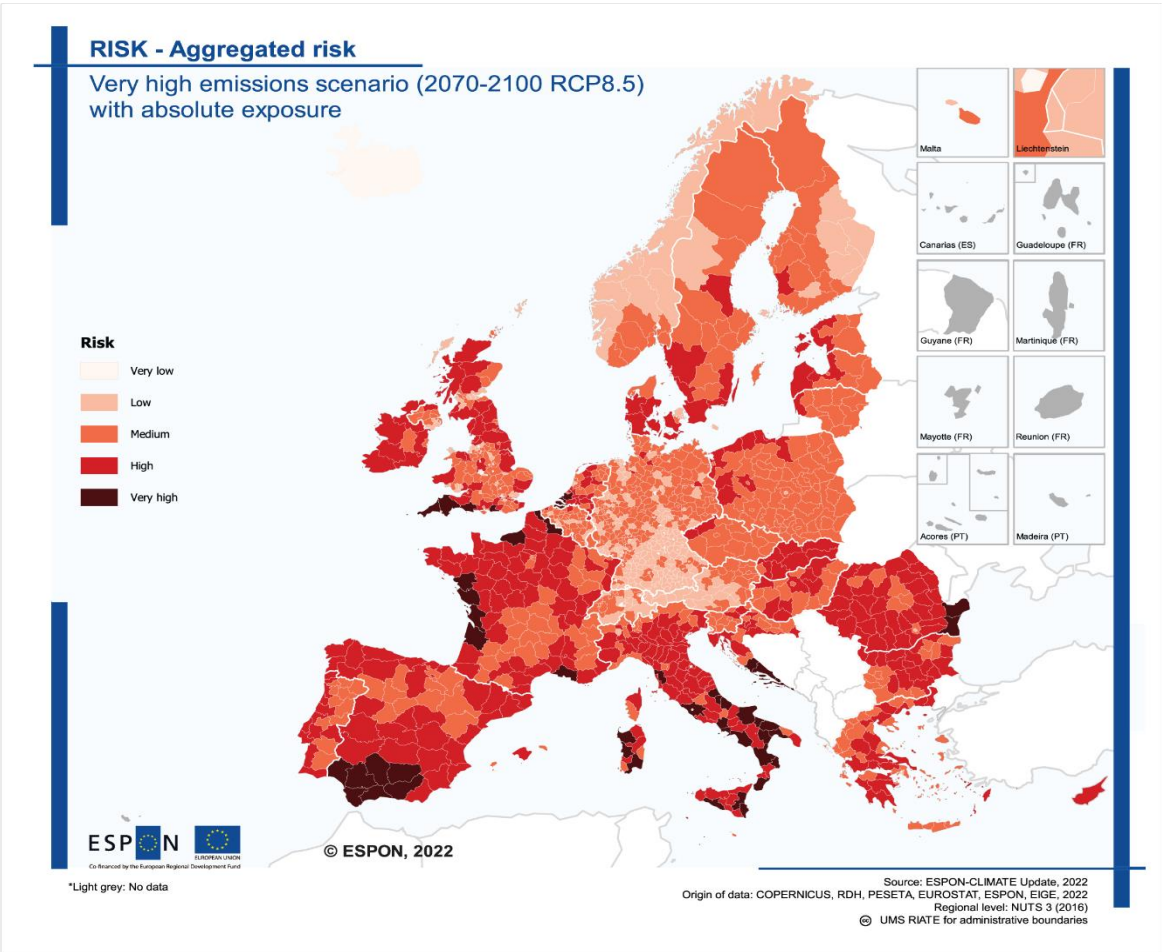


Figure 14 Spatial distribution of risk in Europe associated with the climate change.

Source: ESPON at the COP 27 - NOVEMBER 8, 2022

7- Assessing the Cost of Inaction

Failing to address the impacts of climate change on the tourism sector in the European Union (EU) entails dire consequences that are already being felt. Economic losses are imminent, with the World Travel & Tourism Council (WTTC) warning of potential billions of dollars in revenue losses by 2030 due to climate-related disruptions.

Reputable studies commissioned by the European Parliament project staggering economic impacts ranging from **€2.9 billion to €23 billion per year** by 2100.

Environmental degradation is accelerating, jeopardizing iconic natural attractions like the Mediterranean coastline and Alpine landscapes.

The Intergovernmental Panel on Climate Change (IPCC) paints a stark picture of irreversible damage to ecosystems and biodiversity loss, undermining the very essence of tourism in the EU.

Social disruptions are inevitable, exacerbating inequalities and threatening the livelihoods of communities reliant on tourism. Vulnerable groups, from coastal residents to small-scale farmers, bear the brunt of climate-related disasters and economic instability.

The Paris Agreement, a cornerstone of international climate action, underscores the urgent need for sustainable development and poverty eradication, principles essential for the tourism sector's survival. Reputational risks loom large as inaction tarnishes the image of EU destinations and erodes consumer confidence.

The EU's Circular Economy Action Plan and the European Tourism Manifesto for Growth and Jobs provide frameworks for sustainable tourism practices, yet failure to act risks irreparable reputational damage and loss of market share. With the temperature increase surpassing the targets set by the Paris Agreement, assertive action is not just an option; it is imperative.

Damages already outweigh mitigation costs. The time for bold, decisive measures to mitigate climate risks and ensure the resilience and sustainability of the EU tourism sector is now!

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