European Committee of the Regions

Commission for Natural Resources

NAT

Natural disasters: anticipatory governance and disaster risk management from a local and regional perspective

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Contents

List of abbreviations

ANEPC	Portuguese National Authority for Emergency and Civil Protection
AWAC	Walloon Air and Climate Agency
CCA	Climate Change Adaptation
CoR	Committee of the Regions
DRM	Disaster Risk Management
DRMKC	Disaster Risk Management Knowledge Centre
DRR	Disaster Risk Reduction
EC	European Commission
EEA	European Environment Agency
ESPON	European Observation Network for Territorial Development and Cohesion
EU	European Union
EUCRA	European Climate Risk Assessment
GHG	Greenhouse Gas
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LRAs	Local and Regional Authorities
NAP	National Adaptation Plan
NAS	National Adaptation Strategy
NECP	National Energy and Climate Action Plan
NGOs	Non-governmental Organisations
OECD	Organisation for Economic Co-operation and Development
RAP	Regional Adaptation Plan
RCM	Region of Central Macedonia
SAP	Sectoral Adaptation Plan
SWOT	Strengths, Weaknesses, Opportunities and Threats
UN	United Nations

Executive summary

Climate change is a key dominant trend across the territories of the European Union (EU) given the expected growing frequency of multiple climate change-induced hazards. Serious impacts on ecosystems, the economy, and human health and well-being will be observed as a result. Minimising the risks and impacts stemming from these extremes is therefore a priority for the EU, and for national and Local and Regional Authorities (LRAs).

At the same time, such shocks do not follow administrative borders, and therefore require a multilevel cross-border approach involving all levels of governance. Resilience can only be achieved at the EU level if key tasks are pursued by LRAs, given their responsibilities and proximity to their citizens. After all, mitigation and Climate Change Adaptation (CCA) actions must be tailored to the specific conditions and capabilities of cities and regions across the EU. Despite numerous benefits related to the introduction of adaptation strategies at the local and regional levels, numerous obstacles and challenges remain. Hence, in some regions, the progress of decentralisation of climate adaptation-related responsibilities can still be far from satisfactory as a result of inefficient technical knowledge and capacity or a shortage of data and resources. At the same time, potential risks of maladaptation can be minimised precisely through the involvement of local communities and experts with specific know-how. Planning of CCA actions should be multi-sectoral and inclusive to make sure that the benefits from a given action cover multiple sectors and systems.

The traditional approach to crisis management (reactive) starts after an emergency occurs, reducing the effectiveness of the response. Proactive crisis management aims to prevent crises by addressing existing and future risks, as well as strengthening community resilience. This approach integrates crisis management with Disaster Risk Management (DRM), focusing on identifying, assessing and mitigating risks before they escalate. Strategic foresight tools (such as horizon scanning, scenario thinking, megatrends analysis, visioning and back-casting, and risk matrices) aid in this proactive approach by exploring possible futures, informing policy formation, and steering outcomes in the desired direction.

Anticipatory governance effectively integrates strategic foresight into governance structures, facilitating proactive decision-making in crisis management. When applied on a key- sub-national level, such an approach to crisis management can bring a multitude of benefits to the local decision-making system – including better preparedness for future challenges, allowing LRAs to adapt and allocate resources more effectively based on regular risk monitoring and assessment, while also enhancing crisis management strategies by incorporating diverse

perspectives. On the other hand, LRAs might also face certain challenges when developing and implementating the anticipatory governance approach, related to risk ownership and trust, limited organisational and financial capacity, proper effectiveness of mechanisms and actions, as well as proper recognition of disparities in exposure and vulnerability to crises, and ensuring equitable outcomes for marginalised groups.

To address these challenges, enhance resilience and effectively anticipate crises, LRAs should implement inclusive governance structures, citizen engagement initiatives, evidence-based planning and risk assessments, and integrate climate change adaptation measures with DRM strategies.

Addressing climate-related risks through DRM initiatives is crucial, although financing remains a challenge. Member States address civil protection and DRM in diverse ways, with some enacting statutory acts and others utilising regulations across multiple laws and resolutions, leveraging risk assessments to inform policies and civil protection plans at various administrative levels, alongside training and exercises for preparedness and ensuring public awareness through diverse channels and early warning systems. Where climate adaptation is concerned, most Member States rely on soft policies without legally binding commitments. However, some are developing national climate legislation to enforce adaptation objectives and strategies.

As climate-related hazards intensify and their impacts become more pronounced, it is imperative that regions and cities across Europe actively engage in implementing DRM that includes CCA – with a proactive, anticipatory approach integrating vulnerability criteria and resilience considerations into all aspects of policy, regulation, and investment. Initiatives emphasising collaboration, capacity building, policy integration, multi-sectoral approaches, data-driven decision-making, and participatory processes can help in better equipping communities to withstand and recover from the impacts of climate change and disasters caused by natural hazards.

Introduction

The European Union (EU) has already witnessed numerous extreme weather events directly linked to the changing climate, from floods to wildfires and heatwaves, that will become more intense and more frequent.[1] Climate change is in fact a key dominant trend across the territories of the EU, considering the anticipated increase in incidence of multiple climate change-induced hazards.[2] They will bring about serious impacts on ecosystems, the economy, and human health and well-being. Minimising the risks stemming from these extremes is therefore a priority for the EU, and for national and Local and Regional Authorities (LRAs), including the Committee of the Regions (CoR), whose political priorities include building more resilient communities.

At the same time, such shocks do not follow administrative borders, and therefore require a multilevel cross-border approach involving all levels of governance. Resilience can only be achieved at the EU level if key tasks are pursued by LRAs, given their responsibilities (see Part 4) and proximity to their citizens. After all, mitigation and adaptation actions must be tailored to the specific conditions and capabilities of cities and regions across the EU.

Apart from adaptation measures, understood as adjustments in ecological, social or economic practices to respond to current and future climate change impacts, natural disasters and other environmental externalities triggered by the climate crisis require a more proactive, anticipatory approach. Resilience, if understood as society's ability to resist and recover easily and quickly from a major shock, needs a toolbox for risk prevention, coupled with the dissemination of a shared culture of crisis preparedness so that potential damage and losses can be limited, and an efficient, predictable and timely recovery can be ensured in the aftermath of a natural disaster.

With this in mind, the EU and the Member States have identified five disaster resilience goals which address the areas where the need to strengthen Europe's resilience to disasters and crises is the greatest. Each of the five disaster resilience goals is accompanied by a flagship initiative that helps to translate the broader goals and objectives into concrete steps and mobilises the relevant stakeholders to cooperate on issues of common interest.[3]

[1] EEA (2023). *Extreme weather: floods, droughts and heatwaves.*
[2] Forzieri G. Cescatti A. E., Silva F. B., Feyen L. (2017) *Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study.*
[3] EC (2023). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: European Union Disaster Resilience Goals: Acting together to deal with future emergencies.*

Box. 1. Five disaster resilience goals and their corresponding flagship initiatives

Goal 1. Anticipate – Improving risk assessment, anticipation and disaster risk management planning
- Flagship initiative: Develop Europe-wide disaster scenarios to support planning and preparedness for disasters that transcend geographical and sectoral borders.

Goal 2. Prepare – Increasing the risk awareness and preparedness of the population
- Flagship initiative: Launch a preparEU pan-European awareness-raising programme for disaster resilience targeting a wider population.

Goal 3. Alert – Enhancing early warning
- Flagship initiative: Link global early warning to local action in Europe.

Goal 4. Respond – Enhancing the Union Civil Protection Mechanism response capacity
- Flagship initiative: Scale up the rescEU strategic reserve of response capacities by doubling the aerial firefighting fleet.

Goal 5. Secure – Ensuring a robust civil protection system
- Flagship initiative: Stress-test the emergency operation centres across Europe to ensure that they themselves remain resilient in complex emergency situations.

Source: own elaboration, CASE based on EC (2023). Communication From the Commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the Regions: European Union Disaster Resilience Goals: Acting together to deal with future emergencies.

Objectives of the study

The overall objective of the study is to **map and analyse tools to develop and improve the anticipatory governance approach to disasters, disaster risk management and climate adaptation by LRAs across the EU.** Hence, the research focuses around questions such as the following (Box. 2):

Box. 2. Research questions

- *What is the geographical distribution of regional vulnerabilities to natural disasters?*
- *What is anticipatory governance in disaster risk management and why is it relevant for local and regional authorities?*
- *Are there differences between EU regions in terms of their governance approach to disaster risk management and implementation from a local and regional perspective?*
- *What are the main adaptation measures that can be implemented to face the main natural hazards and climate risks and enhance the resilience of EU regions?*
- *What are the main benefits of adopting an anticipatory governance approach for local and regional authorities? What are the risks of maladaptation?*
- *What does the legislative and financial framework for disaster risk management and climate adaptation look like in the EU Member States?*

Source: own elaboration, CASE

Keeping in mind the study's context and specific research questions, the study is structured as follows:

1. Part 1 presents a brief overview of vulnerabilities to natural disasters across EU regions, pointing to trends and perspectives linked to climate change. Extreme weather events and climate-related disasters, given their growing frequency, intensity and impact, are of key interest.

2. Part 2 of the study analyses the benefits of an anticipatory approach, such as preparedness for disasters in risk and crisis management and climate adaptation, as well as the challenges involved in adopting and implementing such an approach.

3. Part 3 focuses on the role of adaptation actions in enhancing the resilience of EU cities and regions and the risks related to potential maladaptation.

4. Part 4 provides an overview of the legislative and financial framework for disaster risk management and climate adaptation in EU Member States, and gives examples of best practices implemented by LRAs that have created tools and actions to strengthen local resilience.

5. Part 5 of the study synthesises the research findings and provides concrete future-oriented suggestions for improving the involvement of regions and cities in the implementation of the EU's disaster resilience goals and

“resilience-by-design” approach, so that vulnerability criteria and resilience considerations are fully integrated into public policies, regulations and action plans, specifically at the local and regional level.

Part 1: Vulnerability to natural disasters: trends and perspectives of regional exposure across Europe

Vulnerability to natural disasters can be understood as a condition contingent upon numerous processes or factors, such as socio-economic, political or environmental ones, that contribute to a specific location's susceptibility to the effects of hazards.[4] The concept of vulnerability explains why similar shocks, such as natural disasters, can affect different cities or regions unevenly, even within the same country.

The likelihood of such impacts occurring is known as risk, and it is divided into three components: hazard, exposure and vulnerability.[5] While hazard is physically determined and can be observed and somehow measured, exposure, or in other words distribution of population, assets or infrastructure, and especially vulnerability, are more subjective, socially constructed and related to different capacities at stake.[6] What is more, climate change-induced hazards further impact existing vulnerabilities and make inequalities across the EU even more significant.[7] Yet, while it is almost impossible to reduce the occurrence and severity of climate change-induced hazards, reducing the vulnerability of local communities is something that should, must, or needs to be put on the political agenda when Disaster Risk Management (DRM) is discussed.[8]

Hence, vulnerability is a particularly multiform concept consisting of various dimensions that require the introduction of a holistic synthesis to rightly assess what exactly is vulnerable, where and how, and under what circumstances. That is precisely why there is a wide range of tools and methodologies assessing vulnerability to natural hazards.[9] While some of these approaches focus entirely on the quantitative physical vulnerability of assets, such as buildings or public infrastructure, others include mixed methods, such as analysis of socio-economic

[4] UN (2016). *Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction, United Nations General Assembly.*
[5] UNDRR (2019). *GAR. Global assessment report on disaster risk reduction, United Nations office for disaster risk reduction (UNDRR*).
[6] Brooks N., Neil Adger W., Mick Kelly P. (2005). *The determinants of vulnerability and adaptive capacity at the national level and the implications for adaptation.*.
[7] ESPON (2013). *Territorial Dynamics in Europe Natural Hazards and Climate Change in European Regions, Territorial Observation No. 7.*
[8] EC (2023). *Towards a European wide vulnerability framework – A flexible approach for vulnerability assessment using composite indicators*.
[9] Birkmann J. (2013). *Measuring vulnerability to natural Hazards.*

or political vulnerability, where qualitative methodology also needs to be introduced.[10]

Based on desk research methods, predominately literature review, the chapter below aims to briefly highlight vulnerability to natural disasters across the EU. It does so by presenting the nexus between the hazards already observed and their exposure, as well as the impacts within specific geographical locations stemming from such hazards.[11] It also provides trends and perspectives linked to climate change.

1.1 Current climate change-induced hazards

Vulnerability cannot be assessed without understanding the nature, magnitude, extent and reoccurrence of natural climate change-induced hazards.[12] As all available data show, these are becoming increasingly severe throughout Europe, given the steadily growing number of days with extreme temperatures, as well as the more extreme precipitation events that have particularly significant effects and impacts:[13]

- *Global mean near-surface temperature between 2013 and 2022 was 1.13 to 1.17°C warmer than the pre-industrial level, which makes it the warmest decade on record. European land temperatures have increased even faster over the same period, by 2.04 to 2.10°C.[14] Such extreme weather has health impacts, particularly on vulnerable groups. The elderly, children, women, people in poverty and people in poor health are more likely to be affected by heatwaves, for example. Additionally, diseases are moving north. Mosquitos and ticks carrying infectious diseases are gaining a foothold in many parts of Europe.[15]*
- *Between 1980 and 2022, weather- and climate-related extremes caused economic losses estimated at EUR 560 billion in EU Member States, of which EUR 59.4 billion in 2021 and EUR 52.3 billion in 2022. It is estimated that the associated economic losses will further increase by 2030* (see subchapter 2.2 for more statistics on economic losses).*[16]*
- *Arctic sea ice has declined by an average of 76,000 km2 in summer and 32,000 km2 in winter since 1979. Reduced Arctic and Baltic sea ice further accelerates global temperature rising.[17]*

[10] Conlon K. C. et.al (2020). *Mapping Human Vulnerability to Eextreme Heat: A Critical Assessment of Heat Vulnerability Indices Created Using Principal Components Analysis. Environmental Health Perspectives.*
[11] Forzieri G, Cescatti A, E Silva FB, Feyen L. (2017). op. cit.
[12] Klein J., Valkama M., Staudt M. et al. (2024). *ESPON-TITAN: territorial patterns of natural hazards in Europe. Nat Hazards.*
[13] EEA (2021). *Europe's changing climate hazards — an index-based interactive EEA report.*
[14] EEA (2023). *Global and European temperatures.*
[15] Climate Adapt (n.d.). *Vector-borne diseases.*
[16] EEA (2023). *Economic losses from weather- and climate-related extremes in Europe..*
[17] EEA (2023). *Arctic and Baltic sea ice.*

- *Severe droughts caused a 3% annual vegetation productivity loss in affected areas from 2000-2019.*[18] *Each year losses from drought are around "EUR 9 billion for the EU+UK with the highest losses in Spain (EUR 1.5 billion/year), Italy (EUR 1.4 billion/year) and France (EUR 1.2 billion/year)".*[19]
- *Soil moisture in the growing season was far below the long-term average in European Environment Agency (EEA) member countries from 2000-2019.*[20, 21] *Forest fires coinciding with record droughts and heatwaves have affected central and northern European regions that are not typically prone to fires, and have had devastating effects in southern Europe.*[22]

To understand which countries are impacted by such trends or climate change-induced hazards, every two years the EEA (and European Commission – EC) ask its member states for reports on their specific situation and adaptation measures put into effect,[23] focusing on both "acute" (extreme weather events) and "chronic" (slow onset events) hazards.

In 2023 reports, similarly to previous ones from two years earlier,[24] droughts, floods, heavy precipitation and heat waves were pinpointed by 25 countries as observed acute hazards in 2023. In particular, wildfires were reported in fifth place by 25 countries, while in 2021 they placed only tenth in the most reported acute hazard list. This may be due to the 2022 summer wildfires which impacted numerous EU regions, particularly in the South. The 2023 wildfire season was equally devastating; it included the largest single fire to occur in Europe since the 1980s (Alexandroupoli, Greece) measured by total burnt surface area.[25]

When it comes to the most commonly reported chronic hazards in 2023, then as in the case of 2021, changing temperature was prioritised. On a similar note, temperature variability was often reported, ranking third for chronic hazards, while it was the seventh most reported in the previous edition. Other chronic hazards reported by most countries were precipitation or hydrological variability (second) and changing precipitation patterns (fourth). Twenty out of 23 countries with coastlines reported sea level rise as a water-related chronic hazard.[26]

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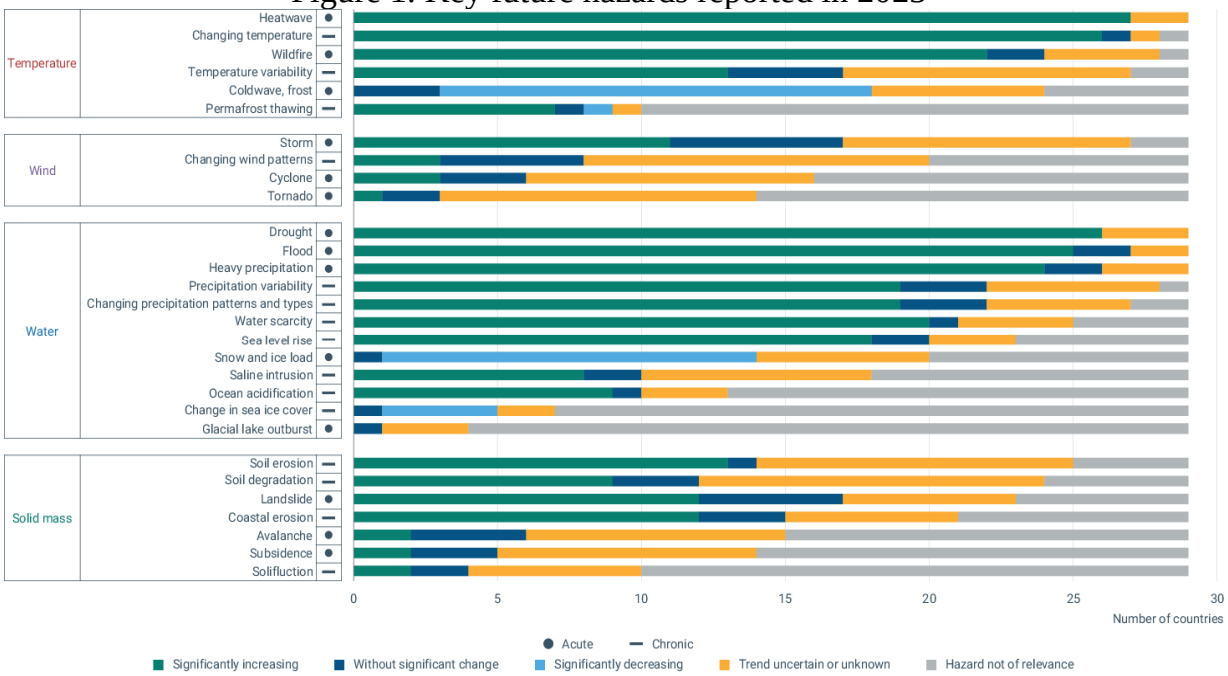
[18] EEA (2023). *Drought impact on ecosystems in Europe*.
[19] JRC (2020). *Impacts of climate change on droughts*.
[20] EEA (2020). *Soil moisture deficit during vegetation growing season*.
[21] EEA (2024). *Climate change impacts, risks and adaptation.*
[22] EEA (2021). *Forest fires in Europe.*
[23] EEA (2023). *Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023.*
[24] EEA (2021). *National and transnational climate atlases in Europe*
[25] EC (2024). EU Science Hub - *Wildfires: 2023 among the worst in the EU in this century.*
[26] EEA (2023). *Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023.*

Figure 1. Key future hazards reported in 2023



Source: EEA (2023). Key future hazards reported in 2023.

1.2 Future trends and perspectives

In March 2024, the EEA published the European Climate Risk Assessment (EUCRA) report[27] that builds on and complements the existing knowledge base on climate impacts and risks for the EU. The report suggests that there will be a strong increase in the frequency and intensity of climate hazards across all EU regions, with the following hazards being predominant:

- *"Changes in rainfall will differ considerably throughout Europe, with heavy rain expected in the north. Combined with more frequent heatwaves, lower rainfall will present a greater risk of drought and forest fires in the south.*
- *Storm intensity is projected to increase across Europe, but changes in frequency are projected to differ across regions. People may be injured or killed and strong winds and heavy rainfall can destroy properties and structures, downed power lines cause power outages, water supplies can be cut off, and sewage can overflow due to flooding.*
- *Snowfall is projected to decrease in central and southern Europe, whereas mixed changes are anticipated for northern Europe. Heavy snow can immobilise this region and paralyse its cities, stranding commuters and closing airports, stopping the flow of supplies and disrupting emergency and medical services. The weight of snow can cause roofs to collapse, and bring down trees and power lines.*

[27] EEA (2024). *European Climate Risk Assessment.*

- *Sea levels will rise in all areas except the North Baltic Sea. This may lead to the erosion of beaches, the inundation of deltas, and flooding and the loss of many marshes and wetlands. Increased salinity will likely become a problem in coastal aquifers and estuarine systems as a result of saltwater intrusion.*
- *Sea surface temperature is projected to increase in all European seas. Europe's seas are also expected to become more acidic, which could have devastating impacts on marine life, weather patterns, and land temperatures".*

If climate change progresses at its current pace and no significant adaptation measures are in place, around 350 million European citizens will be impacted by its extremes every year by the end of this century, with a 50-times increase in fatalities compared to current estimates, particularly among the most vulnerable groups – the elderly and the sick.[28]

With these trends in mind, the table below showcases the nexus between climate change-induced hazards, the most vulnerable EU territories, and future projections concerning these specific hazards.

Table 1. Climate hazards and territorial vulnerability

Hazard types[29]	Most vulnerable countries and regions	Projections for the future
Heat and cold (e.g. extreme heat)	All EU regions, particularly in the south (for extreme heat hazards and higher mean air temperatures). Specifically in the Mediterranean region: "projected combination of climatic impact-driver changes (warming, temperature extremes, increase in droughts and aridity, precipitation decrease, increase in fire weather, mean and extreme sea levels, snow cover decrease, and wind speed decrease) by mid-century and at global warming of at least 2°C and above (high confidence)".[30]	Air temperature will rise steadily across Europe. As a result, the number of growing degree days and cooling degree days will increase, whereas the number of heating degree days and days with frost will decrease. Hot extremes are expected to increase. Humid heatwaves, which pose a serious risk to human health, are projected to increase rapidly across all EU territories.
Wet and dry (e.g. excessive precipitation and droughts)	All EU cities and regions. In Northern Europe, particularly in Scandinavian countries: observed increase in pluvial flooding attributed to human influence and projected to further increase at global warming of 1.5°C (medium confidence). In Western & Central Europe: projected increase in pluvial flooding at global warming	Projected changes in annual precipitation are expected to differ considerably across regions and seasons. In northern Europe, annual precipitation and heavy rainfall are likely to increase, with less frequent droughts. Mixed changes are expected for summer rainfall, flooding events, aridity and fire

[28] Forzieri G. Cescatti A. E., Silva F. B., Feyen L. (2017) *Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study*
[29] EEA (2021). *Europe's changing climate hazards — an index-based interactive EEA report.*
[30] IPCC (n.d.). *Regional fact sheet – Europe.*

	of 1.5°C (medium confidence) and 2°C or above (high confidence); observed increasing trend in river flooding and projected further increase at 2°C. In Eastern Europe: projected increase in pluvial flooding at global warming of 1.5°C (medium confidence) and 2°C and above (high confidence); projected increase in fire weather at global warming of 2°C and above (medium confidence). In the Mediterranean region: Observed increase in hydrological and agricultural and ecological droughts (medium confidence), projected increase in aridity and fire weather conditions at global warming of 2°C and above (high confidence).[31]	hazards. Central Europe is likely to experience lower summer rainfall, but also harsher weather extremes (heavy precipitation, river floods, droughts and fire hazards), with mixed changes in annual precipitation and aridity. In the South, annual precipitation and summer rainfall are projected to decrease, whereas aridity, droughts and fire hazards are all likely to increase. Mixed changes are projected for heavy precipitation and river floods.[32]
Wind (both extreme and mean wind speed)	Northern Europe: projected increase in severe windstorms at global warming of 2°C and above (medium confidence); Mediterranean region: wind speed decrease by mid-century and at global warming of at least 2°C and above (high confidence).[33]	Climate models anticipate relatively minor changes in mean wind speed. Storm intensity is projected to increase across Europe, but changes in frequency are projected to differ across regions.
Snow and ice	Lack of snow and ice sheet might be particularly troublesome for regions in central and southern Europe, whereas mixed changes are anticipated for northern Europe.	Strong declines in glaciers, permafrost, snow cover extent, and seasonal snow duration at high altitudes are and will be observed.[34]
Coastal: - **Relative sea level** - **Coastal flood**	Most coastal regions in Europe will experience further increases in mean and extreme sea levels, except for the northern Baltic Sea, where land levels are still rising following the last ice age. The coasts of Belgium, Netherlands and north-west Germany; most of the coastal regions in Denmark and southern Sweden; the coasts in southern and western France and north-east Italy, including the region of Venice, are particularly vulnerable.[35]	Regardless of the level of global warming, the relative sea level will rise in all European areas except the Baltic Sea, at a rate close to or exceeding the global mean sea level. Changes are projected to continue beyond 2100. Extreme sea level events will become more frequent and more intense, leading to more coastal flooding. Shorelines along sandy coasts will retreat throughout the 21st century (high confidence).[36]
Open ocean (e.g. marine heatwave or ocean chemistry)	Marine heatwaves projected everywhere. Europe's seas are also expected to become more acidic, which could have devastating impacts on marine life, weather patterns, and land temperatures. Coastal communities will be affected all over Europe.	The frequency and intensity of hot extremes, including marine heatwaves, have increased in recent decades and are projected to keep increasing regardless of the Greenhouse Gas (GHG) emissions scenario. Critical thresholds

[31] Ibidem.
[32] EEA (2021). *Europe's changing climate hazards — an index-based interactive EEA report.*
[33] Ibidem.
[34] Ibidem.
[35] EEA (n.d.). C*limate change impacts in Europe.*
[36] IPCC (n.d.). *Regional fact sheet – Europe.*

		relevant for ecosystems and humans are projected to be exceeded for global warming of 2°C and higher (high confidence).

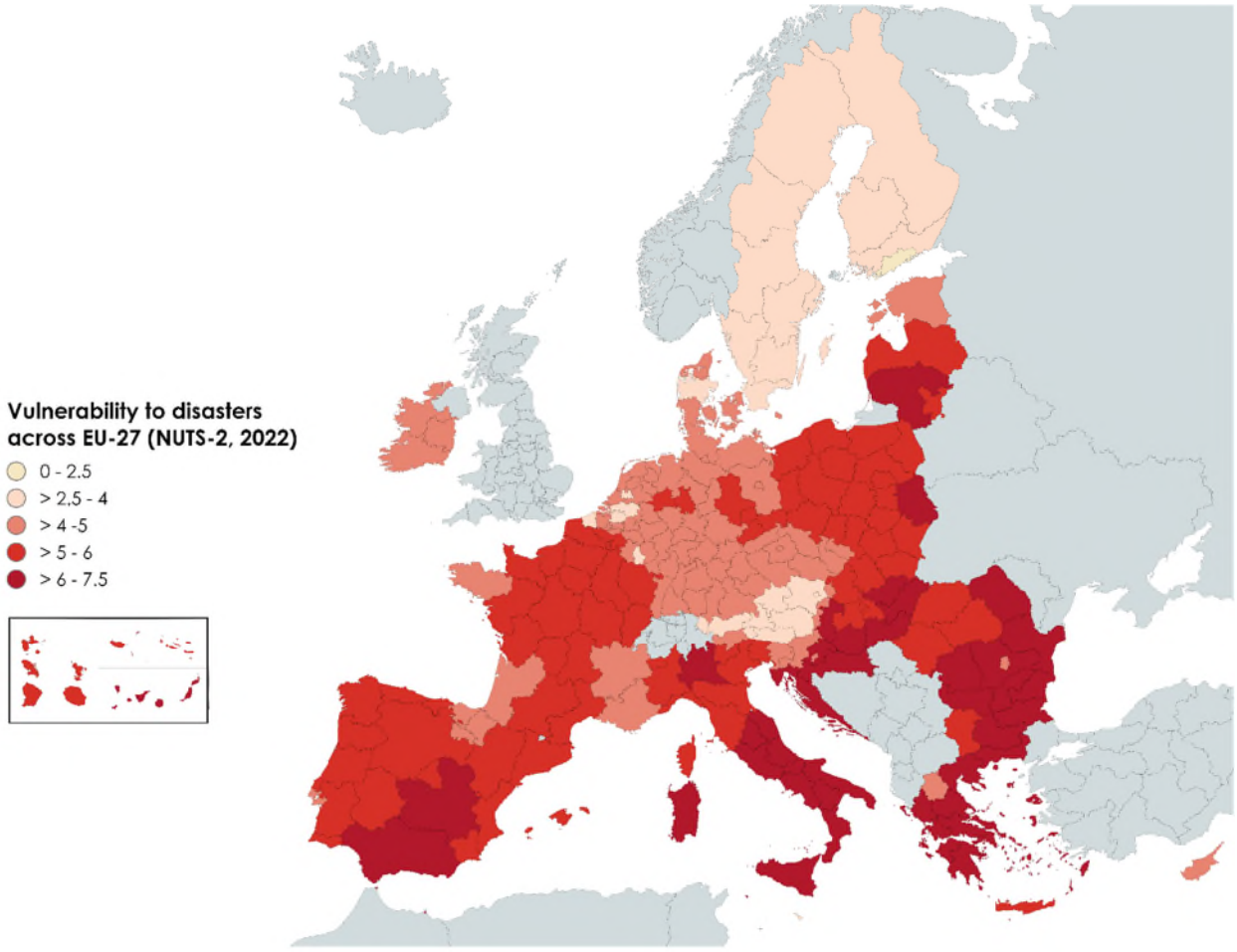
Source: CASE own elaboration based on desk research.

While the table above presents territories vulnerable to specific hazard types of interest for this particular study, there are numerous interesting publications and tools showcasing the multi-hazard, overall vulnerability of EU Member States and their regions. One of the measurements is included in the Disaster Risk Management Knowledge Centre's (DRMKC) Risk Data Hub[37] as Vulnerability Dashboard. The vulnerability indicator is composed of five dimensions (social, economic, political, environmental and physical) and is meant to capture the systemic vulnerability to disasters across different administrative levels (country, NUTS-2 and NUTS-3). The index is scored using values ranging from 0 to 10.[38] The measurement provides an interesting methodology for assessing the overall vulnerability at the EU Member State level and could be highly beneficial for Member States and LRAs currently re-working their adaptation strategies. The figure below presents a vulnerability to disasters across the EU-27 regions according to the DRMKC vulnerability index for 2022.

[37] A multi-hazard Geo-portal developed based on needs identified in a 2016 assessment, aimed to make research results more accessible and usable for decision-makers.

[38] Eklund G. et.al. (2023*). Towards a European-wide vulnerability framework.*

Figure 2. DRMKC Risk Data Hub, Vulnerability Dashboard - vulnerability to disasters across EU-27 (NUTS-2, 2022)

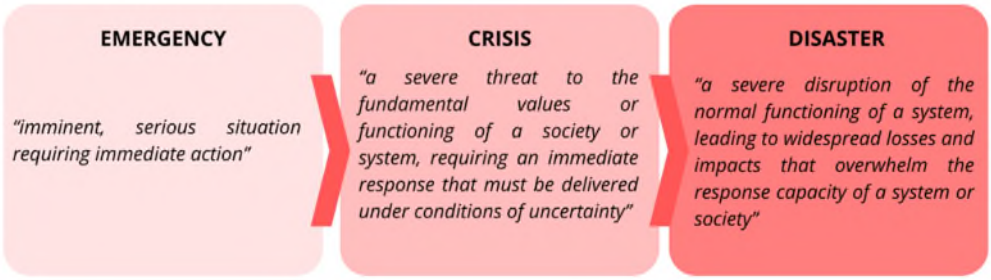


Source: DRMKC - Risk Data Hub, Dashboard – Vulnerability; Eklund G et.al. (2023). Towards a European-wide vulnerability framework.

Part 2: Proactive versus reactive crisis management: analysis of the benefits of anticipatory governance in disaster risk management

The terms *emergency*, *crisis*, and *disaster* are frequently used interchangeably. The figure below presents the definitions adopted by the EC.[39]

Figure 3. Emergency, crisis and disaster – definitions



Source: SAPEA (2022). Strategic Crisis Management in the European Union

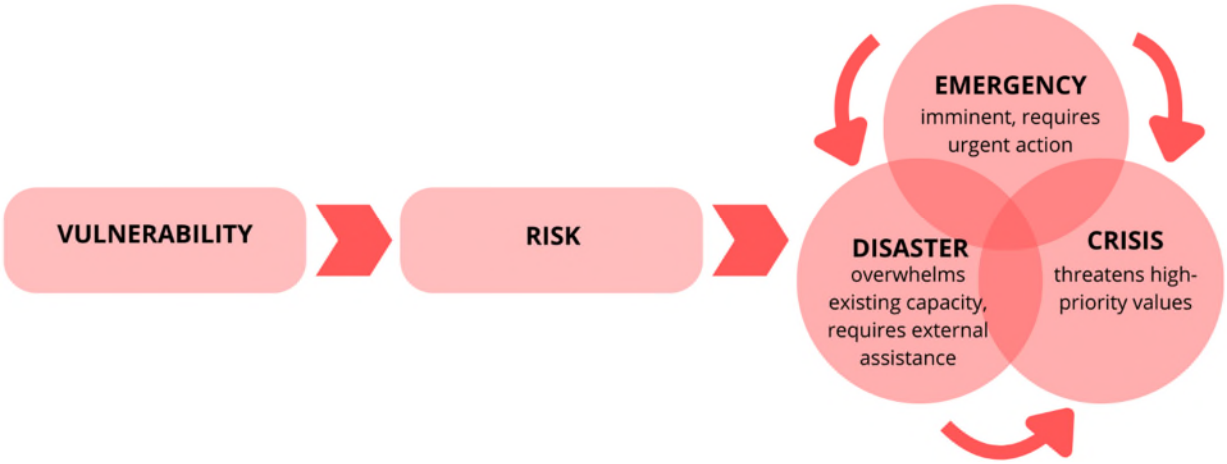
Both emergency and crisis (if neglected or mismanaged) can lead to a disaster that requires urgent response and, typically, external assistance, as the local capacities to respond can become overwhelmed.

To understand crises, it is also important to recognise how they arise. The combination of the consequences of an event or hazard and the associated likelihood of its occurrence (the vulnerability and coping capacity) is defined as **risk**.[40] Conventionally, vulnerabilities create risks that – when unaddressed – can develop into crises, often initiated by a triggering event or series of events.

Whether a hazard escalates into a disaster depends largely on society's capacity to address the underlying risk factors, reduce the vulnerability of the community and be ready to respond in the case of an emergency.[41] **As a general rule, if individuals, households, municipalities and countries have lower levels of coping and adaptive capacities, their vulnerability is higher**.

[39] EC (2022). *Strategic crisis management in the EU Improving EU crisis prevention, preparedness, response and resilience.*
[40] Ibidem.
[41] EEA (2011). *Mapping the impacts of natural hazards and technological accidents in Europe — An overview of the last decade*.

Figure 4. From vulnerability and risk to emergency, crisis and disaster



Source: SAPEA (2022). Strategic Crisis Management in the European Union.

Prompt **crisis management** may prevent a situation from escalating into a disaster. However, any crisis management system has several levels. On the strategic level, decision-makers facilitate and arrange crisis management across all phases of the crisis management cycle, including preparedness, response, and recovery.[42] At the operational level, emergency responders and volunteers set up emergency shelters, dispatch ambulances, organise call centres, and transport goods to where they are needed, along with other measures.

In discussions about crisis management, **resilience** that refers to "the capacity of systems to recover at a certain pace and includes the possibility of reaching better conditions with respect to the pre-crisis"[43] appears as a core concept, highlighting the need for a resilience-oriented approach that acknowledges the challenges associated with transboundary, and complex systemic interdependencies.

With this perspective, the boundaries between the different phases of crisis management and **risk management** often overlap and become blurred. In a crisis, society is either facing a disaster or close to one. While crisis management conventionally deals with measures to reduce impacts and restore stable conditions in due time, risk management either involves preventing a crisis from happening, preparing for crisis situations in advance, or having measures in place that can mitigate or reduce the magnitude of harm associated with the risk.[44]

[42] EC - DG RTD (2022). *Strategic crisis management in the EU Improving EU crisis prevention, preparedness, response and resilience*
[43] SAPEA (2022). *Strategic Crisis Management In The European Union.*
[44] Ibidem.

In the EU, crisis management encompasses a large range of capacities that are distributed vertically across EU institutions and Member States (national, regional and local levels).[45] Effective crisis management should be based on a proactive and comprehensive approach. Recognising that disasters are a consequence of vulnerability also shapes approaches to resilience that should lead to more local and community-based measures.[46] By shifting from reactive to more proactive strategies, sub-national governments can anticipate, prepare for, and effectively respond to crises whenever they occur.

2.1 Proactive versus reactive crisis management – introduction to anticipatory governance

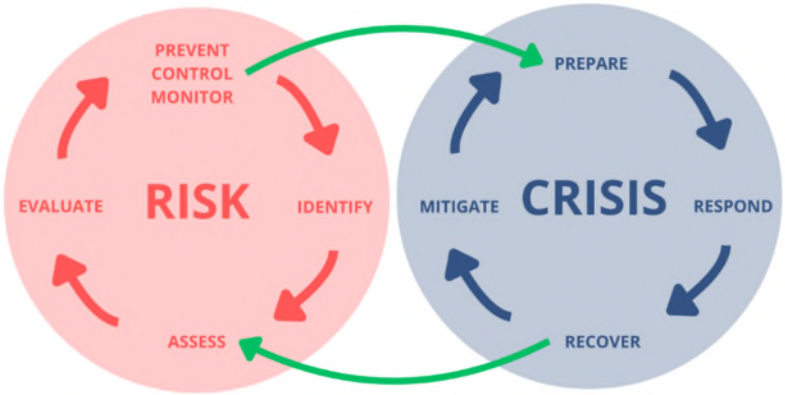
The reactive crisis response phase starts only when an emergency, a crisis or a disaster occurs – after the initial shock has already had an impact on people's lives and safety. This leads to a significant drop in the effectiveness of crisis response efforts.[47] Data from past events are used to inform present-day action in order to avoid repeating the same mistakes in the future, and to break past patterns and cycles. However, this assumes a degree of predictability and repetition.

Conversely, proactive crisis management is forward-looking and favours anticipatory action. This includes the effective alignment of comprehensive and integrated **disaster risk reduction** (DRR) that prevents new and reduces existing disaster risks (exposures, hazards or vulnerabilities), while managing residual risk, thereby contributing to stronger community resilience.

This interplay of crisis management and **disaster risk management** or in other words the application of DRR policies and strategies,[48] is illustrated in Figure 5 below as a proactive approach to crisis management. While risk management involves identifying, assessing, and then monitoring and ideally preventing risks, the crisis management cycle incorporates preparedness, which should be complemented by DRM control and monitoring measures. Similarly, as crises become protracted and their longer-term implications become visible, new risks may arise during the response and recovery phases; continuous assessment, control and monitoring of the DRM cycle is of importance in crisis management.[49]

[45] Initially, the EU was not intended to handle crises, but it has gradually developed capabilities in crisis management across sectors like finance, health, climate change, and data governance. With the emergence of interconnected and cross-border crises, there is now greater demand for the EU to step up. It is tasked with fostering coordination and solidarity among Member States, and delivering swift, adaptable, and multi-sectoral solutions.
[46] Burnside-Lawry J. et al. (2015). Building local level engagement in disaster risk reduction: A Portugese case study.
[47] Council of the European Union (2022). *Council conclusions on Disaster Risk Reduction in EU external action.*
[48] UNISDR (2017). *Terminology.*
[49] SAPEA (2022). *Strategic Crisis Management in the European Union.*

Figure 5. Integrated crisis and risk management cycles: a proactive approach to crisis management



Source: SAPEA (2022). Strategic Crisis Management in the European Union.

DRM is a complex process that requires a range of methods and tools aligned with all possible components of the cycle, providing a range of complementary approaches for managing the risks of extreme weather- and climate-related hazards and disasters.[50]

Reactive DRM uses past data to inform present actions, preventing the repetition of errors, assuming predictability and overlooking the systemic risks and current states shaped by past developments. However, present actions influence future resilience, so emerging trends should also be integrated into decision-making.[51] An important tool for forecasting and decision support for proactive DRM that allows the gathering, sharing and analysing of information is **strategic foresight.**

Strategic foresight is not about predicting the future but exploring different possible futures that could arise, in order to better prepare for change.[52] **When integrated into policy formation, it enables policymakers to take actions today that influence future outcomes and ultimately help steer the future in the desired direction**.[53] There is a variety of methodologies and tools that are used to support the development of strategic foresight at different stages, from setting the scope to taking action. They include cost-benefit analyses; brainstorming; strengths, weaknesses, opportunities and threats (SWOT) analyses; megatrends analyses; and relevance trees. The table below presents five of the most common approaches to strategic foresight used in crisis management.

[50] EEA (2017). *Climate change adaptation and disaster risk reduction in Europe. Enhancing coherence of the knowledge base, policies and practices.*
[51] UNPD (2023). *Choosing Your Tomorrows: Using Foresight and Anticipatory Governance to Explore Multiple Futures in Support of Risk-Informed Development.*
[52] CoR (n.d.) *Embracing Uncertainty: Harnessing Strategic Foresight for Regional and Local Progress.*
[53] EC (n.d.d). *Strategic foresight.*

Table 2. Examples of strategic foresight tools used in crisis management

Strategic foresight approach	Description
Horizon scanning	A systematic scan and collection of events and trends, the output being a future scape or visual mapping of new signals of change. Horizon scanning is particularly well suited for identifying systemic risks and multiple crises, as it supports their identification through information on emerging trends in political, economic, social, technological, environmental and legal areas, and secondly, it can take a long-term perspective, which increases the chances of identifying emerging or creeping risks.
Scenario thinking	An interactive and iterative process that incorporates interviews, analysis and modelling to generate a collection of plausible future narratives, regardless of preference, depicting how these futures might unfold. Its purpose is to aid decision-makers in navigating future uncertainties.
Megatrends analysis	Exploring and reviewing large-scale changes building in the present at the intersection of multiple policy domains, with complex and multidimensional impacts in the future.
Visioning and back-casting	Developing an image of an ideal (or undesirable) future state and working backwards to identify what steps to take (or avoid).
Risk assessment matrices	Risk assessment models that use risk matrices are the scientific tools that provide an opportunity to better understand disaster risk drivers and inform DRM measures. They are based on two dimensions: the probability of the hazard, and the (expected) impact of the hazard when it does occur.

Source: EC (n.d.). Strategic foresight, EC (2019). Recommendations for National Risk Assessment for Disaster Risk Management in EU Approaches for identifying, analysing and evaluating risks, OECD (2019). Strategic Foresight for Better Policies. & SAPEA (2022). Strategic Crisis Management in the European Union.

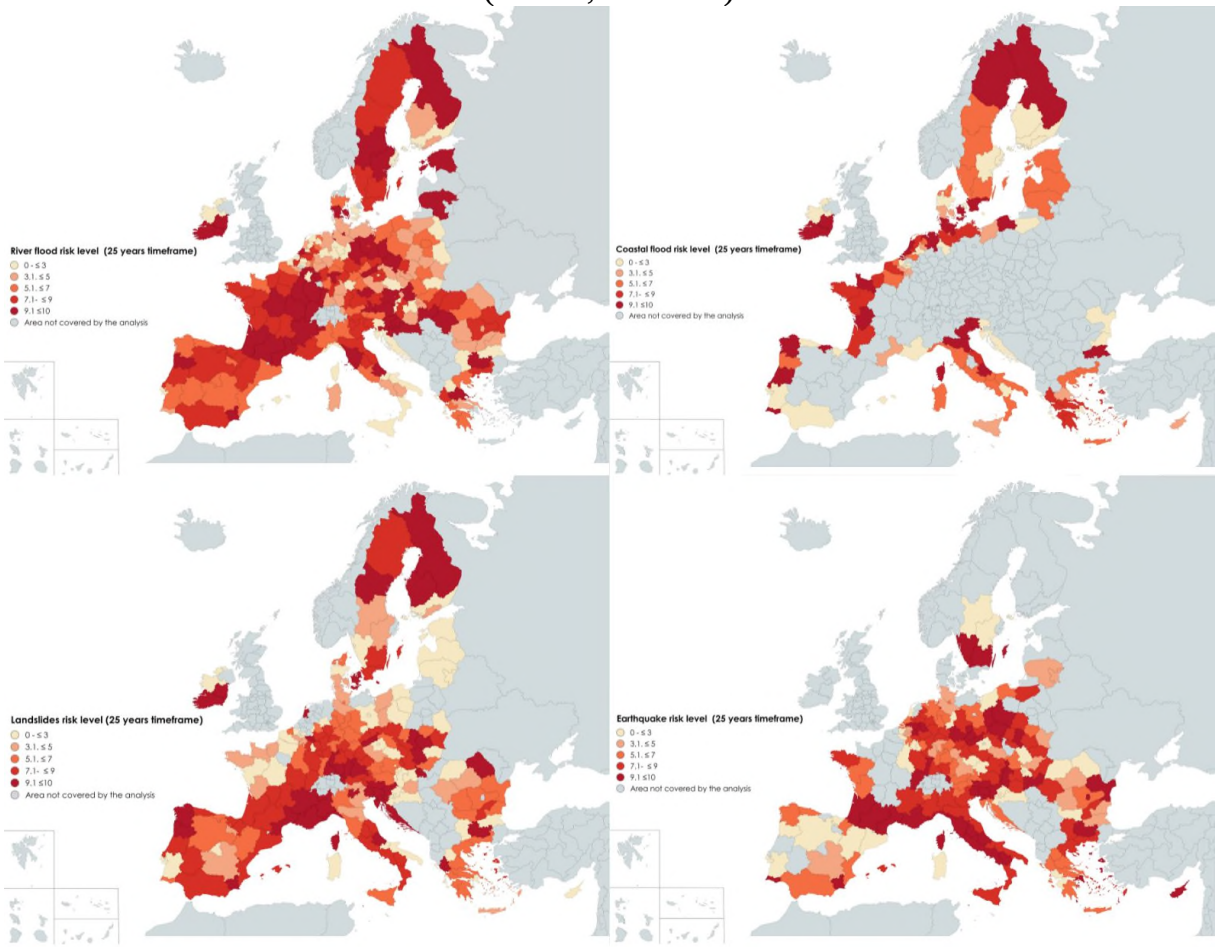
Given the resource constraints, the authorities should leverage and build on already developed tools and scientific background to integrate strategic foresight tools with decision support activities to improve preparedness and optimise resource allocation in the proactive crisis management cycle. There is a variety of hazard-based indexes, and indicators available for national, regional and local levels.

For example, the results of the Risk Analysis Module included in the DRMKC Risk Data Hub provide national and local authorities with open-source software and data that allows for easy adoption and replication of the presented methodologies, which can be expanded or substituted with supporting data for more precise assessments. A key feature of the model is its ability to compare potential impacts across different hazards.

The module provides risk values normalised between 0 and 10 for administrative units, according to selected hazards (earthquake, landslide, coastal flood, river flood) and assets (buildings, environment, critical services and population). The methodology identifies the most affected locations by using average relative values over the last 25 years. It also computes the expected exposures for various temporal intervals, (including annual, 2 years, 5 years, 10 years, 15 years, and 25

years). The figure below presents visualised data (on the NUTS-2 level) based on the module, where the population at risk is evaluated in 25 years timeframe. The risk is determined probabilistically as a function of hazard, exposure and vulnerability.

Figure 6. DRMKC Risk Data Hub, Risk Analysis Module – river flood, coastal flood, landslide and earthquake risks according to population asset in 25 years timeframe (EU-27, NUTS-2)



Source: DRMKC - Risk Data Hub, Risk Module.

Such strategic foresight exercises can effectively address the need for standardised data formats to facilitate efficient information exchange and can be translated into effective preparedness actions, including conducting training sessions and emergency drills.[54] **As European cities and regions possess unique vulnerabilities that distinguish them from the national level (and from each other), conducting strategic foresight at the local level is vital in identifying the specific needs, challenges, and drivers of change that affect each territory**

[54] SAPEA (2022). *Strategic Crisis Management In The European Union.*

differently – allowing LRAs to tailor evidence-based, anticipatory policies and approaches.[55]

2.2 Benefits of anticipatory governance in disaster risk management

Anticipatory governance is defined by the Organisation for Economic Co-operation and Development (OECD) as the "systematic embedding and application of strategic foresight throughout the entire governance architecture, including policy analysis, engagement, and decision-making".[56] In crisis management, it is referred to as the **use of DRM tools through a set of planned and pre-financed measures taken when a disaster is imminent before a shock, or acute impacts are felt**.[57] It translates into a sustainable decision-making process based on consensus on a desirable future or vision through the participation of a variety of stakeholders (including authorities, civil society, and academia) as well as a feedback system to measure the consequences. Such an approach to crisis management and DRM when applied on a key sub-national level can bring a multitude of benefits to the local decision-making system.

1. Better anticipation and future-proofing

In times of escalation of potential risks and hazards, especially given the climate change impacts, policy-making requires the consideration of various potential future scenarios along with robust preparation mechanisms. With anticipatory governance that aims to prepare sooner for new opportunities and challenges that could emerge, it is possible to equip LRAs with the capacity to prepare, navigate, adapt, and shape the future through better policies.[58]

A critical component in this regard is the systematic assessment and identification of risks to gain insights into potential vulnerabilities. This allows LRAs to take preventative measures to mitigate risks before they escalate into crises. After conducting a risk analysis, it becomes feasible to create risk maps to provide a transparent overview that facilitates the involvement of various stakeholders. The combination of risk assessments and mapping helps to prioritise policy decisions to address the most critical risks through suitable prevention and preparedness measures.[59] Risk analysis can also have a significant effect on the **continuous improvement of the crisis management system** – for example through the use

[55] CoR (n.d.) *Embracing Uncertainty: Harnessing Strategic Foresight for Regional and Local Progress.*
[56] OECD (2019). Strategic Foresight for Better Policies.
[57] E. Wilkinson (2020). *Integrating 'anticipatory action' in disaster risk management.*
[58] OECD (2021). *Foresight and Anticipatory Governance in Practice Lessons in effective foresight institutionalisation.*
[59] EC (2010). *Commission staff working paper 'Risk assessment and mapping guidelines for disaster management'.*

of scenario thinking tools that are based on experiences from the past, although events and impacts that have not yet occurred should also be considered.

2. Flexibility of actions and responses (including better allocation of financing)

Some aspects of the future are unknowable, and any prediction or forecast represents only one of many possible futures. By breaking down actions into components and spreading the costs over time, potential losses can be minimised should investments need to be abandoned.[60]

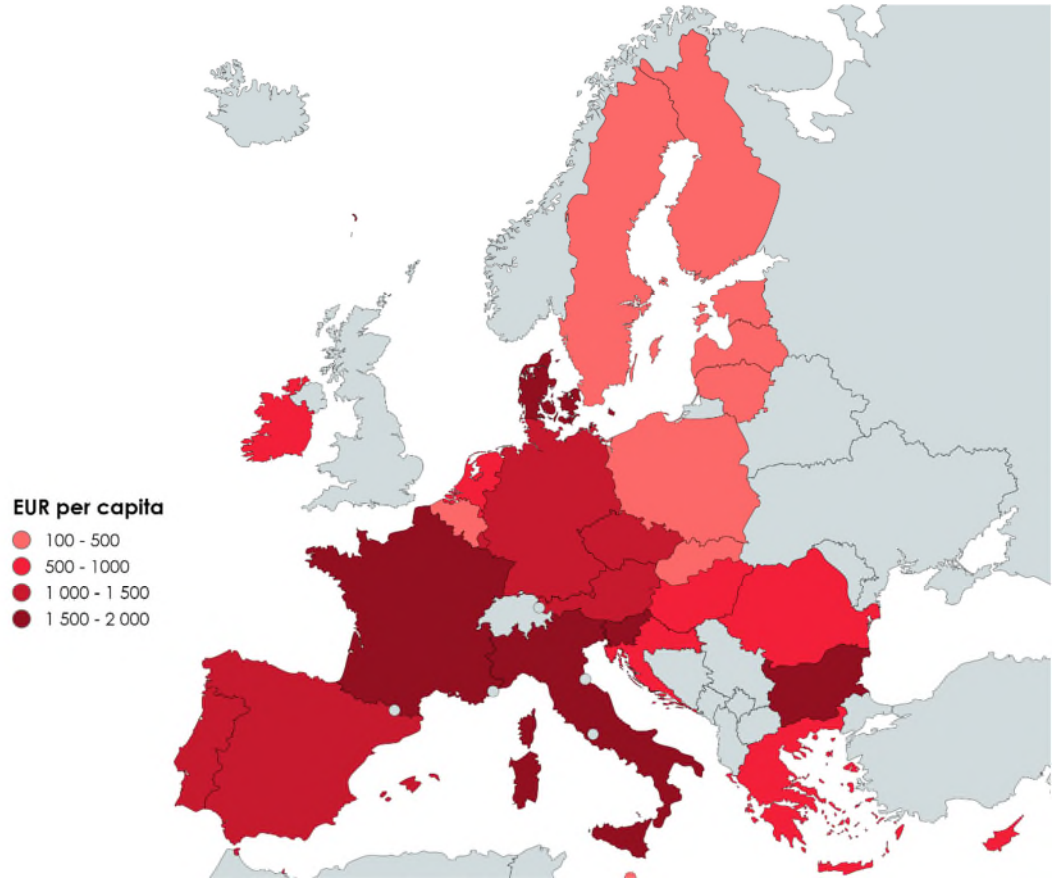
Given the impact of climate change, regular monitoring through particular risk indicators should be done regularly, feeding the decisions. In fact, the cost of non-action in the EU stemming from losses resulting from extreme weather events already averages over EUR 12 billion per year, and the frequency and severity of climate hazards is only going to intensify.[61] The annual investment requirements for adapting the EU for climate hazards are estimated at between EUR 35 and 500 billion; the substantial variation here stems from the different underlying assumptions, tools and methodologies used.[62]

- It is estimated that exposing the EU economy to global warming of 3°C above pre-industrial levels could, with the current adaptation and mitigation strategies – or rather lack thereof in many cases – result in an annual loss of at least EUR 170 billion.[63]
- Losses would be distributed unevenly, hitting predominately vulnerable groups, coastal areas and regions that may already be performing worse than others in terms of economic growth or innovation generation.[64] River flood losses alone could exceed EUR 50 billion per year, while coastal flood losses each year could be as high as EUR 250 billion in 2100.[65]

The figure below presents the total economic loss (EUR per capita) caused by weather - and climate-related extreme events for the period 1980-2020 in EU-27 countries.[66]

[60] Quay E. (2015). *Anticipatory Governance - A Tool for Climate Change Adaptation.*
[61] Feyen L., Ciscar J.C., Gosling S., Ibarreta D., Soria A. (2020). *Climate change impacts and adaptation in Europe. JRC PESETA IV final report.*
[62] EC (2017). *Climate mainstreaming in the EU budget - Preparing for the next MFF.*
[63] EC (2021). *Building a Climate-Resilient Future - A new EU Strategy on Adaptation to Climate Change.*
[64] EC (n.d.). *PESETA - Projection of Economic impacts of climate change in Sectors of the European Union based on bottom-up Analysis.*
[65] Ibidem.
[66] Based on the damage records from CATDAT of RiskLayer and the EUROSTAT structural indicators.

Figure 7. Total economic loss caused by weather - and climate-related extreme events across EU- 27 (1980-2020, EUR per capita)



Source. EEA (2021). Economic losses and fatalities from weather- and climate-related events in Europe (Briefing no. 21/2021); based on the damage records from NatCatSERVICE of Munich Re and the EUROSTAT structural indicators

However, crises and ineffective means of reaction can have devastating consequences not only for the economy but also for the environment and overall stability. For example, wildfires both trigger and increase the probability of extreme temperatures and can spark off further wildfire events. Causing immediate damage as they burn (including charred vegetation and burnt soil), in the long term they increase the risk of floods in the future. The cascading effects of such events may include food unaffordability, climate-related displacement and financial instability. Through foresight tools and effective risk assessments, **anticipatory governance allows the consideration of multiple (co-occurring) hazards and the potential cascading effects, in which one hazard triggers another**[67] – minimising the potential negative effects in the long term.[68]

[67] EC (2010). *Commission staff working paper 'Risk assessment and mapping guidelines for disaster management'.*
[68] Pescaroli G., Alexander D. (2016). *Critical infrastructure, panarchies and the vulnerability paths of cascading disasters.*

3. Policy innovation and increased citizen engagement

Lastly, a significant benefit of anticipatory governance that is based on inclusive participation and resourcing is the **enhancement of the effectiveness of the whole system**. Incorporating diverse perspectives and disciplines, including various backgrounds and age groups, allows exploration of the interplay between different areas of expertise. This diverse participation not only enhances the legitimacy of foresight processes but also ensures that a broader range of potential scenarios and solutions are considered, thus leading to more robust and comprehensive crisis management strategies.[69] However, adequate resourcing is crucial for facilitating the involvement of large, diverse groups of stakeholders in foresight processes that go beyond surface-level analysis. To address this, it is essential to challenge common arguments against citizen participation and clearly define how civil and expert input will be utilised in decision-making processes.[70]

2.3 Possible challenges and ways to develop anticipatory governance

With the benefits outlined in the previous sub-chapter, the process of developing anticipatory governance in crisis management may pose some challenges for LRAs.

1. Risk ownership and trust

The challenge of risk ownership arises when new cross-level issues emerge, leading to the ad-hoc assignment of responsibilities without clear processes. Issues connected to climate change often lack clear leadership, resulting in a reluctance to intervene on both national and sub-national levels.[71] To tackle emerging problems systematically, governments need a flexible, long-term and unified approach to analyse and assign responsibility.

Decision-makers also confront a challenging societal landscape when making risk-related decisions. Alongside uncertainties about the accuracy of truth claims, there is **a growing erosion of trust in government problem-solving capabilities**, with doubts regarding regulatory agencies' reliability, and scrutiny of the moral integrity of key figures involved in risk assessment and management.[72] These issues can place the responsibility for addressing systemic risks squarely on the shoulders of LRAs.

[69] OECD (2021). *Foresight and Anticipatory Governance in Practice: Lessons in effective foresight institutionalisation.*

[70] Ibidem.

[71] Ibidem.

[72] Siegrist M. (2021). *Trust and Risk Perception: A Critical Review of the Literature*; Mewes J. et al (2021). *Experiences matter: A longitudinal study of individual level sources of declining social trust in the United States.*

2. Organisational and financial capacities

The main organisational and financial challenges revolve around a lack of individual and collective capabilities in anticipation, innovation, and futures literacy within public administration, and a shortage of the effective allocation of resources to support capacity-building efforts.[73] This deficit leads to the prioritisation of short-term tasks (reactive approach) over long-term, anticipatory strategic thinking. Strategic development responsibilities are often concentrated among a few individuals with heavy workloads, while public servants need to receive training and support to develop foresight capacity not met.

3. Ensuring effectiveness

A significant challenge is to ensure the **effectiveness of overseeing and coordinating activities across the different phases of risk and crisis management cycles**, given the interconnected nature of various crises and risks. These responsibilities are often divided among different organisations.[74]

4. Navigating uncertainties

Despite good intentions, interventions can fail, or they can even exacerbate situations due to unforeseen side effects (see subchapter 3.4 on maladaptation). This uncertainty can lead to either paralysis in decision-making and inaction or blind activism and impulsive action without clear effectiveness.[75] In such uncertainty, conflicting ideas and models emerge, making it challenging for decision-makers to determine the best course of action.

5. Addressing inequalities

Various areas and regions exhibit distinct levels of exposure and vulnerability to crises, while also differing in the resources and capabilities that they have to address them. Similarly, **crises tend to exacerbate existing social inequalities**, leading to the most severe consequences affecting marginalised groups the most, whereas those who are economically advantaged often remain unaffected or may even experience economic gains.[76]

Given the main challenges, there are several critical areas for action in the development of anticipatory governance to crisis management on a sub-national level. The table below outlines the main mechanisms and action points for LRAs.

[73] OECD (2022). *Anticipatory Innovation Governance Model in Finland: Towards a New Way of Governing.*
[74] SAPEA (2022). *Strategic Crisis Management In The European Union.*
[75] Ibidem.
[76] SAPEA (2022). *Strategic Crisis Management In The European Union.*

Table 3. The main mechanisms for anticipatory governance in crisis management at the sub-national level

MECHANISM	ACTION POINTS
Inclusion in all levels of governance	The traditional approach to crisis response follows a hierarchical, quasi-military structure, where information is centralised and decisions are made at the top, orders and instructions are then disseminated for execution in a top-down manner. Input from a diversity of affected and interested parties – scientists, experts, and Non-governmental Organisations (NGOs), can increase social accountability and impact trust in decision-making. Such measures can take many forms, such as making sure that project beneficiaries are fully informed, organising community consultations on project plans (regulatory feedback), or giving affected communities control over investment decisions and project implementation.[77]
Civic engagement	➢ Going beyond inclusive consulting and strengthening the resilience of local communities. **Bottom-up approaches that empower communities** to drive a risk reduction agenda in support of their development goals constitute the best manner to build resilience based on local knowledge and address local priorities, especially those related to climate risks. Moreover, in times of crisis, community response alleviates the pressure on the LRA-based disaster response and increases the collective response capability.[78] ➢ **Prompt information and communication during crises**. Digitalisation offers new possibilities as the widespread use of smartphones and other technologies supplements conventional methods, enhancing response capacity and empowering citizens to aid themselves and others.
Evidence-based planning	**Planning concrete contingencies and scenarios**, as well as ensuring that the capacities and resources to respond are in place. The use of strategic foresight tools enables the steering of strategic decision-making by identifying potential crises, and improving preparedness and resource allocation processes.[79]
Evidence-based risk assessments	➢ Further advancement in integrating hazard mapping and risk assessments as a critical priority area.[80] While some progress has been made, there is room for **improving the alignment between assessing climate change impacts, and vulnerability and disaster risk evaluation**. Establishing comprehensive, cohesive, and interoperable databases on disaster losses is crucial for enhancing existing damage models. DRMKC Risk Data Hub,[81] a multi-hazard geo-portal that includes dashboards on disaster risk, vulnerability to disasters and disaster loss, available on the NUTS-1, 2 and 3 levels, is an example of an EU-level initiative in this regard. **However, the active involvement of LRAs, civil protection authorities, statistical offices, and meteorological and hydrological services in standardising data, ensuring its quality and enhancing accessibility is vital.**[82] ➢ Alongside recorded losses, it is **imperative to incorporate hazard simulations and model-based loss assessments, enhance exposure data resolution, and gain deeper insights into various vulnerabilities and hazards**. By employing such measures through strategic foresight tools, the

[77] GFDRR (2015). *Building social resilience protecting and empowering those most at risk.*
[78] This is particularly critical during the first 72 hours after a disaster strikes, which is the time it often takes until government response is fully operational; SAPEA (2022). *Strategic Crisis Management in the European Union.*
[79] Ibidem.
[80] EEA (2017). *Climate change adaptation and disaster risk reduction in Europe: Enhancing coherence of the knowledge base, policies and practices.*
[81] DRMKC – Risk Data Hub.
[82] SAPEA (2022). *Strategic Crisis Management in the European Union.*

	existing gaps can be bridged, allowing a more nuanced understanding of the distribution of losses.[83]
Addressing inequalities	Consideration of how marginalised groups are represented in crisis management and how inequalities apply to the situation.
Integration of CCA measures	**Taking into account the importance of climate change as a driver of risk through increased coherence between DRM and CCA measures.** While CCA focuses on the future and addresses uncertainty and new risks, and DRM addresses already existing risks, both offer various complementary strategies for mitigating the risks associated with extreme weather and climate-related hazards.[84]

Source: own elaboration, CASE based on desk research.

[83] Ibidem.

[84] EEA (2017). *Climate change adaptation and disaster risk reduction in Europe: Enhancing coherence of the knowledge base, policies and practices.*

Part 3: The role of climate adaptation in preventing disasters and enhancing the resilience of EU regions

Adaptation to climate change is one of the strategies we undertake to reduce the effects of climate change on the economy, society and the environment. It is the process of adapting to changing conditions now and in the future, in a situation where we know that regardless of the efforts made to mitigate climate change, the climate crisis will pose an increasing threat to the planet. Therefore, CCA:

- *is a response to current climate change-induced risks and hazards and those predicted in the future*
- *applies to both natural and human systems*
- *reduces the effects of threats while taking advantage of possible benefits*
- *can be implemented through policy, practice and projects*
- *applies to all decision-making levels*
- *can be undertaken by communities or citizens as long as it is transparent*.[85]

The EC adopted its strategy on adaptation to climate change in February 2021 so that the EU can "adapt to the unavoidable impacts of climate change and become climate resilient by 2050".[86] The strategy has four specific objectives: to make adaptation smarter, swifter and more systemic, and to boost international and Member State-level action on CCA. At the local level, examples of CCA actions include building and adapting large-scale infrastructure, such as developing various facilities to protect against sea level rise (for example green and blue urban infrastructure) and bringing about behavioural changes, such as choosing climate-friendly products and services.[87] There are also multiple platforms (such as the CoR's Green Deal Going Local databse or the EU Mission on Adaptation to Climate Change) and organisations, such as the Covenant of Mayors and its Policy Support Facility, working with cities and regions to support them in driving the change in disaster resilient and climate adaptation-oriented urban development.

The specific objective of this chapter is to describe the role of adaptation actions in enhancing the overall resilience of EU regions, and to present potential risks related to maladaptation.

[85] UNFCC (n.d.). *Adaptation and resilience*.
[86] EC (n.d.). *EU Adaptation Strategy*.
[87] EEA (2023). *What is the difference between adaptation and mitigation?*

3.1 The role of LRAs in fostering climate change adaptation

Each city and region has distinct features that characterise it, such as geographical and hydrological conditions, as well as interregional, spatial, socio-economic, ecosystemic and industrial dependencies. Each city and region can also distinguish sectors in which some of its activities and impacts on the environment are concentrated, for example, public transport, water management, spatial management, energy and biodiversity. Each of these sectors, depending on the area being analysed, has a different vulnerability to the effects of climate change.

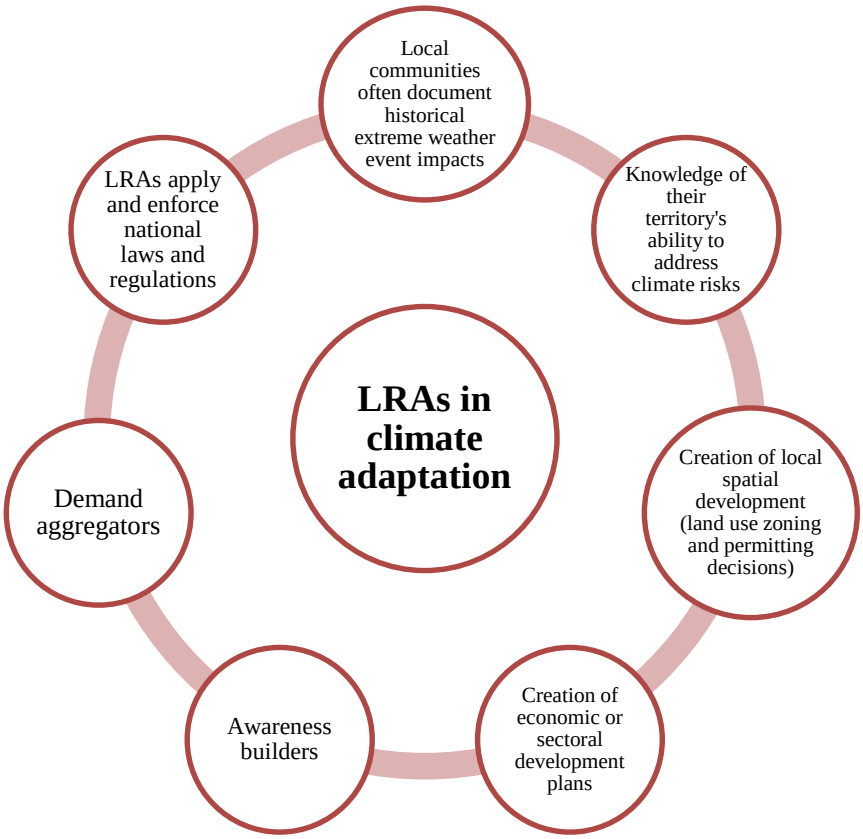
Cities in particular are critical in regard to the green transition since they consume the majority of global primary energy used for the construction and operation of urban buildings, in logistics and urban mobility, and in industry and other activities. In fact, worldwide, cities account for ca. 70% of all GHG emissions, and the numbers are believed to be growing as a result of continuing urbanisation, including across the EU.[88] This further indicates the importance of undertaking climate adaptation measures to prepare for severe hazards while reducing GHG emissions and other impacts associated with fossil fuel use, such as health repercussions.

Following the example of national pledges stemming from the Paris Agreement and EU-specific objectives and other strategies on climate adaptation and mitigation, LRAs can also contribute towards a green and just energy transition while preventing disasters and enhancing the resilience of the EU. In the end, their engagement is vital to planning and achieving commitments, also given their relevance within national governing setups. However, despite cities' and regions' ambitions, there is a need for coordinating the efforts at the EU level, and nationally, regionally and locally, so as to ensure the effective achievement of resilience by design methodology at all levels.

Once coordination is ensured, regions, cities, towns and villages are uniquely positioned to plan, promote, introduce, implement and monitor the effectiveness of adaptation actions. That is because LRAs are planners and regulators, for example holding responsibility for urban zoning, building permits and various ordinances. Sub-national governments are often important owners or operators of energy-generating facilities and related urban infrastructure. In addition, they also have an educational role to play, and they are awareness builders for the local community. Figure 8 below presents the roles that LRAs can have towards developing climate adaptation strategies:

[88] UN (n.d.). Department of Economic and Social Affairs, Statistics Division: Goal 11.

Figure 8. The role of LRAs in fostering climate change adaptation



Source: own elaboration, CASE.

Local leadership and knowledge are essential to building resilience to climate impacts, as there is no one-size-fits-all quick fix. The benefits of adaptation measures at the local and regional levels are essentially:

1. ***The ability to introduce context-specific initiatives***

Effective CCA tackles the uncertainties of climate hazards, risks and vulnerabilities in a context of a specific locations. There is no universal solution for all EU Member States, its cities and regions. When CCA is introduced at the local level, LRAs can adopt flexible initiatives considering future projections on climate hazards and risks.

2. ***Higher social, environmental and economic returns***

The benefits of local CCA outweigh the estimated costs (see chapter 2). Preventing loss and damage from climate change-driven risks and hazards unlocks economic and social potential for the area.[89]

[89] EC (2023). *Climate Action - Building a climate-resilient future.*

3. More equitable results

Initiatives that consider societal inequalities can avoid further exclusion of the most vulnerable individuals and groups. Inviting them to participate in decision-making can make local CCA actions more effective, while putting the needs of those most vulnerable on top of the political agenda.

4. More comprehensive approaches

Territorial CCA is more likely to be effective because LRAs apply adaptation comprehensively. They understand the links between CCA and other development measures, such as disaster impact reduction, and translate these links to their local plans and strategies.

5. Reinforced local knowledge

Local know-how is an underutilised capital that is more accessible and tailored to programmes designed for a particular location. Using local know-how in CCA actions not only eases their uptake but also makes them more inclusive and sustainable as a result of boosting communities' sense of ownership.[90]

3.2 Challenges related to climate change adaptation

Despite numerous benefits related to the introduction of adaptation strategies at the local and regional levels, numerous obstacles and challenges remain. Hence, in some regions, the progress of decentralisation of climate adaptation-related responsibilities can still be far from satisfactory as a result of inefficient technical knowledge and capacity or a shortage of data and resources. The most common challenges to LRAs' introduction of ambitious CCA strategies include:

- **Insufficient financial resources**

LRAs derive a significant portion of their financial resources from local taxes, fees, and charges to cover at least part of the costs of the services they provide. Large-scale infrastructure needs larger investments, thereby becoming something that only the most prosperous cities and regions can afford. Even they often struggle with access to EU funds and limited national adaptation funding.

- **Information barriers**

This group embraces all situations where a lack of data, its sharing, or simply the absence of appropriate policy on data sharing can limit the success of adaptation policies.[91] Relevant data are required for the implementation of all three adaptation process steps (problem, planning, practice), but the data should also be "usable" for the decision-making bodies.

[90] Word Resources Institute (2020). *5 Benefits to Local Action on Climate Resilience.*
[91] Palutikof J.P., et.al. (2018). *Overcoming knowledge barriers to adaptation using a decision support framework. Climatic Change.*

- **Institutional and organisational skills barrier**

LRAs often lack skills and therefore need support and continuous feedback from national authorities to develop new adaptation measures. However, the support system for this particular area is rather scarce.

- **Governance and regulatory barriers**

An unknown regulatory environment or risk of legal liability can become serious concerns for LRAs planning adaptation measures.

- **Social barriers**

This group of barriers consists of various prejudices in how people think and what they might be afraid of, stemming from different perspectives on climate change and difficulties in understanding and accepting respective risks and hazards.[92] If social barriers are not appropriately understood and addressed, additional challenges can occur as the local community can turn out to be disengaged, resistant and unwilling to participate in the transition. Therefore, although such challenges are not always visible or easy to assess and measure, they can give rise to other obstacles and can limit the successful application of adaptation actions.

3.3 Different types of adaptation actions

Different climate risks and hazards require different approaches and strategies that communities and LRAs can use to adapt to climate change. The table below presents how different types of adaptation actions can address climate change-induced risks and hazards.

Table 4. Climate hazard types and relevant local disaster prevention and adaptation strategies

Hazard type	Examples of appropriate local disaster prevention and adaptation strategies	Successful adaptation action from the EU city / region
Heat and cold	1. Foster community networks that find and help at-risk populations. 2. Make changes in built infrastructure: build structures to attenuate waves and storm surges. 3. Make land use changes and build differently.	An analysis of white roofs on a school and laboratory building in Greece showed an average decrease of indoor temperatures by 1.5-2 degrees, and a substantial decrease in surface temperatures.
Snow and ice	1. Increase tree maintenance. 2. Bury power and distribution lines. 3. Formalise the checking of vulnerable groups.	RESIN – Climate Resilient Infrastructures and Cities project

[92] Hupe P.L. and Hill M. J. (2016). *And the rest is implementation. Comparing approaches to what happens in policy processes beyond Great Expectations.*

Coastal floods	1. Relocate and retreat: relocate homes and infrastructure to higher elevations. 2. Make changes in built infrastructure: build structures to attenuate waves and storm surges. 3. Renew and conserve natural systems: renourish beaches, plant coastal vegetation, and restore wetlands. 4. Make land use changes (especially in low-lying cities).	Plans for self-protection against floods in local communities / Navarra (Spain)
Open ocean	1. Undertake scenario analysis based on modelling to inform regional management responses. 2. Integration of terrestrial and coastal issues to understand and manage co-stressors on a regional scale. 3. General measures to strengthen ecosystem resilience including identifying particularly vulnerable areas and protecting these by identifying co-stressors and compensating for negative impacts.	Baltic Sea Region Climate Change Adaptation Strategy (BALTADAPT)

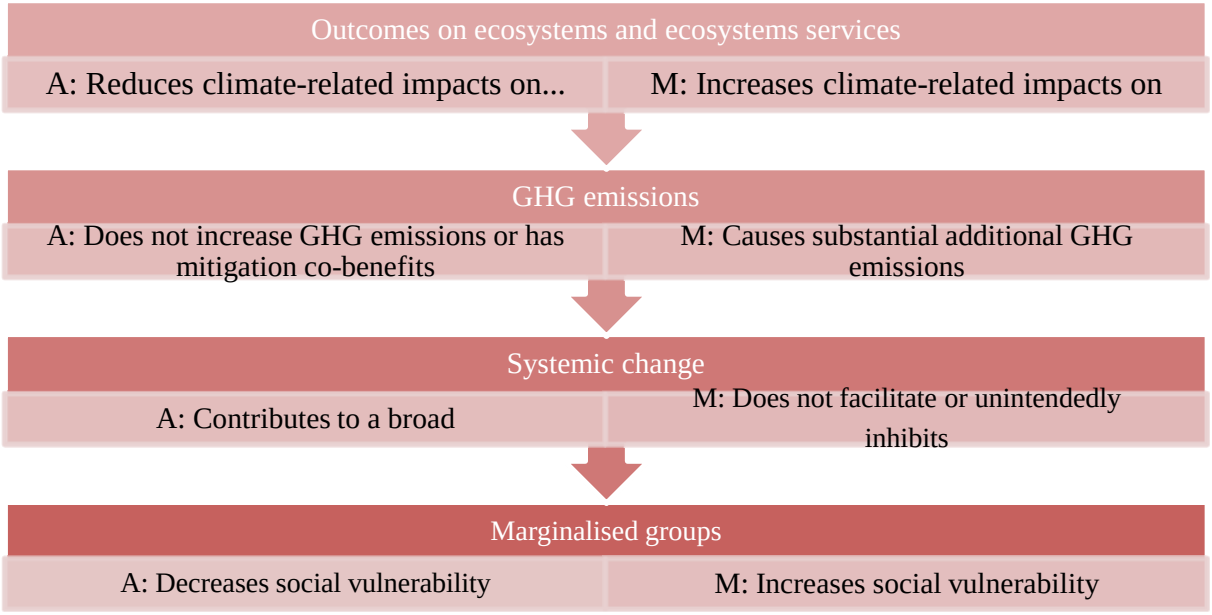
Source: own elaboration, CASE.

3.4 Potential risks related to maladaptation

According to the Intergovernmental Panel on Climate Change (IPCC), "maladaptation refers to actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased or shifted vulnerability to climate change, more inequitable outcomes, or diminished welfare, now or in the future".[93] It is essentially a situation when adaptation goes wrong, actions have direct or indirect negative outcomes and are usually unintended and its consequences can shift one region's climate problems to another location if one does not have resources to deal with the "new" risks. While there are multiple guidelines for LRAs to support them in preparation for ambitious CCA, most of them neglect the risk of maladaptation. Thankfully, some checklists have been created within the Horizon-funded projects, such as the Regional Pathways to Climate Resilience (REGILIENCE),[94] to help LRAs "identify potential risk factors for maladaptation when drafting and adopting an adaptation strategy or plan", thereby limiting the risk of maladaptive outcomes as Figure 9. below showcases.

[93] IPCC. (2022). *Summary for Policymakers.*
[94] REGILIENCE (n.d.). *Resources.*

Figure 9. Differences between adaptation (A) and maladaptation (M) actions



Source: based on Reckien D., Magnan A.K., Singh C. et al., 'Navigating the continuum between adaptation and maladaptation', Nature, Climate Change, Vol. 13, 2023, pp. 907-918.

According to the checklist, the risk of maladaptation can be minimised through the involvement of local experts with specific know-how, among others (as depicted by the above subchapter). Also, CCA planning should be transparent, multi-sectoral, and inclusive, so as to reduce the chances of maladaptation, while at the same time making sure that the benefits from a given action cover multiple groups and sectors.[95] Furthermore, LRAs should be reminded that there will always be some uncertainty regarding climate change-induced hazards and risks, as well as a diverse range of potential adverse consequences of the chosen adaptation actions, but these are still better than the costs of climate inaction (see Chapter 2).

All in all, there are four main dimensions to assess the risk of maladaptation: process, drivers, temporal and spatial scales. There are also three examples of frameworks—the Pathways, the Precautionary, and the Assessment frameworks stemming from proactive crisis management (see subchapter 2.1) that can help capture the risk of maladaptation already in the conceptualisation phase. Put together, these dimensions and frameworks can therefore significantly limit the risk of maladaptation.

[95] Schipper L. (2020*). Maladaptation: When Adaptation to Climate Change Goes Very Wrong, One Ear*th.

Part 4: Overview of the legislative and financial framework for disaster risk management and adaptation in EU Member States

Considering the effects of climate change, the reduction of vulnerabilities to climate-related risks should leverage and enhance current DRM initiatives. Strong DRM that includes adaptation strategies and plans is essential to ensure continuous progress in societal, political and economic readiness in alignment with the European Climate Law, and should be aimed at proactively addressing the climate crisis.[96] According to the EC, the **successful implementation of strategies and plans is determined by stakeholders' commitment and the resources available to them, and should be supported by a legal framework**.[97]

In 2021, the EC adopted its new EU strategy on adaptation to climate change to make adaptation smarter, swifter and systemic, and to step up international action in this regard. It gave grounds for further discussion on EU preparedness for the unavoidable consequences of climate change. The strategy also provided certain EU Member States with a good starting point for their actions in the area. [98]

All EU Member States are progressing with commitments, adopting various policy instruments that address civil protection, disaster risk prevention and preparedness, as well as CCA. An increasing role is being played by climate laws, as well as the embedding of national adaptation strategies (NASs), national adaptation plans (NAPs), sectoral adaptation plans (SAPs) and regional adaptation plans (RAPs) in binding regulatory frameworks.[99] However, these instruments vary from country to country, reflecting each country's specific national circumstances in terms of governance structure and institutional frameworks.

LRAs are often responsible for developing local strategies, risk assessments and disaster risk prevention and preparedness measures. The local approach is more

[96] EEA (2022) *Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021.*
[97] EC (2023) *Commission Notice Guidelines on Member States' adaptation strategies and plans.*
[98] EC (2021). *Communication from The Commission to the European Parliament, the Council, the European Economic And Social Committee And the Committee of the Regions Forging a Climate-Resilient Europe - the New EU Strategy on Adaptation To Climate Change.*
[99] EEA (2022) *Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021.*

personalised and reflects the actual risks in the area as well as the available local resources and capabilities, which often cannot be accurately estimated at higher levels of governance. As climate change and natural disasters do not stick to administrative boundaries, the LRAs work together within the EU Covenant of Mayors for Climate and Energy as well as the EU Mission on Adaptation to Climate Change.

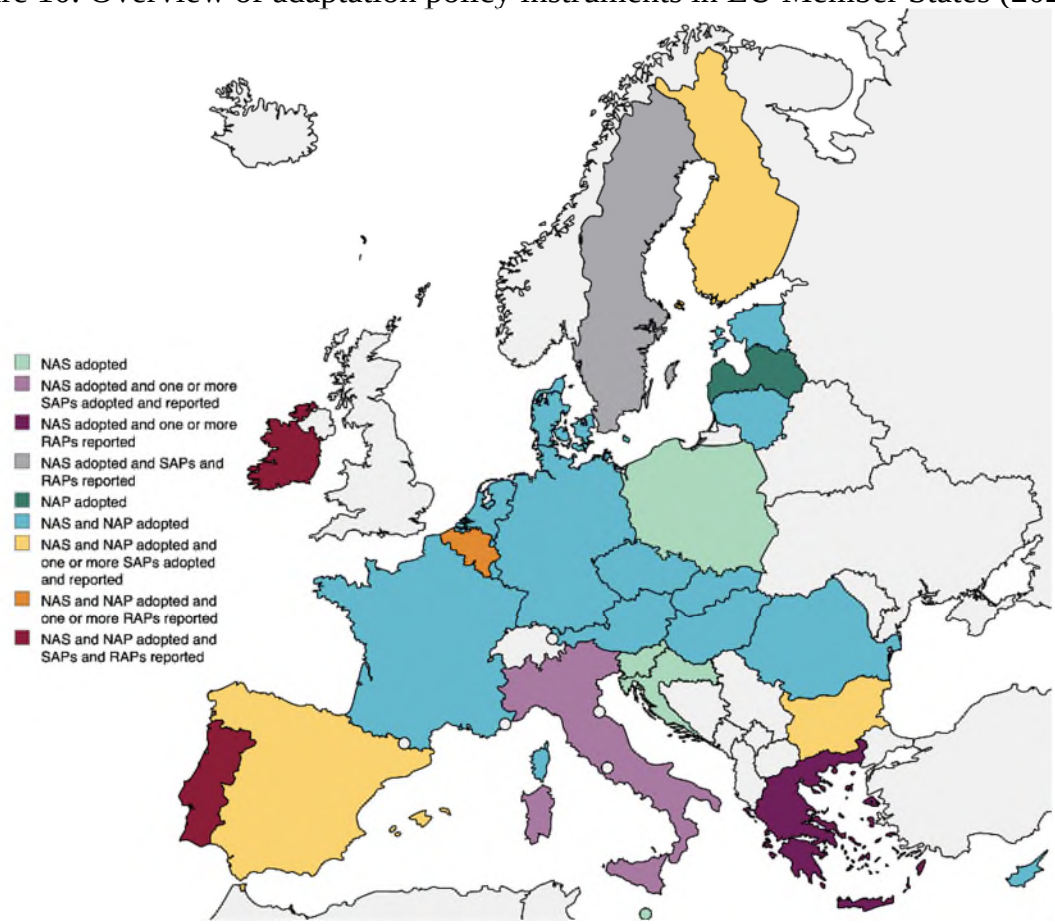
All EU Member States have in some way officially addressed civil protection and DRM, and the majority have a statutory act on civil protection in place. Among those that do not, Ireland has a legally binding Government Policy (Framework for Major Emergency Management), Finland has appropriate rules spread within several acts, strategies and programmes, the Netherlands' basic statutory act focuses on division into safety regions rather than strictly civil protection, and Austria has emergency response regulated at the provincial level. Risk assessments constitute the grounds for risk management policies and civil protection plans on different administrative levels.

As a measure of preparedness, all EU Member States conduct appropriate training and exercises. The public is informed about the risks at all levels of governance through various channels, in particular social media, TV and radio. Early warning systems have been introduced in most EU Member States, and generally include sirens, mobile apps and text messages. Some countries, such as Estonia, do not have a nationwide warning system. In many countries (for example Sweden, Latvia and Malta), children already receive education at school on natural hazards and how to behave in emergencies.

In general, in terms of climate adaptation, most Member States have introduced rather soft policies without legally binding commitments, relying on voluntary, informal, and non-hierarchical cooperation. At the same time, an increasing number of Member States have started drawing up national climate legislation to have stronger legal tools at their disposal for enforcing adaptation objectives and strategies.[100] The figure below presents an overview of adaptation policy instruments across the EU Member States.

[100] EEA (2022) *Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021.*

Figure 10. Overview of adaptation policy instruments in EU Member States (2022)



Source: EEA (2022). Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021.

It is important to highlight **that local and regional engagement is a key driver for the successful implementation of DRM and CCA efforts in the EU**. After all, many interventions depend on the context-specific conditions and vulnerabilities of a given area, and it is the local authorities who can determine what measures are the most feasible. They are also the driving force in fostering public engagement and local actions by educating the residents about the benefits of climate adaptation for their region.[101]

As described in the previous sections, the costs associated with DRM and CCA are rising and are anticipated to escalate in the coming decades, driven by the growing urgency for adaptation measures. Although the EU finances adaptation to climate change through a wide range of instruments (including the LIFE programme, Horizon Europe, the European Regional Development Fund – particularly through INTERREG projects, the Cohesion Fund, the Just Transition Fund, and many more), national and private funding is vital. This poses a

[101] EC (2023) *Commission Notice Guidelines on Member States' adaptation strategies and plans.*

challenge for local, regional, and national authorities because of uncertainty regarding the necessary funding, given the frequently unpredictable nature of climate risks and impacts. The budget for prevention and preparedness is easier to plan than the budget for emergency response. Some EU Member States have dedicated funds for natural disaster prevention, and initiatives mitigating the risks of natural hazards or CCA, such as France's "Barnier Funds" (fr. "*Fonds Barnier*"), or the Polish National Fund for Environmental Protection and Water Management. The EC recommends that Member States have a dedicated adaptation budget as part of a national comprehensive budget. However, most existing NASs and NAPs do not have dedicated budgets or financing for implementation. The adaptation finance gap is especially apparent for LRAs responsible for implementing most adaptation measures. The EC recommends that innovative funding instruments, meaning collaboration with the private sector, should be explored (while traditional sources of funding remain in use).

The following sections of the study present an overview of the legislative and financial framework for DRM and CCA in EU Member States according to the level of decentralisation of governance (centralised, partially decentralised, or decentralised), while also introducing good practice examples from LRAs (especially those that have recovered from past disasters and strengthened their resilience, or those that have used innovative funding instruments) to foster the shift from response to preparedness in Member States' efforts.

The analysis shows that the countries most affected by major natural disasters, such as Italy, Greece, Austria and France, have well-developed systems for DRM and CCA. These systems were in place long before the EU Strategy on adaptation to climate change was adopted. Austria's approach is almost purely local, and there is no national framework for civil protection. In Italy, Greece and France the national laws emphasise prevention and local preparedness. The latter is not necessarily consistent with the administrative division of the country, and might concern more municipalities or provinces that are affected by the risk in the given area, for example with plans concerning a Vesuvio eruption or cross-border plans for the Alps. In countries with experience in emergency response, additional focus is also put on ensuring effective decision-making and response in the event of an emergency.

On the other hand, the approach to the financing of preventative and reactive measures differs even among these countries. Even though the budget is put together in various ways, the more-experienced countries usually have some funds dedicated to adaptation and preparedness. Most EU Member States also benefit from EU funds in this respect.

4.1. Legislative and financial framework for disaster risk management and climate change adaptation in EU Member States

Table 5. The legislative and financial framework for DRM and CCA in EU-27: countries with centralised governance structures

CENTRALISED GOVERNANCE		
CYPRUS *A unitary presidential republic consisting of 6 administrative districts, with no deliberative representative bodies at the regional level.*	**DRM**	There is no national strategy, nor any legislation beyond the Civil Defence Law of 1996. Risk management planning is conducted through the risk management plans in which the complete disaster cycle is taken into account. A risk reduction strategy is also in being developed. A National Risk Assessment for climate change impacts was carried out in 2015-2016, with the cooperation of the Department of Environment and Civil Defence. ➢ The primary objective of Cyprus Civil Defence is to undertake diverse humanitarian duties aimed at safeguarding the civil population, helping in recovery from the immediate effects of hostilities or disasters, and providing the conditions necessary for survival. ➢ The Minister of the Interior is responsible for the implementation of the Civil Defence Law and the relevant regulations and has the overall supervision of the civil defence system.[102]
	CCA	The combined climate adaptation plan and strategy[103] (updated and formally adopted in 2017) includes many vertical mechanisms. For scenarios and projections, the Strategy considers the future period 2021-2050. ➢ There are no strategic documents for the sub-national level. ➢ Local adaptation actions are not part of a programmed and planned process. Some municipalities have their own initiatives.
	FUNDS	The adaptation policy process has been aided by the CYPADAPT project (2011-2014)[104], which was co-financed by the EU through the LIFE+ instrument and was coordinated by the Ministry of Agriculture, Rural Development and Environment. The adaptation measures identified have been included in the funding priorities foreseen in the Partnership Agreement of the Republic of Cyprus, a comprehensive strategic document for the utilisation of European Structural and Investment Funds (ESIF).[105]
CZECHIA *A parliamentary representative democracy, divided into 14 regions*	**DRM**	Based on risk assessment, and mostly implemented at the national level. ➢ The key legislation in terms of disaster risk management is the Crisis Act of 2000.[106] ➢ Checklists were introduced for the most significant risks to ensure effective response. ➢ The basic aim of risk management is to mitigate the impact of a disaster, i.e. to ensure appropriate emergency response.[107]

[102] Civil Defence Cyprus (n.d.) Laws – website; EC (n.d.), European Civil Protection and Humanitarian Aid Operations (n.d.) Cyprus.
[103] CYPADAPT - *National Adaptation Plan of Cyprus to Climate Change*; Climate-adapt (n.d.). *Country profiles – Cyprus.*.
[104] CYPADAPT – website. https://cypadapt.uest.gr
[105] EC (2017). *Adaptation preparedness scoreboard: Country fiche - Cyprus*.
[106] Crisis Management Act N. 240/2000 Coll.
[107] European Civil Protection and Humanitarian Aid Operations (n.d.) *The national disaster management system – Czech Republic.*

	CCA	CCA has already been incorporated into the Czech legal system[108] and is guided by the NAS and NAP. The main goals and objectives of both documents are set according to climate vulnerability, risk assessments and NAP evaluation. CCA has also been mainstreamed in sectoral strategies and plans, including the national disaster risk management plans, and spatial and urban plans. ➢ NAS: the *Strategy on Adaptation to Climate Change*[109] with specific adaptation and legislative measures and partial economic analysis. The last update of the NAS and the *National Action Plan on Adaptation* from 2021. ➢ No legal requirements on adaptation actions and strategies at the regional and local levels – all adaptation measures on the sub-national level are voluntary initiatives.[110]
	FUNDS	The NAS offers a structured assessment of the financial requirements for proposed adaptation measures. Adaptation measures are funded by EU funds and national programmes tailored to specific sectors such as agriculture, water management, forestry, and biodiversity. Nevertheless, there is no designated budget for cross-cutting adaptation initiatives or dedicated fund for adaptation measures outlined in the NAS and NAP.
HUNGARY *A parliamentary republic divided into 19 counties, Budapest and 23 cities with county. Local governments with the right to adopt local decrees within their competencies to regulate social relations not regulated by a higher act.*	**DRM**	The National Directorate General for Disaster Management of the Ministry of Interior is responsible for DRM, including prevention. The Disaster Management Act is the principal statutory law in this respect. ➢ The national risk assessment is reviewed annually. Mayors of the settlements conduct relevant risk assessments by 30 September each year. ➢ The Directorate contributes to the national planning of disaster response and supervises the preparation of regional and settlement emergency plans.[111]
	CCA	The Deputy Secretariat of State for Climate Policy is responsible for the planning, implementation, monitoring, evaluation and revision of climate adaptation policy and strategy, assisted by the National Adaptation Division. ➢ The NAS was adopted in 2018 and NAP in 2020. ➢ There are no legal requirements for sub-national adaptation strategies. 132 municipalities have developed their own local strategies financed by Energy Efficiency and Environment Operational Programme resources. Considered unlikely to be implemented without legal obligation and proper financial resources.
	FUNDS	➢ DRM is funded at the government level. Obligatory regular allocation of funds for this purpose.[112] ➢ Funding of CCA is mostly from sales of EU-ETS allowances, from European Funds and Hungarian co-funding.[113]

[108] Government of Czech Republic (2001). *Act no. 100/2001 Coll., on the Environmental Impact Assessment and amending some related laws (the EIA Act)*.
[109] Government of Czech Republic (2015). *Strategy on Adaptation to Climate Change in the Czech Republic – executive summary*.
[110] Climate Adapt (n.d.). *Country profile – Czechia*.
[111] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Hungary.*
[112] International Federation of Red Cross (n.d.). *Hungary.*
[113] Climate Adapt (n.d.). *Country profile – Hungary.*

LUXEMBOURG *A unitary state with a municipal level of decentralisation. The central government has exclusive legislative power in all fields related to the national interest..*	**DRM**	DRM activities are conducted at the national level on the basis of emergency response plans and are part of the crisis anticipation and management measures developed by the High Commission for National Protection (a public body under the prime minister) together with relevant public and private entities.[114] ➢ Crisis management activities are carried out under the responsibility of a crisis unit, which is chaired by a member of the government. ➢ The Minister of Home Affairs is in charge of the organisation, coordination, and implementation of civil security.[115]
	CCA	The National Climate Law from 2020[116] constitutes the legal basis of the NAS and NAP. ➢ The NAS and NAP[117] are part of the EU's Climate Change Adaptation Strategy. Both were adopted in 2018. ➢ There is no self-governing sub-national level in Luxembourg, given the small size and nature of the administrative organisation of the country.
	FUNDS	The NAS is not backed by a specific funding allocation or commitment[118]. However, the Climate Law mentions a special fund established under the name "Climate and Energy Fund".[119]
MALTA *A parliamentary republic divided into 5 regions. Each region has its own regional committee – an intermediary between local and national governments*	**DRM**	DRM is regulated by the Civil Protection Act. [120] ➢ Prevention plans are prepared by the competent ministries. The Civil Protection Department is responsible for emergency response with the Civil Protection Council, which constitutes the coordinating body. A national risk assessment was conducted in 2015.
	CCA	Based on the Climate Action Act of 2015 and implemented only at the national level and by central administration. ➢ The NAS was adopted in 2021 as part of the National Low Carbon Development Strategy. The Climate Action Act requires the strategy to be reviewed and updated at least once every five years. ➢ There is a sector-specific approach to climate adaptation/ ➢ The Minister for the Environment, Energy and Enterprise is responsible for climate action policy. An Inter-Ministerial Committee on Climate Change has been set up. [121]

[114] European Civil Protection and Humanitarian Aid Operations (n.d.) *The national disaster management system – Luxembourg.*
[115] Ibidem.
[116] *Loi du 15 décembre 2020 relative au climat et modifiant la loi modifiée du 31 mai 1999 portant institution d'un fonds pour la protection de l'environnement.*
[117] The Government of the Grand Duchy of Luxembourg,Ministry of the Environment, Climate and Sustainable Development (2018). *Stratégie Et Plan D'action Pour L'adaptation Aux Effets Du Changement Climatique Au Luxembourg 2018-2023.*
[118] EC (2017). *Adaptation preparedness scoreboard – Luxembourg.*
[119] *Loi du 15 décembre 2020 relative au climat et modifiant la loi modifiée du 31 mai 1999 portant institution d'un fonds pour la protection de l'environnement.*
[120] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Malta.*
[121] Climate Adapt (n.d.). *Country profiles – Malta*.

	FUNDS	➢ The Climate Action Fund was established by the Climate Action Act to support the implementation of climate adaptation measures, in particular on GHG emissions.[122] ➢ In 2017, two climate adaptation projects were funded by the Ministry of Environment, Energy and Enterprise.[123] ➢ Some projects were funded or co-funded by the EU funds, e.g. under LIFE, ERDF or ESF.[124]

Source: own elaboration, CASE based on desk research. The general information about Member States is based on CoR – Division of Powers – website.

[122] The Directorate General for Environment and Climate Change (n.d.). *Climate Action Act.*
[123] The Malta Resources Authority (2022). *The 8th National Communication of Malta under the United Nations Framework Convention on Climate Change*.
[124] EC (2018). *Adaptation preparedness scoreboard: Country fiche – Malta*.

Table 6. The legislative and financial framework for DRM and CCA in EU-27: countries with partially decentralised governance structures

PARTIALLY DECENTRALISED GOVERNANCE		
BULGARIA *A unitary republican State with 6 planning regions, 28 districts and 265 municipalities*	**DRM**	DRM is regulated in the *Disaster Protection Act* and carried out at all levels. ➢ The National Disaster Risk Reduction Strategy was adopted for the years 2018-2030. Key legislation includes the *Environment Protection Act*, the Spatial Planning Act, the Water Act, the Forest Act, the Regional Development Act and *The Bulgarian Climate Change Mitigation Act*. The Third *National Action Plan on Climate Change*[125] outlines a framework for action focused on mitigation measures. ➢ Appropriate protection plans have been drawn up. Risk assessment is an obligatory part and risk-specific plans have also been adopted.[126] ➢ At the national level, the Disaster Risk Reduction Council assists in measures aimed at DRR. Regional and municipal DRR assist at the local level. [127]
	CCA	Measures are conducted mostly at the national level and integrated into various national sector policies. ➢ The *National Climate Change Adaptation Strategy and Action Plan* was approved in 2019. A sectoral rather than a regional approach was adopted. ➢ Regionally, the Strategy on Adaptation to Climate Change for Sofia Municipality was developed under the EU-funded project "Transitioning towards Urban Resilience and Sustainability".[128]
	FUNDS	According to the NAS, adaptation measures receive funding from EU funds, state finances, and possibly contributions from energy corporations. Insufficient financial resources are highlighted in the NAS, along with an excessive reliance on EU support. Including estimated investment costs is proposed in order to aid in funding allocation. [129]

[125] Republic of Bulgaria (2019). *National Climate Change Adaptation Strategy and Action Plan 2019-2030*.
[126] They include flood risk management plans, plans for forest fire protection activities and a national program for prevention, and reduction of landslides on the territory of the Republic of Bulgaria, erosion and abrasion on the Danube and the Black Sea Coast.
[127] Bulgarian Ministry of Energy (n.d.). *News and highlights;* European Civil Protection and Humanitarian Aid Operations (n.d.), Summary of the national disaster management system – Bulgaria.
[128] Republic of Bulgaria (2019). *National Climate Change Adaptation Strategy and Action Plan 2019-2030;* EC (2018). *Adaptation preparedness scoreboard – Country fiche for Bulgaria*.
[129] Republic of Bulgaria (2019). *National Climate Change Adaptation Strategy and Action Plan 2019-2030.*

CROATIA *A parliamentary republic divided into 21 counties - including the capital Zagreb - 128 towns and 428 municipalities*	**DRM**	The national level is considered critical: ➢ The national risk assessment (last review in 2019) was prepared by the Croatian Disaster Risk Reduction Platform. Measures for risk reduction are included in the Act on Civil Protection System and Act on Mitigating and Eliminating Consequences of Natural Disasters (the "Mitigating Act"), as well as sectoral laws such as the Water Act and the Act on Protecting Forests against Fires. ➢ Disaster risk assessment plan has been established for the particular level of governance. Under the Mitigating Act, the local and county self-government have to prepare action plans consisting of specifically indicated types of measures.[130]
	CCA	Mainly regulated in the Climate Change and Ozone Layer Protection Act. The Ministry of Economy and Sustainable Development is responsible for climate change policy, supported by the Government Commission for Intersectoral Coordination for Policy and Measures for Mitigation and Adaptation to Climate Change. ➢ The NAS, NAP and Programmes for Climate Change Mitigation and Adaptation and the Protection of the Ozone Layer at the local and regional level are the most important implementing documents. The current NAS was adopted in 2020. The Environmental Protection Act and the Climate Change and Ozone Layer Protection Act require local and regional authorities to adopt adaptation measures. However, only 4 out of 21 counties and 3 out of 16 large cities have developed such programmes.[131]
	FUNDS	Mostly through EU funds, in particular EUSF. The Fund for Environmental Protection and Energy Efficiency in cooperation with the Ministry responsible for climate policy has had two public calls for co-financing of the preparation of subnational adaptation plans and their implementation. [132]
DENMARK *A constitutional monarchy with five administrative regions, 2 special status regions (Faroe Islands and Greenland) and 98 municipalities, each governing through its own*	**DRM**	Mainly regulated by the Danish Emergency Management Act. [133] ➢ The Danish Emergency Management Agency carries out the national risk assessment every 4-5 years (the last version in 2022). Risk management planning is also described in the National Emergency Plan, the Comprehensive Preparedness Planning Guidelines, Guidelines for Crisis Management and Guidelines for On-scene Incident Command, as well as other documents. Sector-specific plans are also prepared, but mostly relate to hazards in general and are not risk-centered. ➢ Ministries are obliged to adopt emergency and continuity plans in the event of disasters. An appropriate emergency management plan also has to be drawn up by each municipal and regional council. Municipalities are obliged to draw up risk management plans for mitigating the direct effects of natural weather and climate hazards.

[130] Z. Sigmund et. al. (2022). *The Role of Disaster Risk Governance for Effective Post-Disaster Risk Management – Case of Croatian,* Buildings' European Civil Protection and Humanitarian Aid Operations (n.d.). *Croatia*; Climate-adapt (n.d.). *Country profiles – Croatia*

[131] Climate Adapt (n.d.). *Country profiles – Croatia*

[132] D. Trut, J. Kovačević (2022). *Climate Change, Disaster Risk Reduction and Resilience*; International Bank for Reconstruction and Development, The World Bank (2021). *Economics for Disaster Prevention and Preparedness. Financial Risk and Opportunities in Build Resilience in Europe*; Climate-adapt (n.d.). *Country profiles – Croatia.*

[133] European Civil Protection and Humanitarian Aid Operations (n.d.) *The national disaster management system – Denmark*; Danish Emergency Management Agency (2022). *National Risk Profile 2022*; Gram-Hanssen I., et al. (2023). *Comparison and analysis of national adaptation policies in the Nordic region.*

elected councils and a very high degree of autonomy	**CCA**	The Danish government is principally responsible for policy objectives and approving the overarching framework for adaptation.[134] ➢ The NAS[135] was established in 2008. As a direct result of the NAS, the national adaptation portal, www.klimatilpasning.dk, was launched under the Danish Environmental Protection Agency. In 2012, the NAS was supplemented by a NAP[136] for a "climate-proof Denmark". ➢ The revised Planning Act of 2018 is one of the most important acts on adaptation and introduces legal responsibility to consider climate risks in planning cycles, and to prepare adaptation plans and facilitate their implementation, which includes flood protection, land use planning, and infrastructure management.
	FUNDS	➢ The Danish government allocates funding primarily for adaptation purposes, focusing mainly on coastal protection and research and development initiatives. ➢ In 2023, nearly DKK 190 million (approx. EUR 25.5 million) was earmarked for the Danish Meteorological Institute and other national authorities to develop an innovative early flood warning system. ➢ Municipalities are not typically tasked with financing adaptation efforts unless they directly safeguard public assets. Instead, the responsibility falls upon wastewater utilities and private landowners.
ESTONIA *A unitary republican State with 79 local government units (15 towns and 64 rural municipalities), with a multi-*	**DRM**	The DRM system is decentralised. On a national level, competent authorities are appointed for each risk and the ministries are responsible for crisis management within their area of governance: ➢ The Ministry of the Interior coordinates risk and crisis management. ➢ A national risk assessment is conducted and constitutes the basis for further actions. Contingency plans are risk-based. ➢ Crisis committees are appointed at national, regional and local levels [137]

[134] Gram-Hanssen I., et al. (2023). op.cit.
[135] Danish Government (2008). *Danish strategy for adaptation to a changing climate.*
[136] Danish Government (2012). *How to manage cloudburst and rain water - Action plan for a climate-proof Denmark.*
[137] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Estonia.*

level approach to the environment and the climate.	**CCA**	Mostly conducted at the national level. The NAS and NAP were adopted in 2017. The *Development Plan for Climate Change Adaptation until 2030*[138] presents a framework for action for reducing vulnerability to climate change. In 2021, the NAS action plan for the period of 2021–2025 was completed ensuring that adaptation activities are consistent, meet the goals set in the development plan, and contribute to both the local and national levels. ➢ The Ministry of Environment has the overall responsibility for the development of the NAS. ➢ In 2017, the Estonian Parliament approved the *General Principles of Climate Policy until 2050*[139] followed by a more detailed policy approach set out in *Estonia's 2030 National Energy and Climate Plan*[140], supported by specific plans (including climate adaptation). The strategic development documents include direct and indirect measures, concerned with climate change mitigation and the regulation of emergencies (under the *Emergency Act and Water Act*[141]). ➢ Some adaptation measures have been included in sectoral development plans, action plans and laws. ➢ There is a shortage of information or evidence regarding any adaptation strategies at lower administrative levels. County and local municipal risk assessments and crisis management plans include climate adaptation.[142]
	FUNDS	➢ The NAS provides the estimation for the implementation in the amount of EUR 43,745,000.[143] ➢ Measures financed from the state budget are ensured within the cost limits of the implementing agencies in the financial strategy. ➢ The majority of climate adaptation measures at the subnational level have occurred through EU-funded projects.[144]
FINLAND *A parliamentary republic with 19 regions, 70 sub-regions and 309 municipalities.*	**DRM**	There is no single national framework, but government resolutions, strategies and programmes form the basis for preparedness for disasters. Some responsibilities within prevention are included in the Rescue Act and Emergency Powers Act. ➢ Risk assessments constitute a basis for preparedness for various administrative bodies and actors. ➢ Coordinated by the Ministry of the Interior, the rescue services are responsible for the emergency preparedness planning under the Rescue Act. The Security Strategy for Society harmonises national preparedness principles and guides various administrative branches.[145]

[138] Ministry of the Environment of Estonia (2017). *Climate Change Adaptation Development Plan until 2030.*
[139] EC (2023). *Resolution of the Riigikogu General Principales of Climate Policy until 2050.*
[140] EC (2019). *Estonia's 2030 National Energy and Climate Plan (NECP 2030).*
[141] Parliament of Estonia (2017). *Emergency.*
[142] EC (2018). Adaptation preparedness scoreboard – *Country fiche for Estonia.*
[143] Ministry of the Environment of Estonia (2017). *Climate Change Adaptation Development Plan until 2030.*
[144] EC (2018). Adaptation preparedness scoreboard – *Country fiche for Estonia.*
[145] Climate-adapt (n.d.). *Country profile – Finland;* European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Finland.*

	CCA	The core of CCA is regulated by the Climate Act of 2022. ➢ The NAP is part of the climate policy planning system under the Climate Act. It is prepared by the National Monitoring Group of the National Adaptation Plan and adopted by the government. ➢ Regional Councils form a collaboration network on climate. Tampere included measures of regional collaboration in the Climate Strategy of the Tampere City Region 2030. In Pohjois-Savo, the Savonia University of Applied Sciences coordinates the business network of climate security which informs on extreme weather events, and adaptation to climate change. In Helsinki, a network of adaptation experts and practitioners in the metropolitan cities was formed in 2022.[146]
	FUNDS	There are no dedicated funds for DRM at any level of governance.[147] Climate adaptation is mainly financed from the state budget and relevant public finance plans, existing resources and funding (CAP funding, national subsidy schemes), and EU funding.[148]
IRELAND *A parliamentary republic consisting of 26 counties. The legal system is based on the Constitution of 1937, acts adopted by the Parliament, delegated legislation, and – as*	**DRM**	Mainly implemented at the national level: ➢ No law dedicated to natural disasters, emergency response, or otherwise civil protection has been adopted. A legally binding policy was adopted by the government in 2006 - the Framework for Major Emergency Management, introducing five stages of continuous activity in emergency management: hazard identification, mitigation, preparedness, response and recovery. This was an approach designed to fit "all hazards". The National Steering Group oversees the implementation of the Framework for Major Emergency Management. ➢ Eight major emergency management regions were established. They are responsible for annual planning and preparing for major emergencies based on identified risks.[149]

[146] Climate-adapt (n.d.). *Country profile – Finland.*
[147] International Federation of the Red Cross (n.d.). *Finland.*
[148] Climate-adapt (n.d.). *Country profile – Finland*
[149] Irish Government (2021). *A framework for major emergency management*; Irish Red Cross (n.d.). *A Study for Strengthening the Legal and policy Framework for International Disaster Response in Ireland.*

a common law system – courts' judgments.	**CCA**	CCA measures have a national focus. The most recent Climate Action Plan was published in December 2022 and includes climate adaptation issues, setting out measures for 2023 aimed at building resilience. ➢ The NAP is mainly included in the Climate Action and Low Carbon Development Act of 2015 (amended in 2021). The National Adaptation Framework is adopted and reviewed at least every five years (the last review in 2022). It identifies priority sectors for which the Government adopts sectoral adaptation plans. ➢ Twelve key Sectoral Adaptation Plans and thirty-one local authority climate adaptation plans were published in 2019. Consistency in adaptation planning is ensured by the National Adaptation Steering Committee and chaired by the Department of the Environment, Climate and Communications. ➢ Since 2021, local adaptation strategies have been replaced by Local Authority Climate Action Plans that local authorities are now required to adopt every five years. Four Climate Regional Offices were established in 2018 to assist local governments.[150]
	FUNDS	➢ No dedicated budget for natural disaster prevention. ➢ A well-developed system with support for non-governmental humanitarian organisations. In the case of emergency response, the Framework anticipates unbudgeted costs; the principal response agency should record costs and have control mechanisms in place; the local economic actors may request support from principal support agencies.
ITALY *A unitary state (a democratic Republic with a bicameral parliamentary system) with 220 regions (15 ordinary regions, 5 special-status regions), 2 self-governing provinces (Bolzano/Bozen and Trento), 110 provinces, 15 metropolitan areas and 7960 municipalities*	**DRM**	A well-developed system for DRM and civil protection - an integrated system of public and private entities with central and territorial structures constantly working to ensure coordination and consistent operativity.[151] ➢ The Civil Protection Code[152] dedicated to civil protection related to natural disasters was introduced in 2018. The role of citizens and non-governmental organisations is recognised, facilitating their involvement in legal and economic terms. ➢ The Code stipulates that the authorities should conduct dynamic studies of possible risk scenarios and regulate activities for non-structural prevention.[153]
	CCA	CCA activities are conducted at the national level by the Central Government, in particular the Ministry of Environment and Energy Security. ➢ The NAS was adopted in 2015, while NAP is under development; ➢ All regions and several local authorities participate in the activities of the Ministry of the Environment to strengthen administrative capacity in adaptation within the CReIAMO PA Project; ➢ Several regions and municipalities have adopted their own adaptation strategies and plans. Some municipalities also adopted local adaptation plans. [154]

[150] Climate Adapt (n.d.). *Information on national adaptation actions reported under the Governance Regulation – Ireland; Irish Government* (2022*). Review of the National Adaptation Framework.*
[151] International Federation of Red Cross and Red Crescent Societies (2022). *Disaster recovery and reconstruction in Italy: a legal and policy survey*.
[152] Legislative Decree No. 1 of 2 January 2018: Civil Protection Code, (*Codice della protezione civile (GU n. 17 del 22-1-2018)*).
[153] International Federation of Red Cross and Red Crescent Societies (2022). Disaster recovery and reconstruction in Italy: a legal and policy survey, p. 10.
[154] Climate Adapt (n.d.). (n.d.). *Country profile – Italy.*

	FUNDS	➢ Italy launched a funding programme in 2021 specifically for urban adaptation, allocating approximately EUR 80 million for green, blue, and grey measures. By December 2022, 80 municipalities were eligible for funding and started interventions. [155] ➢ Furthermore, since 2020, deposits other than those from the National Emergency Fund can be authorised through ordinances, including contributions from regional and local governments, private donations, other administrations, and the EU Solidarity Fund.[156] ➢ The Italian Council of Ministers has the authority to authorise specific support to assist private entities (individuals and companies) affected by an event. This assistance is limited to resources dedicated to this purpose in applicable legislation and takes into account compensation from insurance companies.[157]
LATVIA *A parliamentary republic with 9 republic cities and 110 districts.*	**DRM**	The framework for national disaster management[158] was set up in the Civil Protection and Disaster Management Law in 2016 (the "Civil Protection Law"). The prime minister ensures the functioning of the system and implementation of tasks, whereas the state fire and rescue service is responsible for the operation of the system and civil emergency planning. ➢ The competent ministers are required to perform risk assessment as a basis for the preventive measures and civil protection plans for relevant natural hazards. The state fire and rescue service prepares guidance on conducting the assessment for natural disasters and the "Potential Hazard Catalogue" which is updated whenever necessary. ➢ The Civil Protection Law assigns tasks and rights to local councils that cover the organisation of natural disaster response and preparedness. Municipalities must draw up their own civil protection plans encompassing identified risks, scenarios, matrices, mapping, prevention, preparedness, response, and recovery measures.
	CCA	The regional level has not been traditionally relevant in climate adaptation.[159] Many measures related to CCA have recently been taken.[160] ➢ National legislation on GHG inventory, projections and adaptation to climate change reporting systems was adopted in 2022. The Ministry of Climate and Energy released a draft of the Climate Law, which will also include a section on adaptation to climate change.[161] ➢ The main policy planning document that includes climate change issues is *The Latvian National Plan for Adaptation to Climate Change until 2030.*[162] ➢ Municipalities and regions play crucial roles in implementing the NAP and are tasked with elaborating information related to adaptation issues as outlined in mid-term development programs.[163]

[155] Ibidem.
[156] International Federation of Red Cross and Red Crescent Societies (2022). op.cit.
[157] Ibidem.
[158] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system* –Latvia.
[159] CASCADE (2019). *The role of local governments in adapting to climate. Overview of regulatory requirements and support mechanisms in the Baltic Sea Region.*
[160] Climate Adapt (n.d.) *Country profiles* - Latvia.
[161] Valsts kancelaja (2023). *Klimata likums (Climate law).*
[162] Latvian Ministry of Environmental Protection and Regional Development (2019). *Latvian National Plan for Adaptation to Climate Change until 2030*; CASCADE (2019). *The role of local governments in adapting to climate. Overview of regulatory requirements and support mechanisms in the Baltic Sea Region.*
[163] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system* –Latvia.

	FUNDS	➢ Civil Protection Law stipulates that the state budget should dedicate resources for civil protection tasks within their field of activity, similarly to the local authorities for their respective tasks. ➢ According to the NAP, outlined measures are to be funded primarily through allocated State budget funds, supplemented by financial support from the EU and other sources, as well as private capital where applicable. The allocation of additional State budget funds to responsible authorities is evaluated as the plan progresses.[164] The CCA Plan does not determine the specific funding for the priority measures identified therein. They are supposed to be financed by the state, local government and external funding.[165]
LITHUANIA *A parliamentary republic divided into 60 municipalities with directly elected mayors*	**DRM**	Mostly regulated in the Law on Civil Protection. The responsibility lies with the state and municipalities within their sphere of competence. The national emergency system is coordinated by the Minister of Interior. The national risk assessment is coordinated by the Fire and Rescue Department; it was last updated in 2021. ➢ The emergency commission coordinates, among others, the prevention and management of emergencies. ➢ The risk assessments and emergency management plans are conducted on all levels of governance by ministries, state institutions and directors of the municipal administration, economic entities and other agencies.[166]
	CCA	Mostly governed at the national level. ➢ The National Climate Change Management Policy Strategy was adopted in 2012, and its targets were updated in 2021, while the National Energy and Climate Action Plan (NECP) was adopted in 2019. The principal aim is to strengthen adaptive capacity, increase resilience and reduce the vulnerability to the effects of climate change. ➢ The NAP is under development. ➢ No sectoral adaptation plans. ➢ The planning and implementation of the adaptation policies is conducted by ministries, municipalities and other institutions within their competencies. ➢ The municipalities of Panevezys district and Klaipeda city developed adaptation action plans for the improvement of local adaptive capacity and infrastructure resilience.[167]
	FUNDS	The main sources of funding for climate change adaptation measures planned in the NECP are the European Regional Development and Cohesion Funds, electricity and heat tariffs, Climate Change programme, Waste Management Programme as well as State and municipal budgets. [168]

[164] Latvian Ministry of Environmental Protection and Regional Development (2019) *Latvian National Plan for Adaptation to Climate Change until 2030*.
[165] CASCADE, The role of local governments in adapting to climate. Overview of regulatory requirements and support mechanisms in the Baltic Sea Region.
[166] Law on Civil protection of 15 December 1998, No VIII-971 (with amendments), Article 6 sec. 1, Articles 10, 2 sec. 7, 11, 13 sec. 4(7), 14 sec. 4, 16 sec. 2.; Climate Adapt (n.d.). *Country profiles – Lithuania.*
[167] Climate-adapt (n.d.). *Country profiles – Lithuania.*
[168] Ibidem.

THE NETHERLANDS *A parliamentary constitutional monarchy divided into 12 provinces and 388 municipalities as well as 22 water districts. Its 6 overseas countries and territories in the Caribbean are not part of the EU*	**DRM**	Decentralised, governed by the Safety Regions Act of 2010[169] system. ➢ The central government intervenes only when necessary. The National Handbook on Decision-Making in Crisis Situations constitutes the policy framework for planning and preparation. The Minister of Justice and Security coordinates the measures within the area of DRM, and competent ministries organise the crisis management within their area of competence. ➢ National Risk Assessment is coordinated by the National Network of Safety and Security Analysts. ➢ There are 25 decentralised safety regions linking local civil protection organizations and national institutions. Regional risk assessments are conducted in each safety region.[170]
	CCA	There is a long history of CCA measures. The policy is mainly based on the NAS of 2016[171] and the Dutch Delta Programme of 2024 that is focused on floods, climate-proof housing and freshwater access.[172] Additional rules are included in the National Strategy on Spatial Planning and the Environment.[173] ➢ Implementation of the NAS is accelerated by the National Climate Adaptation Implementation Programme (2023).[174] ➢ The NAS is governed by a board of directors from the relevant ministries who cooperate with national, regional and local governments, NGOs, knowledge institutes and the private sector. [175] ➢ Local adaptation strategies have been developed in some municipalities, such as Rotterdam (the Rotterdam Climate Initiative, Resilient Rotterdam Strategy 2022-2027) and Amsterdam (Amsterdam Rainproof). About half of the municipalities have published climate adaptation plans.[176]
	FUNDS	➢ Individual ministries are responsible for financing disaster risk management within their area of competence. [177] ➢ The governmental Delta Fund finances measures included in the Delta Programme with an additional contribution of other partners. Until 2050, the Fund is expected to have EUR 27.4 billion available, and the estimated needs are EUR 30.8 billion.[178]

[169] Wet veiligheidsregio's (Dutch Safety Regions Act).
[170] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management* system – the Netherlands.
[171] Kennisportaal Klimaatadaptatie (n.d). *Nationale klimaatadaptatiestrategie (NAS).*
[172] *Nationaal Deltaprogramma 2024 – website.*
[173] Climate-adapt (n.d.). *Country profiles – the Netherlands.*
[174] Rijksoverheid (2023). *Nationaal Uitvoeringsprogramma Klimaatadaptatie Slimmer, intensiever, voor en door iedereen.*
[175] Climate-adapt (n.d.). *Country profiles – the Netherlands.*
[176] Ibidem.
[177] European Civil Protection and Humanitarian Aid Operations (n.d.) *The national disaster management system* – the Netherlands.
[178] *Nationaal Deltaprogramma 2024 – website.*

POLAND *A parliamentary republic - unitary State with local government organised at three tiers: 16 voivodships, or regions, 314 counties, and 2478 municipalities*	**DRM**	DRM is based on the Act on Crisis Management.[179] The Council of Ministers leads the measures in DRM; in urgent situations the Minister of Interior and Administration takes the lead. The leading civil protection authority is the National Headquarters of the State Fire Service. ➢ Risk assessment and planning activities are led by the Government Centre for Security subordinate to the Prime Minister. The National Crisis Management Plan[180] contains a civil planning process at the central and regional levels at the stage of prevention and preparedness as well as the stage of response and recovery. ➢ Crisis management centres are active at each governance level. The voivodes (representatives of the government in the provinces) are responsible for crisis management at the regional level, including monitoring and planning. At the lower levels, the county and municipal authorities are respectively responsible.[181]
	CCA	CCA activities are coordinated by the Ministry of Climate and Environment, supported by the Institute of Meteorology and Water Management, the Institute of Environmental Protection, and the Institute for Ecology of Industrial Areas. ➢ The NAS was adopted in 2013 and includes goals for 2020 with a 2030 perspective.[182] The NAS constitutes the basis for the climate adaptation measures, supported by the National Environmental Policy 2030, National Urban Policy, and Strategy for Responsible Development by 2020 (with a 2030 perspective). ➢ Adaptation plans for 44 major Polish cities have been developed within the project "Development of Urban Adaptation Plans for Cities with more than 100,000 inhabitants in Poland".[183]
	FUNDS	➢ The Act on Crisis Management stipulates that DRM measures based on the act should be financed by the state, region, county and/or municipal budget. ➢ Adaptation and disaster-related risk prevention funding comes from the European Funds for Infrastructure, Climate and Environment 2021-2027 programme (EUR 1.4 billion), the European Funds for Eastern Poland 2021-2027 programme (EUR 255 million) and regional operational programmes (approx. EUR 740 million). ➢ At the state level, the National Fund for Environmental Protection and Water Management finances adaptation measures through the "adaptation to climate change" priority programme (PLN 1.15 billion, approx. EUR 270 million). The regional funds for Environmental Protection and Water Management also provide funding. ➢ Additional funding comes from the World Bank, International Monetary Fund (IMF), EEA and Norway Grants as well as private entities.

[179] *Ustawa z 26 kwietnia 2007 r. o zarządzaniu kryzysowym*.
[180] Government of the Republic of Poland (n.d.). *Krajowy Plan Zarządzania Kryzysowego.*
[181] European Civil Protection and Humanitarian Aid Operations (n.d.) *The national disaster management system* – Poland; *Ustawa z 26 kwietnia 2007 r. o zarządzaniu kryzysowym*.
[182] Ministerstwo Środowiska (2013). *Strategiczny plan adaptacji dla sektorów i obszarów wrażliwych na zmiany klimatu do roku 2020 z perspektywą do roku 2030.*
[183] Climate-adapt (n.d.). *Country profiles – Poland.*

PORTUGAL *A regionalised state with three levels of governance: central, regional (the Autonomous Regions Azores and Madeira) and local - 308 municipalities and 3,091 civil parishes*	**DRM**	Overseen by the Ministry of Home Affairs and the Portuguese National Authority for Emergency and Civil Protection (ANEPC) supported by the National Civil Protection Commission. ➢ The Basic Law on Civil Protection[184] focuses on creating a more resilient society, in particular preventing and mitigating collective risks. ➢ National Risk Assessment is conducted by ANEPC, while at the local level municipalities also perform risk assessments which provide a basis for appropriate plans and programmes to be developed. [185]
	CCA	The Central Government is responsible for the country's general CCA policy, while the Autonomous Regions have their organic laws. ➢ The *National Energy and Climate Plan for 2021-2030* [186] is the main plan addressing both energy and climate and promotes adaptation to climate change in sectoral policies, plans and programmes. ➢ The main strategic documents on adaptation at the national level are the *National Climate Change Adaptation Strategy*[187] (NAS), the *Action Programme for Climate Change Adaptation*[188] and Portuguese Climate Law,[189] adopted respectively in 2015, 2019 and 2021. The NAS promotes the integration of adaptation in sectoral policies and territorial programs and plans for the Regional governments. The association of Portuguese municipalities participates in the NAS governance structure. ➢ The Autonomous Region of Madeira approved the *Madeira Climate Change Adaptation Strategy* [190] in 2015. The Autonomous Region of the Azores proceeded with the *Regional Programme for Climate Change,*[191] which encompasses mitigation and adaptation.
	FUNDS	➢ There is no dedicated budget or fund for DRM.[192] ➢ One of the objectives of the NAP is to mobilise financing instruments and financing exercises to guide the implementation of more structural actions that contribute to reducing the vulnerability of the territory and its economy to climate change by minimising related impacts.[193] The Portuguese Climate Law introduced requirements for the creation of a State *Budget for Climate Action*, that would consolidate allocations for climate policy.[194]

[184] Lei de Bases da Protecção Civil (2006).
[185] European Civil Protection and Humanitarian Aid Operations (n.d.), *The national disaster management system* – Portugal.
[186] EC (2020). *National Energy and Climate Plan 2021-2030.*
[187] *Decreto do Presidente da República n.º 87/2015.*
[188] *Resolução do Conselho de Ministros n.º 130/2019.*
[189] *Assembleia Da República Lei n.º 98/2021 de 31 de dezembro* .
[190] CCIAM, CE3C, FCUL (n.d.) *Estrategia CLIMA – Madeira.*
[191] EC (n.d.) *Regional Program for Climate Change in Azores.*
[192] International Federation of Red Cross (n.d.).
[193] Ambiente (2021). *National climate change adaptation planning and strategies.*
[194] Climate Adapt (n.d.). *Country profiles* -Portugal.

ROMANIA *Semi-presidential republic divided into 42 departments including the capital, Bucharest, 103 larger cities, 217 towns and 2 861 rural municipalities*	**DRM**	Legislative ground for DRM are included in the Civil Protection Law and supporting acts. The inter-ministerial National Committee for Special Emergency Situations is led by the Minister of Internal Affairs responsible for emergency management. National risk assessment constitutes the basis for the National Strategy for Disaster Risk Reduction. ➢ All institutions are obliged to prepare emergency management plans. Prevention activities are conducted in cooperation with the relevant experts from the ministries or agencies. ➢ County inspectorates for emergency situations provide guidance and control prevention measures. The inspectorates are under the command of the General Inspectorate for Emergency Situations. The National Strategy promotes sectoral and local disaster risk reduction strategies and plans that should take into account not only disaster risk management, but also climate change adaptation actions. [195]
	CCA	Mainly decided on the national level with the Ministry of Environment, Water and Forests as the central authority. It is supported by the inter-ministerial committee on climate change launched in 2022. ➢ CCA measures are governed by the National Strategy for Sustainable Development 2030 with an action plan adopted in 2022 as well as NAS in the form of National Climate Change and Low Carbon Green Growth Strategy and its action plan for the period 2016-2020. ➢ At the county level, the Local Environmental Protection Agencies are based in 41 offices throughout Romania responsible for the implementation of the appropriate policies and laws. ➢ Some municipalities such as Mediaș and Sibiu have adopted strategies and plans for mitigating and adapting to climate change. [196]
	FUNDS	➢ The World Bank supports the Romanian Government under the Strengthening Disaster Risk Management in Romania initiative (EUR 142 million in 2023-2027).[197] ➢ DRM financing is mostly reactive. Considerable international resources such as the EU and World Bank funds (as above) are used to improve risk management and risk reduction. State and local budgets are also used to cover the preventive measures. ➢ CCA measures are mostly financed from the EU funds. The dedicated budget for the National Climate Adaptation Strategy is managed by the Ministry of the Environment. Mandatory housing insurance was introduced for rural and urban houses' private owners. A public-private partnership (PPP) was used.

[195] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system* – Romania; Climate Adapt (n.d.). *Country profiles – Romania*
[196] Climate Adapt (n.d.). *Country profiles – Romania.*
[197] The World Bank (2023). *Strengthening Disaster Risk Management in Romania: Building Modern, Inclusive, Near-Zero Energy, and Disaster-Resilient Fire Stations.*

SLOVAKIA *A parliamentary democratic republic divided 8 self-governing regions, 79 administrative districts and 2 926 municipalities*	**DRM**	DRM is divided geographically, with each level of public administration playing its part: ➢ Key legislation is the Act on Civil Protection of Population[198]. Security Strategy[199] approved in 2022 aims to strengthen the effective management of security risks, leading to greater state resilence. ➢ The Ministry of the Interior manages and develops annual plans in the field of civil protection and determines the main aims and activities of the state administration authorities and self-government authorities (municipalities – cities/towns, villages). ➢ Emergency response is primarily the responsibility of local authorities. [200]
	CCA	The NAS[201] was updated in 2018, and the NAP[202] was adopted in 2021. As of 2024, the Ministry of Environment is working on a law on climate change and low-carbon transformation, that will oblige municipalities with more than 2,000 inhabitants to develop an adaptation strategy.
	FUNDS	The main sources of financing for adaptation activities include integrating them into sectoral policies, pooling funds from multiple sources (such as EU budgets and public resources), and leveraging existing subsidy programmes at regional and local levels.[203]
SLOVENIA *A parliamentary democratic republic divided into 212 municipalities (with no administrative regions)*	**DRM**	Organised as an integrated system with a bottom-up approach and subsidiary principle. The responsibilities lie with the government, local communities, commercial companies, and citizens: ➢ DRM is regulated by the Act on Protection against Natural and Other Disasters[204] and other sector-specific acts. In 2023, a Flood Risk Management Plan was introduced for the most flood-prone basins in Slovenia;[205] ➢ The national authority responsible for disaster management is the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief within the Ministry of Defence.[206]

[198] National Council of the Slovak Republic (1994). The Act No. 42/1994 of January 27, 1994 on Civil Protection of the Population.
[199] Ministry of Foreign and European Affairs (2021). *Security Strategy of Slovak Republic.*
[200] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Slovakia.*
[201] Ministry of Environment of the Slovak Republic (2018). *Stratégia Adaptácie Slovenskej Republiky Na Zmenu Klímy.*
[202] Ministry of Environment of the Slovak Republic (2021). *Akčný plán pre implementáciu Stratégie adaptácie SR na zmenu klímy.*
[203] Ministry of Environment of the Slovak Republic (2018). *Stratégia Adaptácie Slovenskej Republiky Na Zmenu Klímy.*
[204] Republic of Slovenia (1994). *Zakon o varstvu pred naravnimi in drugimi nesrečami (ZVNDN).*
[205] Republic of Slovenia (n.d.) *Flood risk reduction plan.*
[206] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Slovenia.*

	CCA	The strategic Framework For Climate Change Adaptation (NAS), prepared by the Ministry of Environment and Spatial Planning and approved in 2016, includes general objectives and horizontal guidelines for all sectors. ➢ Due to insufficient implementation of the NAS, Slovenia prepared a strategic integrated LIFE project proposal "SLOVE LIFE4ADAPT". ➢ Municipalities are the primary local government bodies, tasked with roles in spatial planning, housing, water management, economic development, and environmental protection. While there is no legal obligation for adaptation plans, climate change considerations are integrated into municipal spatial plans through Strategic Environmental Assessments.[207]
	FUNDS	➢ The funding for adaptation measures comes from various sources, including EU funds (structural funds, Horizon 2020, and LIFE programmes), national and local community budgets, as well as international financial institutions such as the European Investment Bank and the European Bank for Reconstruction and Development. ➢ Efforts are made to mobilise private sector investments, such as those from insurance companies, to support CCA measures. ➢ Strengthening prevention to increase flood safety (connected to the Flood Risk Management Plan) has been supported in loans under the Recovery and Resilience Facility.

Source: own elaboration, CASE based on desk research. The general information about Member States is based on CoR – Division of Powers – website

[207] Republic of Slovenia (2016). *Strategic Framework for Climate Change Adaptation;* EC (2023). *Preliminary assessment of Slovenia's second payment request.*

Table 7. The legislative and financial framework for DRM and CCA in EU-27: countries with decentralised governance structures

DECENTRALISED GOVERNANCE		
AUSTRIA *A federal parliamentary republic with 9 federal states, 95 districts (including 15 cities) and 2 098 municipalities*	**DRM**	Conducted at all levels of governance. At the national level coordinated by federal ministries led by the Ministry of the Interior in cooperation with provinces and municipalities. [208] ➢ No national rules for emergency response, which is regulated at province level by disaster relief acts. There is a strategic framework for national security and legislation for specific areas susceptible to natural hazards (e.g. water, forestry). ➢ Risk assessments are conducted on all levels of governance. There is close cooperation between relevant ministers and provinces, districts and municipalities when planning and implementing risk management plans. ➢ The provinces' legislation determines the precautionary measures. Appropriate plans are required at all levels. ➢ At the local level, citizens are also involved in planning activities and the preparation of hazard maps and risk management plans.
	CCA	Coordinated by the Federal Ministry for Climate Action with the support of the Environment Agency Austria. Climate policies are coordinated by the National Climate Committee. Cooperation between the provinces is ensured by the Conference of Provincial Environmental Ministers as well as Climate Ministers. ➢ The NAS was adopted by the Council of Ministers and endorsed by the Provincial Governors' Conference; its last revision was in 2017. The next revision was planned for autumn 2023, but it has not been published yet. ➢ The NAP is a part of and revised with the NAS. Each measure is described with relation to existing instruments, possible resource needs and the potential of conflict, and a comprehensive system is put together. ➢ Provincial adaptation strategies have been adopted in Upper Austria, Styria, Vorarlberg and Salzburg. Other forms of climate strategies and adaptation measures have appeared in Tyrol, Lower Austria, Carinthia, Vienna and Burgenland. [209]
	FUNDS	Preventative measures against natural hazards are financed from the national funds, to the tune of EUR 400 million per year. The costs of climate adaptation are covered by available budgets through appropriate prioritisation and shifting. The Climate and Energy Fund was established in 2007 to finance the implementation of climate strategy and policies. It has ann annual budget of up to EUR 150 million.[210]

[208] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system* — Austria; Federal Minister for the Interior (n.d.), *Civil Protection in Austria;* Austrian Government (2022). *Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030*.
[209] Climate-adapt (n.d.). *Country profiles – Austria.*
[210] European Civil Protection and Humanitarian Aid Operations (n.d.),.*The national disaster management system – Austria*; Climate Adapt (n.d.). *Country profiles – Austria*; Austrian Government (2022). *Midterm Review of the Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030*; Federal Ministry: Climate Action, Environment, Energy, Mobility, Innovation and Technology, *Climate and Energy Fund.*

BELGIUM *A complex federal state structured around three linguistic communities and three regions, each with its own governing bodies responsible for both executive and legislative functions, 10 provinces and 581 municipalities. Regional authorities are responsible for legislation and implementation of policy on the environment, as well as environmental planning*	**DRM**	DRM is implemented at all levels. The Ministry of Home Affairs, in particular the National Crisis Centre is responsible for coordinating the emergency planning and crisis management policy[211]. ➢ The Belgian National Risk Assessment for 2018-2023 is the latest. A departmental crisis cell for emergency preparedness at Federal government services (transport, energy) prepares measures to manage emergencies and actions for continuity of service and business. ➢ The actions and plans are based, among others, on the risk assessment. Generic and risk-specific emergency plans have been drawn up.[212] On federal and regional levels, legislative and procedural actions are taken to prevent shortages or the disruption of critical infrastructure.
	CCA	Mainstreamed at different levels[213]: ➢ Federal and regional (Flanders, Wallonia and Brussels) governments prepared an adaptation strategy upon the National Climate Committee's instructions. The Belgian National Adaptation Plan is complementary to the regional and federal plans. ➢ Three RAPs: *Flemish Plan on Climate Change and Adaptation*[214]*, Brussels Regional Air Climate Energy Plan, Towards a Climate change resilient society by 2050* and *Air-Climate-Energy plan 2016-2022* (Wallonia).[215] Vertical mechanisms have been adopted between the regions and the provincial and local levels. ➢ The majority of responsibilities are under the jurisdiction of regional governments, with most adaptation measures implemented at the regional and local levels. Adaptation is mainstreamed at the local level with the municipalities that have signed the Covenant of Mayors (for example Flemish Local Energy and Climate Pact). Some provincial and local government adaptation plans are under development (province of Antwerp[216] and the city of Gent[217]).
	FUNDS	Funding within existing governmental budgets. Sectoral adaptation actions have to be financed by the relevant policy departments. Regional governments allocate a part of their budget to implementing adaptation measures, including (for example) impact assessments and the development of adaptation support tools to help local authorities.[218]

[211] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – system – Belgium*; National Crisis Centre (n.d.), Belgian Risk Assessment.
[212] The national emergency plan was adopted by the Royal Decree of 31 January 2003.
[213] National Climate Commission (2010). *Belgian National Climate Change Adaptation Strategy*; National Climate Commission (2016). *Belgian National Adaptation Plan 2017-2020*.
[214] Vlaamse overheid (2023). *Vlaams Klimaatadaptatieplan – Vlaanderen wapenen tegen de klimaatverandering.*
[215] AwAC (n.d.). *Agence wallonne de l'Air & du Climat - Website*.
[216] Provincie Antwerpen (2016). *Provinciaal Klimaatadaptatieplan*
[217] Stad Gent (n.d.). *Groen & milieu – Klimaat.*
[218] EC (2018). *Adaptation preparedness scoreboard – Country fiche for Belgium.*

FRANCE *A parliamentary democracy – unitary State organised in 18 regions (incl. 5 overseas) with their own authorities and elected assemblies on a decentralised basis. Two lower levels of governance – departments and municipalities*	**DRM**	Focused on prevention of and preparedness for natural disasters, next to crisis management and reconstruction. The Directorate-General for Civil Protection and Crisis Management is responsible for anticipating and monitoring crises in cooperation with local prefects. ➢ On a national level, in terms of prevention, France has adopted regulations and norms within the area of reconstruction codes, risk prevention and flood prevention action programmes. France has invested in tools and methodologies for risk assessment; ➢ Each level of governance has responsibilities in terms of the adoption of appropriate policies for risk prevention. The natural risk prevention plans have to be annexed to the local urban plan. [219]
	CCA	Conducted on all levels of governance: ➢ The last NAP was adopted in 2017.[220] The NAS has been applicable since 2006. Both are based on broad consultations among stakeholders. ➢ Steering and monitoring of the NAP is entrusted to the specialised commission of the National Council for Ecological Transition. ➢ The territorial organisation of the Republic law of 2015 requires each metropolitan region, except for Ile-de-France, to adopt a regional strategy for planning, sustainable development and territorial equality. Natural risk prevention plans also contribute to climate change adaptation. ➢ Regional research and expertise networks have also been created. They aim to anticipate climate change in their territories and give scientific grounds for decisions taken by the authorities. [221]
	FUNDS	Various funding dedicated to natural disaster prevention and climate adaptation: ➢ Dedicated "Barnier Funds" - a prevention fund for major natural hazards to cover emergency housing, temporary rehousing and relocations, prevention measures as well as research activities; ➢ The NAP predicted EUR 8.7 billion budget for 2018-2023, the majority of which is spent on international action on climate change. In the years 2018-2021, EUR 346 million was spent on the prevention and management of natural risks and disasters. [222]

[219] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system*– France. French Government (2023). *Examen à mi-parcours de la mise en œuvre du Cadre de Sendai pour la réduction des risques de catastrophe 2015 – 2030*; Climate Adapt, *Country profile – France.*

[220] Ministère de la transition écologique et solidaire (2017.) *Le plan national d'adaptation au changement climatique (PNACC 2*),

[221] Climate Adapt, *Country profile – France;* French Government (2023). *Examen à mi-parcours de la mise en œuvre du Cadre de Sendai pour la réduction des risques de catastrophe 2015 – 2030.*

[222] Ibidem.

GERMANY *A federal state - 16 states with Berlin, Hamburg, and Bremen categorised as city-states, i.e. cities that simultaneously have federal state status, 401 counties and 11,054 municipalities*	**DRM**	Based on close cooperation between the national and federal states, with the main responsibility borne by the federal states: ➢ The Federal Civil Protection and Disaster Relief Act is a key legislation obliging the Federation to conduct a national risk assessment. A risk-based approach constitutes the grounds for the respective action plans. The Federal Ministry of the Interior, Building and Community is the federal authority for civil protection supervising national civil protection agencies: the Federal Office of Civil Protection and Disaster Assistance and the Federal Agency for Technical Relief. Under the German Constitution, the federal states are responsible for disaster management in times of peace. Appropriate disaster management laws are adopted at this level. ➢ The integrated emergency response system signifies that the Federation draws on federal state resources for certain tasks in civil protection. On the other hand, the Federation provides disaster assistance upon request as well as additional equipment, supplies and training. [223]
	CCA	In 2023, the government adopted the draft climate adaptation law - a framework intended to enable adaptation measures to be taken forward in a more coordinated manner on all administrative levels.[224] ➢ As of 2024, the NAS provides the basis for climate adaptation policy. The German government adopted the German Strategy for Adaptation to Climate Change[225] in 2008. The strategy facilitates a cross-sectoral approach by the federal government and regular monitoring of the impacts of adaptation measures. The third Adaptation Action Plan was published in 2020.[226] ➢ The majority of federal states expanded and consolidated their legal frameworks, either in the form of climate legislation or by including additional provisions on climate change adaptation in other specialised legislation. Adaptation strategies or plans have been adopted/updated by almost all of the states. An increasing number of networks exist or are being established, e.g. with business or civil society representatives.[227] ➢ Municipalities are key players in the development of adaptation measures. The climate adaptation law will foster climate adaptation at the local level through comprehensive adaptation concepts and action plans based on risk analyses. [228]
	FUNDS	➢ Some states use funding programs available at both the federal and EU levels (such as the Urban Development Support Programme and the Federal Ministry's for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection programme) to support measures for adapting to climate change. ➢ Some states complement these programs with their unique funding schemes. To better assist regions and municipalities, improved coordination among existing funding programs at the EU, federal, and state levels is necessary. [229]

[223] European Civil Protection and Humanitarian Aid Operations (n.d.).*The national disaster management system – Germany.*
[224] BMUV (2023). *Gesetzentwurf eines Bundes-Klimaanpassungsgesetzes.*
[225] BMUV (2023). *German Strategy for Adaptation to Climate Change*
[226] Umwelt Bundesamt (2020). *Adaptation Action Plan*.
[227] Climate Adapt (n.d.). *Information on national adaptation actions reported under the Governance Regulation – Germany.*
[228] BMUV (2023). *German government adopts first nationwide climate adaptation law*.
[229] Government of Germany (2020). Second Progress Report on the German Strategy for Adaptation to Climate Change (DAS).

GREECE *A parliamentary republic with 13 regions, 7 decentralised administrations and 325 municipalities*	**DRM**	Measures are conducted at all levels of governance based on Greek Constitution of 1975 which provides for obligatory precautionary measures for the protection of the natural environment.[230] ➢ The National Civil Protection Plan "Xenokrates" [231] from 2003 is still applicable, although it has been partially replaced by the new Law on Civil Protection (2020)[232] introducing National Crisis Management and Risk Management Mechanism, a network joining structures of civil protection to create a single national system as a vertical organisation that covers the whole disaster cycle. The General Secretariat for Civil Protection is now a prominent structure of this mechanism.[233] ➢ The planning of is implemented according to the national framework, with regard to hazard-specific plans at the local, regional and national levels[234]with the main focus on prevention and preparedness measures as well as response and recovery actions.[235]
	CCA	The country has had a legal framework for CCA since 2016. Adaptation is included in the mandate of the Ministry for Climate Crisis and Civil Protection.[236] ➢ The National Climate Law from 2022 requires mainstreaming adaptation across sectoral strategies and plans, establishes a National Adaptation Observatory and introduces national annual reporting requirements and defines roles, responsibilities and synergies between the mitigation and adaptation governance structures. ➢ The Greek NAS[237] from 2016 is implemented through 13 Regional Adaptation Action Plans and sectoral policies. Regional Authorities are responsible for its development and implementation.[238]

[230] C. Zacheilas, N. Papadakis, (2020). *An ongoing process? Greek Legislation and Regulatory Framework in Civil Protection: A comparative analysis of pre and post the 4662/2020 Law.*
[231] Greek Government (2003). *Ministerial Decision 1299/2003 on the adoption of the National Civil Protection Plan "Xenocrates"*; Greek Government (n.d.) *Ministerial Decision 3384/2006 on the addition to the National Civil Protection Plan "Xenokrates" of the Special Plan for Human Loss Management.*
[232] C. Zacheilas, N. Papadakis (2020). op. cit.
[233] The Presidential Decree 151/2004 on the organizational structure of the General Secretariat for Civil Protection (Government Gazette 107/A); European Civil Protection and Humanitarian Aid Operations, *The national disaster management system – Greece.* C. Zacheilas, N. Papadakis (2020). op. cit. .
[234] European Civil Protection and Humanitarian Aid Operations (n.d.).*The national disaster management system*– system – Greece,
[235] UNDRR (n.d.). *Greece National Platform.*
[236] EC (2018). *Adaptation preparedness scoreboard. Country fiche - Greece.*
[237] Greek Ministry of Environment & Energy (2016). *National Climate Change Adaptation Strategy.*
[238] National Climate Law 4936/2022 on the transition to climate neutrality and adaptation to climate change.

	FUNDS	➢ There is a separate state budget for financing the operation of the General Secretariat and the response agencies (police, fire service, armed forces) and for local and regional governments. The authorities also awarded a special grant for civil protection to support municipalities in their fire prevention efforts. For the period 2021-2027, over EUR 3 billion is allocated for DRM investments, sourced from various channels including ESIF-funded programs, the NRRP, EIB loans, and special development programs. In addition significant investments were made during 2014-2021, largely co-funded by EU programmes such as ESIF, LIFE, Horizon, and DG ECHO, alongside state-budget programs. [239] ➢ CCA is funded through a combination of sources - including EIF for 2021-2027, Cap Strategic Plan, and EU programs such as LIFE and Horizon Europe. Greece's National Recovery and Resilience Plan ("Greece 2.0") and national funds like the Green Fund and the "Antonis Tritsis" programme also contribute adaptation initiatives.[240]
SPAIN *A parliamentary monarchy with a decentralised model of governance. 17 Autonomous Communities with legislative autonomy. Each region has Statutes of Autonomy that define the Autonomous Community's organisation and distribution of powers 2 autonomous cities (Ceuta and Melilla), 50 provinces and 8 131 municipalities.*	**DRM**	DRM is regulated at the national, regional and local levels. ➢ The National Civil Protection Law[241] introduces the National Civil Protection System and provides guidelines for subnational frameworks.[242] The National Civil Protection Strategy was approved in the 2019[243] and includes the analysis of the main threats and risks as well as strategies of action for their management.[244] In addition to the general legislations and plans, also hazard-specific plans were adopted, for instance concerning floods. ➢ Regional laws, such as the Valencian Civil Protection Law, have been enacted regulating civil protection related to natural disasters. The regional frameworks are usually structured similarly to the national framework, with specific solutions and approaches varying depending on the Autonomous Community.[245]
	CCA	Mostly decided at the national level, although as part of their jurisdiction, the autonomous communities uphold strategic frameworks, plans, and/or programmes addressing CCA through various initiatives and actions.[246] ➢ The National Climate Change Adaptation Plan – the NAS is the basic planning instrument for promoting coordinated and coherent action to tackle the effects of climate change. ➢ The NAS[247] is a reference framework for the coordination of the public administrations to address the climate impacts across key sectors and resources in the country, defining two basic instruments - Work Programmes and sectoral and territorial plans. The first Work Programme (Spanish NAP)[248] for the period 2021-2025 is part of the strategic energy and climate framework.

[239] The World Bank (2021). *Inputs and Recommendations for the Development of a Draft NDRM Plan for Greece.*
[240] Greek Ministry of Environment & Energy (2016). *National Climate Change Adaptation Strategy.*
[241] Law 17/2015.
[242] International Federation of Red Cross and Red Crescent Societies (2022). *Disaster recovery in Spain: a legal and policy survey.*
[243] Order PCI/488/2019.
[244] International Federation of Red Cross and Red Crescent Societies (2022). op.cit.
[245] Ibidem.
[246] Adaptecca (n.d.) *Autonomous Communities - website.*
[247] MITECO (2020). *National Climate Change Adaptation Plan.*
[248] MITECO (2021). *Programa de trabajo 2021-2025. Plan Nacional de Adaptaction al Cambio Climatico.*

	FUNDS	➢ Given the regionalised structure of Spain, the funds allocated from the State Budget are aimed to finance general civil protection services at the national level. The regional budget covers civil protection and emergency management.[249] An Emergency Prevention Fund was created under the National Civil Protection Law. The funds come from the State's general budget but can only be used to support prevention measures such as risk and vulnerability assessments, risk mappings and awareness campaigns. There is no dedicated fund for disaster recovery. ➢ Since 2015, the NAS framework has provided a dedicated budget for adaptation projects. The Plan to Support the Environment for Adapting to Climate Change is a tool to support the objectives of the NAP, providing financial resources for adaptation projects in biodiversity, water, coasts, adaptive restoration and agricultural soil management.[250] ➢ Sectoral ministries or departments have financed one-off assessments of climate impacts and adaptation options, as well as other activities on an ad hoc basis.[251]
SWEDEN *A constitutional monarchy and parliamentary democracy. A unitary state divided into 20 counties and 290 municipalities*	**DRM**	The responsibility for DRM resides at national, regional, and local levels. Key legislation includes the Civil Protection Act[252], the Ordinance on Emergency Preparedness and the Measures to be taken by Designated Authorities in the Event of Heightened Alert, and The Act on Municipal and County Council Measures Prior to and During Extraordinary Events in Peacetime and during Periods of Heightened Alert.[253] ➢ At a national level, the Swedish Civil Contingencies Agency has the operational mandate to organise, aid, and streamline the efforts of relevant stakeholders in addressing accidents, crises, and emergencies, both within the country and on an international scale/ ➢ Municipalities have a responsibility to maintain services like water distribution, schools and rescue services during crises, while the county administrative board primarily has a regional coordinating role. [254]
	CCA	CCA is subject to different forms of regulation. The Ministry of the Environment and Energy is responsible for the Government's overarching policy work concerning climate, including climate adaptation. Each ministry is responsible for climate adaptation within its respective area. Work on adaptation is divided among several government agencies. ➢ The Swedish Government adopted a NAS in 2018. ➢ Instead of the NAP, the 21 County Administrative Boards have developed regional adaptation plans and (together with national authorities) were assigned the development of action plans within their own areas of responsibility. ➢ County Administrative Boards and municipalities have the right to issue local regulations and are tasked to coordinate adaptation regionally and ensure that the national targets are achieved. [255]

[249] Ibidem.
[250] MITECO (2020). *National Climate Change Adaptation Plan.*
[251] Ibidem.
[252] MSB (n.d.) *Lag (2003:778) om skydd mot olyckor*.
[253] The Public Health Agency of Sweden (n.d.). *Emergency preparedness.*
[254] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Sweden.*
[255] EC (2017). *Adaptation preparedness scoreboard: Country fiche for Sweden*; SMHI (2021). *National Strategy for Climate Change Adaptation*.

	FUNDS	➢ The budgets for risk management are integrated into public sector budgets. Moreover, a supplementary yearly allocation is designated for prevention and preparedness efforts, with distribution guided by national assessments of risk and capabilities.[256] ➢ While no specific budget has been earmarked for the NAS, funding is accessible for adaptation initiatives. The government has allocated a budget for climate adaptation, climate services, capacity building, and supporting the Swedish National Knowledge Centre for Climate Change Adaptation, along with the climate adaptation portal. In addition, government funding is allocated to municipalities for disaster risk reduction and prevention measures.[257]

Source: own elaboration, CASE based on desk research. The general information about Member States is based on CoR – Division of Powers – website.

[256] European Civil Protection and Humanitarian Aid Operations (n.d.). *The national disaster management system – Sweden.*
[257] EC (2017). *Adaptation preparedness scoreboard: Country fiche for Sweden*.

4.2. From response to preparedness – selected good practice examples from LRAs

There is an evident need to **enhance the resilience of the EU and its regions and cities to climate change and natural disasters**. As climate-related hazards intensify and their impacts become more pronounced, it is imperative for regions and cities across Europe to actively engage in implementing DRM that includes CCA. However, achieving effective disaster resilience requires more than just reactive measures; it demands a proactive, anticipatory cross-cutting approach that integrates vulnerability criteria and resilience considerations into all aspects of public policy, regulation and investment at the local and regional levels.

This part of the study provides an overview of various good practice initiatives from European regions, showcasing innovative approaches to DRM and CCA, and highlighting the importance of fostering collaboration, capacity building, policy integration, multi-sectoral approaches, data-driven decision-making and participatory processes. By following a "resilience-by-design" paradigm, Europe can build more adaptive and resilient communities that are better equipped to withstand and recover from the impacts of climate change.

Fiche 1. Wallonia, Belgium

To raise local authorities' awareness of the impacts of climate change and support them in the adaptation process, in 2012 the Walloon Air and Climate Agency (AWAC) financed the development of a tool to assess vulnerability and implement measures at the municipal level.

Implementing entity: Walloon Air and Climate Agency (AWAC)

Implementation timeframe: 2012 (with an update finalised in 2017) – ongoing

Main outcomes: Development of a tool based on the results of the previous regional study, presented in the form of an Excel file containing simple questions. Accessible to all without training, this tool is complemented by cartographic support and a web platform (www.leswallonssadaptent.be). A user guide is always available to support municipalities step by step through the process. The tool enables simple, effective and accessible diagnosis based on solid science. With this diagnosis, municipalities can think about courses of action to adapt and implement local strategies for adaptation to climate change.

Source: CASE own elaboration based on AwAC (2017). La démarche "Adapte ta commune" – Guide de l'utilisateu.

Fiche 2. General good practice on cooperation, Denmark

The 2020 Service Level Act (Serviceniveaubekendtgørelsen) defines water tariffs as the funding source for heavy rain adaptation. This allows sewage treatment facilities to finance operational adjustments and collaborate with municipalities and stakeholders.

Implementing entity: Ministry of the Environment, municipal councils

Implementation timeframe: 2020 (the act came into force in 2021) – ongoing

Main outcomes: Municipalities can raise service standards for sewage treatment facilities based on socio-economic feasibility, assessed by a state-defined methodology, to avoid excessive investments.The methodology for this adaptation financing entails a six-step process, which includes hydrological modelling, flood mapping, risk assessment, cost and damage evaluation, and cost-benefit analysis of the proposed adaptation strategies. Sewage treatment facilities are encouraged to partner with relevant entities to fund the most effective climate change adaptation efforts while refraining from financing initiatives that lack economic viability.

Source: CASE own elaboration based on Gram-Hanssen I., et al. (2023). op.cit.

Fiche 3. Wildfire prevention initiative, France

France's parliament adopted an amendment to the national forestry code, mandating landowners to reduce wildfire risks and empowering mayors for preventative actions. Originating from Corsica, the initiative integrates local insights and scientific expertise.

Implementing entity: Local Government Representatives and Mayors (Corsica), University of Corte, French National Parliament

Implementation timeframe: 2020 – ongoing

Main outcomes: The amendment mandates landowners to implement measures to reduce wildfire risks and grants mayors the authority to take preventative actions, thus facilitating a shift from reactive firefighting to proactive prevention. It encourages local authorities to identify wildfire-prone areas, enabling more targeted and effective risk management strategies. The involvement of scientists specialised in fire risk modelling and disaster risk management underscores the importance of evidence-based policymaking, contributing to the amendment's adoption. The amendment not only aims to protect municipalities from wildfires but also seeks to promote sustainable practices on islands and in rural areas (ground clearing, clear vegetation).

Source: CASE own elaboration based on UNDRR (2020). When local science shapes national policy.

Fiche 4: The Region of Central Macedonia (RCM), Greece

RCM experiences environmental impacts from varied land uses and economic activities. A prototype Geographic Information System (GIS) is being developed to monitor the coastal zone, aiming to simulate erosion processes using spatial data for modeling.

Implementing entity: Managing Authority of RCM

Implementation timeframe: Since 2021 – ongoing

Main outcomes: The example outlines the development of an up-to-date and continuously operating information system, utilising Copernicus and in-situ data to monitor coastal erosion and propose appropriate measures to decrease the vulnerability of the anthropogenic and natural environment. It employs a comprehensive methodology and specific tools to identify coastal zones, either urbanised, rural or protected natural habitats, vulnerable to coastal erosion, and simulates erosion risks influenced by climate change. Upon completion, the project will also evaluate and formulate proposals for specific strategies, interventions, and guidance for the management and development of the coastal zone.

Source: CASE own elaboration based on UNDRR (2021). Monitoring coastal changes in Greece.

Fiche 5: Emilia-Romagna, Italy

Weather Alert Emilia-Romagna responds to the need for a unified platform to manage various risks. By facilitating coordinated management and improving the transmission of warning information, it enhances the region's resilience to potential hazards.

Implementing entity: Emilia-Romagna Agency for Territorial Security and Civil Protection, Arpae Emilia-Romagna – Hydro-Meteo-Climate Service of the Regional Agency for Prevention, Environment and Energy

Implementation timeframe: 2017 – ongoing

Main outcomes: Comprehensive website with information on weather and avalanche alerts and bulletins, real-time updates on event development, weather forecasts and data, civil protection plans, risk maps and post-event reports. The website includes a colour-coded regional map that offers an immediate overview of the alert situation for the current day and the following day. Users can navigate by risk or location, accessing local information and municipal civil protection plans. In addition, a dedicated section monitors ongoing thunderstorms and floods, providing timely updates during adverse weather conditions.

Source: CASE own elaboration based on Allerta Meteo Emilia-Romagna – website.

Fiche 6: Personalised adaptation strategies, the Netherlands

ClimApp (Horizon 2020 project) tackles health issues from extreme weather in Europe. It integrates forecasts with individual traits for personalized adaptation, improving warnings and preparedness for vulnerable groups and workers.

Implementing entity: Lund University (leader), University of Copenhagen, Technical University of Denmark, Vrije Universiteit Amsterdam Fritzdorf, Sport Regional Public Health Services, Gelderland-Midden

Implementation timeframe: 2017 – 2021

Main outcomes: The project developed ClimApp, an advanced mobile application integrating weather forecasts with user characteristics and thermal physiology. It offers personalised adaptation strategies to improve decision-making in response to extreme weather events. By integrating individual characteristics into weather forecasts, the application improves the quality and relevance of climate services, enabling individuals and the public and private sectors to access timely and relevant guidelines for improving thermal resilience, health, and productivity.

Source: CASE own elaboration based on Lund University (n.d.). Translating climate service into personalised adaptation strategies to cope with thermal climate stress.

Fiche 7: Situation awareness in 2D and 3D of the flooding and fire events, Poland

To support DRM in Poland and provide a proactive approach and guidance to shape the right deployment plan, the Crisis Information Centre under the Overwatch project (Horizon Europe), will develop an integrated, holographic system aiding rescue efforts in forest fires and floods.

Implementing entity: 10 partners from five different countries: Poland, Germany, Italy, Portugal and Denmark, represented by key stakeholders in security and crisis management

Implementation timeframe: 2022 - 2025

Main outcomes: Using a state-of-the-art approach, the project aims to design and develop a back-end management platform that will cover the full cycle of data management, from data acquisition, harmonisation, standardisation and data processing to the use of information. These efforts will enable situational awareness in 2D and 3D of flood and fire events, management of operations depending on the structure of the area detected by the drones, optimisation of rescue resources according to the severity of the incident and connecting rescuers using augmented reality (AR) devices.

Source: CASE own elaboration based on Overwatch project – website; CIK (n.d.). Aktualne projekty.

Fiche 8: Azores and Madeira, Portugal

By integrating mitigation and adaptation strategies, the project (implemented in Macaronesia and co-financed by the INTERREG MAC Programme) embodies a comprehensive approach to addressing climate-related challenge with resulting in far-reaching implications for resilience.

Implementing entity: The stakeholders involved in the PLANCLIMAC initiative include local governmental entities from the Canary Islands, the Azores, and Madeira, along with academic institutions such as the University of Las Palmas de Gran Canaria and the University of La Laguna, as well as Instituto Tecnológico y de Energías Renovables, S.A., Instituto Tecnológico de Canarias, and Gestión y Planeamiento Territorial y Medioambienta, totalling eight entities from Spain and Portugal

Implementation timeframe: 2019 - 2023

Main outcomes: Creation of an independent entity called "Macaronesia Climate Change Observatory – OCCMAC", which allows for the adoption of corrective and preventative measures, and facilitates management tools against natural risks caused by climate change in the Macaronesia region.

Source: CASE own elaboration based on Proyecto PlanCLIMAC – website.

Fiche 9: From reactive to proactive drought management– DriDanube, Slovenia

Funded by the Interreg Programme – Danube Region, the project shifts focus from crisis to risk management, fostering proactive drought management strategies and engaging stakeholders from various sectors.

Implementing entity: Slovenian Environment Agency (leader) and multiple entities, including governmental agencies, research institutions, non-governmental organisations from the region

Implementation timeframe: 2017 - 2019

Main outcomes: The development of a comprehensive Drought User Service enabling the more accurate monitoring and timely early warning of droughts. This service integrates various data sources, including remote sensing products, to provide stakeholders with essential information for decision-making. Drawing on achievements in participating countries and EU guidelines, this initiative standardises approaches to assess drought risks and impacts, facilitating more effective planning and response measures.

Source: CASE own elaboration based on Slovenian Environmental Agency (2019). Interreg Danube Transnational Programme DriDanube. BETTER prepared for drought : Danube drought strategy.

Fiche 10: Alicante, Spain

The area faced severe flooding, prompting artificial redirection of the river's flow. Vulnerable to earthquakes, it also endured an unprecedented cold drop in 2019. A participatory process developed a recovery plan, guided by the "build back better" principle.

Implementing entity: Generalitat Valenciana (the Government of Valencia)

Implementation timeframe: 2020 – ongoing (Plan introduced in 2019)

Main outcomes: The multisectoral approach was used so that the recovery constituted an opportunity to enhance infrastructure, strengthen the resilience of communities and pursue a more sustainable development model while adapting to the effects of climate change. It also includes key flood risk reduction measures, including reconstruction and improvement of hydraulic infrastructure, retrofitting existing housing in high-risk areas and maintaining the Segura riverbed. The approach adopted in the plan promotes undertaking preventative measures based on natural disaster experience.

Source: CASE own elaboration based on International Federation of Red Cross and Red Crescent Societies (2022). Disaster recovery in Spain: a legal and policy survey.

By promoting similar strategies and facilitating the exchange of best practices among regions and cities, the EU can strengthen the resilience of its communities to climate-related hazards and contribute to achieving its disaster resilience goals.

Part 5: Conclusions and recommendations

The research shows that all EU regions are vulnerable to climate change, although they vary in regard to impacts, with cities but also rural areas in southern and southeastern Europe being the most exposed. These regions may experience adverse impacts including increases in heat extremes, decreases in precipitation and river flows, droughts, lower crop yields, forest fires, and loss of biodiversity. Coastal regions in Western and some parts of Central Europe are exposed to floods and possible storms. Marine ecosystems are vulnerable to increased ocean temperature, increased acidification levels, and the spread of oxygen-depleted dead zones. Significant parts of the EU will be affected by the spread of vector borne diseases and heat-related mortality will be on the rise. The EU and its Member States should therefore implement existing policies to maintain and restore the resilience of ecosystems, particularly by strengthening protection and minimising anthropogenic pressures.

Recommendations

The list below consists of future-oriented suggestions for improving the involvement of regions and cities in the implementation of the EU's disaster resilience goals and working towards a cross-cutting, "resilience-by-design" approach. These have been grouped accordingly.

Promotion of regional cooperation at the city and municipal level

- Cross-border regional cooperation should be promoted, including the creation of joint preparedness and response plans. Cross-border regional cooperation is crucial to ensure preparedness and effective mitigation of the associated risks. Lack of cooperation might even result in mutual obstruction in efforts made in the event of countries unknowingly opting for contradictory actions. In particular, LRAs governing the same geographical regions, for example mountains (such as the Alps or the Pyrenees), should adopt a unified approach so that their efforts are as effective as possible.
- Ongoing exchange of information and experience among LRAs, for example through the Covenant of Mayors or Horizon Europe missions, is strongly encouraged. Learning from the experience of other LRAs shortens the learning curve and enables the more effective implementation of appropriate measures.

More active citizens' involvement

- Civic engagement and the empowerment of local communities play pivotal roles in fostering bottom-up resilience. By involving citizens and NGOs in decision-making processes and empowering local communities to drive risk reduction initiatives, regions and cities can strengthen their resilience fabric while instilling a sense of ownership and responsibility within communities.
- Public consultations of risk assessments and planned CCA and DRM activities can result in the adoption of better fitted solutions that can actually be implemented when needed. The Vega Baja Regeneration Plan in Spain (see Fiche 10 above) highlights the importance of broad participation also in post-disaster recovery planning to ensure that resilience measures meet the needs and priorities of the affected communities.
- Official cooperation between the authorities and scientists should be ensured, including through statutory obligations imposed on the public authorities. Initiatives like the ClimApp project in the Netherlands and the Overwatch in Poland are good examples of international collaboration

aimed at developing innovative ideas for DRM. DRM and CCA actions should not be taken based on political decisions, but on current knowledge. Some countries have introduced such official cooperation in the form of councils, committees or public institutes. Such a practice is valuable, and is worth replicating across all EU Member States. The development of local scientific communities can also help municipalities or regions develop in other areas, which would be an additional benefit from investing in science focused on local needs.

Increased multilevel governance

- Increasing the involvement of LRAs in implementing the EU's disaster resilience goals requires a shift towards a proactive approach to crisis management, which would entail integrating vulnerability criteria and resilience considerations into various aspects of public policies, regulations, action plans and investment programmes, at both the local and regional level. To achieve this, inclusive governance mechanisms must be prioritised.
- LRAs should have real power in terms of climate adaptation and the mitigation of natural disaster risks. The effects of climate change and the risks of natural disasters are often different for different regions even within a country, and coordination at the national level is not as effective as that provided locally. Giving more power to the local authorities ensures a faster emergency response, but also a better fit for the actual needs of the given region minimising risks of maladaptation.

Increased dedicated financing

- The establishment of dedicated budgets for disaster prevention and climate adaptation at national, regional and local levels should be promoted. They do not need to be constructed solely from local funds, which are often limited. On the contrary, whenever such budgets are planned, the potential of existing funding schemes should be considered. In particular, structural funds and cohesion policy should be considered by LRAs to improve preparedness and strengthen resilience. Resources from outside of the EU, for example from the World Bank, can also be considered. Some EU Member States still do not have any dedicated budgets for prevention, but organise the finances from available funds from ministries or local governments on a case-by-case basis. This makes it harder to organise resources for the necessary initiatives.

Making use of different resources

- The provision of resources, training and tools to help local communities (administrations and citizens alike) to understand and address climate-

related risks needs to be ensured. For instance, the Adaptate ta commune initiative in Belgium equips municipalities with user-friendly tools and support to assess vulnerability and plan adaptation measures. Regular training and education of local communities on CCA and DRM by the LRAs could be beneficial for implementation of their plans and for ensuring an effective emergency response. Regular townhall meetings are worth considering, so that LRAs are aware of the problems local communities face in the implementation of CCA and DRM measures, or what areas require further training or public awareness measures.

- Use of data and technology (including foresight tools) to inform decision-making at the local and regional levels should be ensured. Initiatives like the *Weather Alert Emilia-Romagna* in Italy demonstrate how real-time monitoring technologies and comprehensive information platforms can improve disaster preparedness and response.

<u>Planning, assessment and evaluation</u>

- Integration of vulnerability criteria and resilience considerations into local and regional policies, regulations, and investment programmes should be ensured. Examples such as Denmark's adaptation financing model and France's wildfire prevention amendment demonstrate how legislative frameworks can empower local authorities to proactively address climate risks.
- Furthermore, strategic foresight is emerging as a critical tool in anticipating and preparing for future crises. By leveraging foresight methodologies, stakeholders at the sub-national level can identify emerging risks and trends, enabling proactive measures to be implemented.
- Integrating hazard mapping and risk assessments into strategic planning processes enhances preparedness efforts, providing a comprehensive understanding of local vulnerabilities and exposure to various hazards. Enhancing the coherence between DRM and CCA measures is also essential. By aligning DRM and CCA strategies, regions and cities can effectively address both existing and future risks posed by climate-related disasters. This integrated approach not only maximises resource utilisation but also fosters synergies in risk reduction efforts, ultimately bolstering resilience at the local and regional levels.
- Statutory requirements should be introduced for national or local officials to analyse what led to a natural disaster, and whether the damages could have been mitigated or the emergency prevented altogether. The legislative solution should be as concrete as possible, and promote the "build back better" approach, such as that adopted in the *Vega Baja Regeneration Plan*. Local laws should make it obligatory for such an analysis to be taken into account in rebuilding plans.

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