



Climate-Resilient Development Pathways in Metropolitan Regions of Europe – Deliverable

Deliverable 6.5: Policy review and State-of-the-art of implementation options

July 2025

Grant Agreement Number 101137851

Deliverable No:	D6.5
Deliverable nature:	Report
Work Package and Task:	WP6 T6.1
Dissemination level:	Public
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Contractual submission date:	31 July 2025
Actual submission date:	31 July 2025

Technical References

Project title	Climate-Resilient Development Pathways in Metropolitan Regions of Europe
Project acronym	CARMINE
Grant agreement number	101137851
Instrument	HORIZON - RIA
Call	HORIZON-CL5-2023-D1-01
Starting date of the project	1 st February 2024
Project duration	48 months

Document history

Version	Date	Description
1.0	23/07/2025	First draft prepared by the WP6 team
1.1	25/07/2025	Internal review
1.2	28/07/2025	Revisions by the WP6 team

Disclaimer

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UK participants in this project are co-funded by UK Research and Innovation (UKRI).

The work of Meteomatics partner (Switzerland) has received funding from the Swiss State Secretariat for Education, Research and Innovation (SERI).

Table of contents

Abbreviations	7
List of figures	8
List of tables	8
Executive Summary	9
Introduction	11
CARMINE Project	11
Purpose of CARMINE Task 6.1	12
Methodology	13
Overview	13
Sources of documentation	13
Policy documentation	14
CSA contributions	14
Climate-ADAPT portal	14
SECAP: Covenant of Mayors	14
International scientific institutions	15
Academic and grey literature	15
Analytical approach	16
Policy review of Case Study Areas	16
Document translation	16
Document rationalization and keyword selection	16
Review process	18
Academic and grey literature review	19
Discussion and synthesis of state-of-the-art implementation options	19
Policy review	20
Overview of EU documentation	20
EU Green Deal	20
EU Strategy on Adaptation to Climate Change	21
EU Mission on Adaptation to Climate Change	22
EU evaluation parameters	23
Policy review of Case Study Areas	23
Prague, CZ	23
Local	23
Regional	24
National	25
Leipzig, DE	26
Local	26
Regional	27
National	27
Funen-Odense, DK	29
Local	29
Regional	30
National	30

Athens, EL	33
Local	33
Regional	35
National	37
Barcelona, ES	38
Local	39
Regional and national	40
Bologna, IT	41
Local	41
Regional	42
National	42
Brasov, RO	43
Local	43
Regional	47
National	47
Birmingham, UK	49
Local	49
Regional	51
National	51
Policy alignment to EU themes	52
<i>Literature Review</i>	<i>54</i>
Evaluation of EU adaptation policy.....	54
Application of adaptation policy at different governance levels	55
Factors influencing adaptation progress.....	56
Government underreaction.....	56
Approach in policy design	57
International crises and externalities	58
Policy conflicts and trade-offs	58
Synergies with other policies.....	60
<i>Discussion: State-of-the-art implementation options</i>	<i>62</i>
Synthesis of policy review and literature review	62
Specific Case Study Area policy implementation considerations.....	62
Prague, CZ	62
Leipzig, DE	63
Funen-Odense, DK.....	63
Athens, EL	64
Barcelona, ES	65
Bologna, IT	66
Brasov, RO	66
Birmingham, UK	67
Broader policy implementation considerations.....	67
Stakeholder engagement and governance coordination	67
Reporting indicators for monitoring and evaluation	68
Decisive action	69
Next steps for policy outcomes in the CARMINE project	70
<i>Conclusion</i>	<i>72</i>

References	74
Appendices	78
Figure 3 – Prioritization of keywords as provided by CSA leads (page 17).....	78
Climate policies: CSAs contributions (table)	80
Prague, CZ	81
Leipzig, DE	87
Funen-Odense, DK	89
Athens, EL	91
Barcelona, ES	95
Bologna, IT	97
Brasov, RO	100
Birmingham, UK	106
Climate policies: From the Climate-ADAPT platform (table)	108
Czech Republic	108
Germany	108
Denmark	109
Greece	109
Spain	110
Italy	110
Romania	111
United Kingdom	111
Climate Policies: International Reports (table).....	111

Abbreviations

AI	Artificial Intelligence
AR5 WGII	Fifth Assessment Report, Working Group II
AR6 WGII	Sixth Assessment Report, Working Group II
CNR	Consiglio Nazionale delle Ricerche (National Research Council, Italy)
CoM	Covenant of Mayors
CSAs	Case Study Areas
CSR	Corporate Social Responsibility
D	Deliverable
EIA	Environmental Impact Assessment
EMFF	European Maritime and Fishery Fund
ESF+	European Social Fund+
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
ICLEI	Local Governments for Sustainability
IPCC	Intergovernmental Panel on Climate Change
NAP	National Adaptation Plan
NAS	National Adaptation Strategy
NbS	Nature-based Solutions
NOA	National Observatory of Athens
PNACC	National Plan for Adaptation to Climate Change
R&I	Research and Innovation
SDG	Sustainable Development Goal
SECAP	Sustainable Energy and Climate Action Plan
SNACC	National Strategy for Adapting to Climate Change
SuDS	Sustainable Drainage Systems
UHI	Urban Heat Island
UN	United Nations
UoBIR	University of Birmingham
WEF	World Economic Fund
WMO	World Meteorological Organization
WP	Work Package

List of figures

Figure 1 - Graphical abstract: Overview of the methodological process to examine the level of the implementation process of EU policies and goals on adaptation in metropolitan regions	9
Figure 2 - Overview of methodological approach to the D6.5 review	14
Figure 3 - Overview of documents collected, rationalized, and analyzed for the policy review ..	17
Figure 4 - Prioritization of keywords as provided by CSA leads (a large version of the figure is available in the Appendices chapter).....	18
Figure 5 - The various elements of the EU Green Deal. (Source: European Commission, 2019)	21
Figure 6 - Climate change adaptation plan scores in European cities over time (Source: Reckien et al., 2023)	55
Figure 7 - Draft multi-level climate change governance framework. For more details see Milestone 12 report	71

List of tables

Table 1 - The work packages in the CARMINE project.....	11
Table 2 - Search parameters to gather relevant academic and grey literature for review. Selected literature excludes duplicate documents. Note that the Google search produced many results; the first three pages of results were considered, as documents began to	16
Table 4 - Evaluation scores of CSA alignment to EU adaptation policy key themes. Scores are on a scale of 1-5, where 1 = no evidence of alignment with parameter and 5 = strong evidence of alignment with parameter.	53

Executive Summary

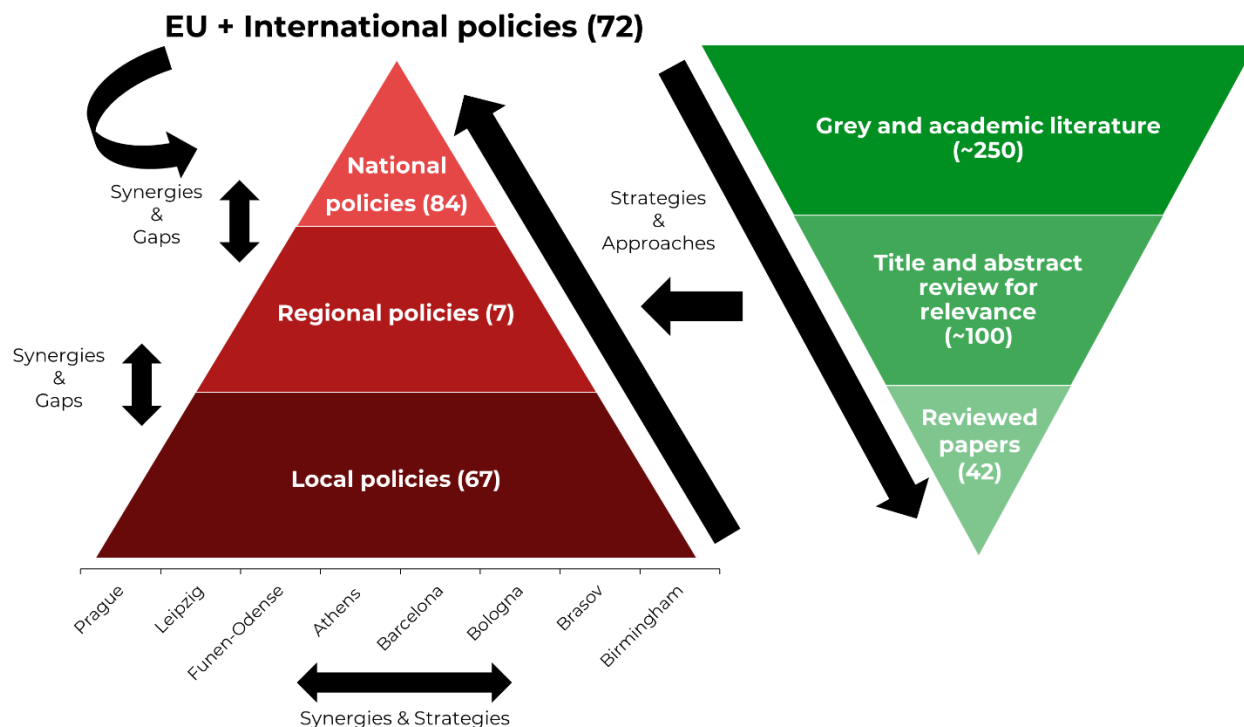


Figure 1 - Graphical abstract: Overview of the methodological process to examine the level of the implementation process of EU policies and goals on adaptation in metropolitan regions

The project “Climate Resilient Development Pathways in Metropolitan Regions of Europe” (CARMINE) aims to help metropolitan communities become more climate resilient, by co-producing knowledge-based tools, strategies, and plans for enhanced adaptation and mitigation actions addressing the Charter of the European Union (EU) Mission on Adaptation to Climate Change by 2030.

Task 6.1 in the CARMINE project runs from Months 7-24 of the project and focuses on (i) examining the level of the implementation process of EU policies and goals on adaptation in metropolitan regions; and (ii) developing a framework for enhancing multi-level governance to improve responding capacity to climate-related risks and boosting metropolitan region resilience. This deliverable (D6.5) focuses on the first aim, undertaking a review of policy review and state-of-the-art implementation relevant to the eight Case Study Areas (CSAs) in the project.

Policy documentation, grey literature, and academic literature were systematically collected for this report using a mixed-method approach. Over 200 documents related to climate policy were collected for review and rationalized based on the specific characteristics of the CSAs. CSA leads provided guidance for the creation of a list of keywords relating to the policy-action area (122 total). The aim of this was to carry out a comparative assessment of local, regional, and national policy. A supporting review of academic literature was also conducted using a fixed set of search

criteria, which were reviewed for relevance, resulting in the identification of key themes and findings more broadly across the EU.

Three key EU documents on climate change adaptation were selected to evaluate the overall alignment of CSA policy to the EU objectives: The EU Green Deal, the EU Strategy on Adaptation to Climate Change, and the EU Mission on Adaptation to Climate Change. The policies collected have demonstrated strong alignment in the objectives for achieving the climate targets set by the EU. Each CSA underlines the necessity for local policies to address the structural situations of the specific country, and how, in some cases, economic and social barriers can partially limit overall political action to achieve the targets. The literature review highlighted that these EU policies are considered ambitious and comprehensive, but implementation at other governance levels is fragmented and not accelerating at a pace appropriate to the pace of climate change. Research has identified a range of complex factors influencing this lack of implementation at national, regional, and local levels.

The discussion considers state-of-the-art implementation options identified from the policy review, and the review of academic and grey literature. For each specific CSA, the multi-level structure (local, regional, national) of climate change adaptation policies was discussed, in terms of alignment and potential gaps that may enable or limit progress. In addition, considerations were made regarding future directions or opportunities to address synergies, trade-offs, and challenges impacting implementation, suggesting ways to strengthen the delivery of adaptation policy with consideration to social, economic and, more generally, political and organizational determinants.

Despite the considerable complexities and variance across the EU policy landscape from differing climate and geographical situations, there is a good level of alignment with EU policy on climate change adaptation across the CSAs' various levels of governance. This is further reinforced by academic and grey literature, which suggests that the direction of adaptation policy is comprehensive and ambitious, with examples of good practice across Member States. There is clear scope and opportunity for knowledge exchange between metropolitan regions, facilitated by governance tools, stakeholder involvement, and the implementation of clear communication policies. Ultimately, this review has identified policy strengths and opportunities that can inform future developments in the CARMINE project, particularly through improved cohesion via a multi-level climate governance framework, that enables stakeholder engagement, builds monitoring and evaluation capacities, and delivers more decisive climate adaptation across Europe at scale.

Introduction

CARMINE Project

The project “Climate Resilient Development Pathways in Metropolitan Regions of Europe” (CARMINE) aims to help metropolitan communities become more climate resilient, by co-producing knowledge-based tools, strategies and plans for enhanced adaptation and mitigation actions addressing the Charter of the European Union (EU) Mission on Adaptation to Climate Change by 2030. To achieve this goal, focusing on a 2030-2035 timeframe and with longer perspectives up to 2050, CARMINE aims to:

- Co-create and co-develop decision-support services and guidelines for enhanced resilience and adaptive capacity, including early warning and disaster risk management systems;
- Cooperate closely with local to regional communities (stakeholders and users), decision and policymakers (local authorities) to co-develop cross-sectoral frameworks for adaptation and mitigation actions;
- Deliver science-based Research and Innovation (R&I) roadmaps for multi-level climate governance supporting local adaptation assessments and plans.

More information can be found on the CARMINE project website (carmine-project.eu).

The CARMINE project has eight Work Packages (WP; Table 1). This report was prepared as part of WP6, which aims to develop robust policy pathways for responsive, resilient governance in climate adaptation and climate resilient development. WP6 is cross-cutting, working closely with WP1, WP3, WP5 and WP7 to ensure that governance, policy and practice knowledge is identified, shared and harmonized, tested in real-world application contexts through engagement with decision support systems and services, and fully communicated with relevant stakeholders and policymakers at all levels. As such, WP6 draws on existing best practice, published and unpublished literature, and extensive experience from key policy and practice stakeholders, both internal and external to the project consortium.

Table 1 - The work packages in the CARMINE project

WP	Title
1	Co-designing adaptation and mitigation actions, including Nature-based Solutions (NbS) for climate resilient development in the Case Study Areas
2	Integrating climate physical risk assessment models and earth system processes
3	Community-based socioeconomic vulnerability and risk assessment for transformative adaptation in the case study areas
4	Co-developing digital twin simulations to enhance cross-sectoral climate resilience frameworks
5	Enabling Impact-Based Decision Support Service (IDSS) for informed local adaptation plans and science-based decision-making
6	Multi-level climate change governance: policy pathways to support a research and innovation roadmap in Europe
7	Societal sharing and impact maximization: dissemination, exploitation, communication
8	Project management

Purpose of CARMINE Task 6.1

Task 6.1 aims to:

- Examine the level of the implementation process of EU policies and goals on adaptation in metropolitan regions, and;
- Develop a framework for enhancing multi-level governance to improve responding capacity to climate-related risks and boosting metropolitan region resilience.

Within Task 6.1, this report, Deliverable 6.5 *Policy review and state-of-the-art implementation options* (due M18 of the M7-24 task) addresses the first aim.

It comprises a systematic policy review that assesses the level of implementation of the European Green Deal (European Union, 2019), the EU Strategy on Adaptation to Climate Change (European Commission, 2021a), and the EU Mission on Adaptation to Climate Change (European Commission, 2021b), in EU Member States. It discusses state-of-the-art implementation options, governance, and business models for climate change adaptation, and undertakes a critical analysis of key EU policies and approaches to engaging stakeholders involved in the development of the Living Labs. D6.5 contributes to the identification of conflicts, trade-offs, and synergies between EU climate adaptation and governance approaches and policies which will feed into the development of D6.1, *Multi-level climate change governance framework*.

Methodology

This report assesses the level of implementation of the EU Strategy on Adaptation to Climate Change (European Commission, 2021a), the EU Mission on Adaptation to Climate Change (European Commission, 2021b), and the European Green Deal (European Union, 2019) in EU Member States, with a focus on the countries in which the Case Study Areas (CSAs) reside.

Overview

This report provides a structured review of policy documentation relevant to the eight CSAs and peer-reviewed literature. Specifically, it includes:

- A **review of current policy** (Section 3) that evaluates the policy cohesion at different governance levels for each CSA, taking a bottom-up approach, from the local, to regional, and finally national scale documents regarding:
- A review of existing policy considering the CSA-specific hazards and capabilities from CARMINE Task 1.2 (Deliverable 1.2) and Tasks 3.1 and 3.3 (information collected by CSA leads on the multifaceted impacts of specific extreme events or climate challenges in different case study locations by focusing on people's capabilities, following Nussbaum 2003).
- The overall alignment of CSA policy to the key themes of EU climate change adaptation policy.
- A **review of academic and grey literature** (Section 4), taking a top-down approach by evaluating studies considering similar or the same EU documentation, which either critiques it or investigates aspects of its implementation or application to Member State policies:
 - To gauge the overall evaluation of EU adaptation policies.
 - To explore the extent of EU policy translation or application at different governance levels.
 - To highlight any conflicts, trade-offs, and synergies identified in past studies among EU Member States.

Sources of documentation

Policies and other related documentation such as peer-reviewed academic journal articles and grey literature such as organizational reports were collated using a mixed method approach. Documents for the Policy review (Section 3) and the Academic and grey literature review (Section 4) were collected using different approaches to optimize the search process. While this review begins with a qualitative and detailed analysis of policy, a quantitative element has been applied to gain a broader understanding of the overarching alignment of policy gathered in accordance with EU policy. This is summarized in Figure 1.

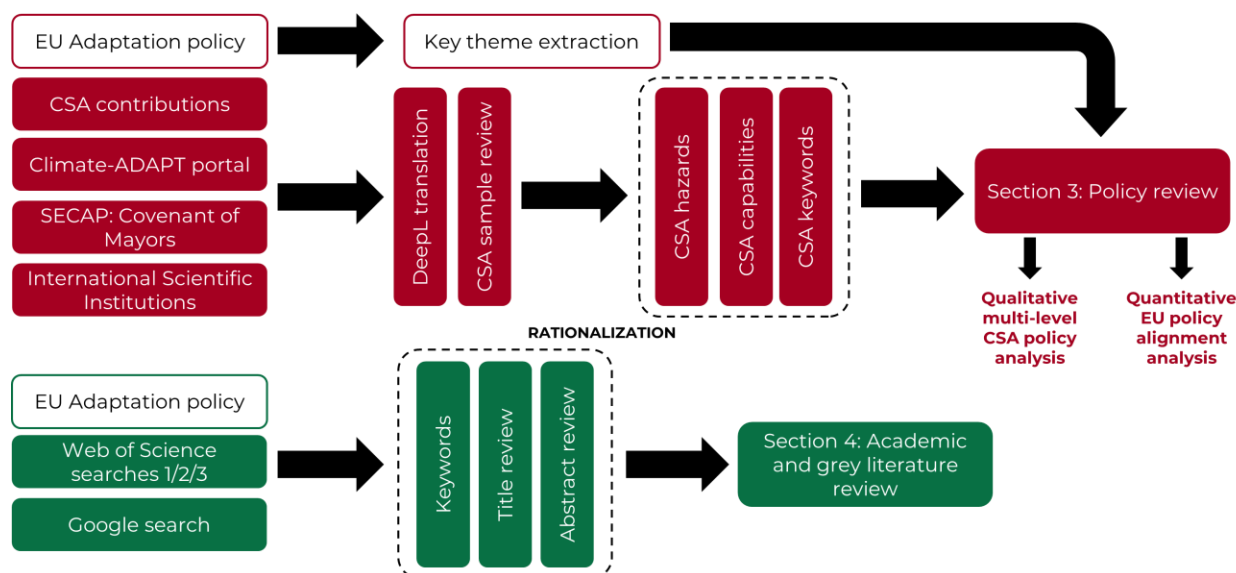


Figure 2 - Overview of methodological approach to the D6.5 review

Policy documentation

CSA contributions

Policies were initially collected from CARMINE consortia stakeholders who have local expertise regarding policies and documents available within the eight CSAs. The 8 CSA leads were contacted via email by the WP6 lead, University of Birmingham (UoBIR) and the D6.5 beneficiary, Consiglio Nazionale delle Ricerche (CNR) on 12/09/2024. The information was collected in an Excel spreadsheet for each CSA, in which policies and other documentation were classified at international, national, regional, and local levels.

All policies that enable adaptation were considered. This included policies with co-benefits to climate change adaptation such as climate change mitigation, green infrastructure, and flood risk management. All documentation was submitted by the end of February 2025. After this date all documentation (name and/ or corresponding link) were checked and downloaded. Where documents were unavailable or had non-working links, the CSA leads provided the documents directly.

Climate-ADAPT portal

The EU's [Climate-ADAPT portal](#) was utilized to gather other documents not provided by the CSA leads. As the CARMINE project's interest levels correspond with 'national', 'local', and the 'European Climate and Health Observatory' sections of the portal, documents relating to the eight CSAs were downloaded from these three sections. In the 'Countries' and 'European Climate and Health Observatory' sections, documents relating to other countries were also downloaded to enable a critical analysis of the most advanced national-level options to be carried out in the subsequent project phases and identified as potential best practices.

SECAP: Covenant of Mayors

In the Climate-ADAPT portal, specifically in the "Data and Tools" sub-section, there is an "Urban Adaptation Support Tool", which assists cities, towns, and local authorities in developing, implementing, and monitoring climate change adaptation plans. For each CSA, the corresponding

Sustainable Energy and Climate Action Plan (SECAP) has been downloaded, where not already directly provided by CSA leads. The development of the SECAP is a requirement for cities and towns to participate in the Covenant of Mayors (CoM) for Climate & Energy initiative.

International scientific institutions

The various CSAs explicitly refer to a series of EU directives and policies. Among those mentioned by CSAs included the EU Green Deal, the European Climate Law 2021, the EU Strategy on Adaptation to Climate Change 2021, Fit for 55, REPower EU, Strategy for the Rights of Persons with Disabilities 2021-2030, the Farm to Fork Strategy, the Transit Oriented Development Strategy, the Green City Accord, the European Flood Directive – and EU initiatives on Water Resilience, the EU Nature Restoration, the EU Biodiversity Strategy, Social Climate Fund, and the EU Mission for Climate Neutral and Smart Cities.

It is therefore evident that the EU-level policies represent a broad framework for potential implementation. Furthermore, the distribution of these policies for the purposes of individual CSAs demonstrates a high-level network of interactions that provides opportunities for the transfer of local knowledge at European dissemination levels and implementation at the EU level. This can contribute significantly to the advancement of knowledge and policies through the results obtained in real-world cases.

Along with the European directives and policies provided by each CSA, other international documents were considered to evaluate how local policies fit with the supranational frames.

The Intergovernmental Panel on Climate Change (IPCC) is a United Nations (UN) body that assesses the science related to climate change, including international, European, national, and local policies. The Fifth and Sixth Assessment reports, Working Group II (AR5 WGII, and AR6 WGII) were used to verify their alignment with the CSA's individual themes of interest. Where CSA documents at local, regional, and national were recently updated, the D6.5 beneficiary (CNR) used the AR5 report to verify compliance.

Also considered are recommendations from the World Meteorological Organization (WMO) such as making climate services accessible and impactful across vital sectors such as agriculture, water, health, disaster risk reduction and energy (Early Warnings4All), and the recent WMO 1234 Guidance on integrated urban, hydrometeorological, climate and environmental services.

The World Economic Forum – White Paper 2025 (Future-Proofing the Longevity Economy: Innovations and Key Trends) has been considered as the inevitable economic and demographic challenges are inextricably intertwined with climate and environmental issues, representing a social impact of enormous economic relevance. For this reason, and for the projected demographic trends specific to Europe, new business models and socio-environmental models must be developed and applied to guarantee the sustainability of services and the well-being of people in a demographic system with an increasingly significant presence of the elderly.

Academic and grey literature

Academic and grey literature were collected to conduct a top-down review of EU policy on adaptation to complement the bottom-up policy review. The literature search was conducted for papers published in the last 15 years (2010-2015) using four rounds of keyword searches, as described in Table 2. Separate search criteria were selected to broaden the scope in stages. This is because when all the keywords in Table 2 were entered into one Web of Science search, no results were found. Searches 1-3 provided more manageable hits, of which the literature metadata were exported from the Web of Science into an Excel spreadsheet and a review of titles and abstracts undertaken for relevance. Search 4 was a final search to capture any other

academic literature not picked up in the Web of Science searches 1-3, as well as grey literature which the Web of Science would not have otherwise captured. An expert-based review process was conducted on the titles and abstracts of the papers for relevance, and duplicates removed, resulting in the final selection of 42 articles marked for consideration.

Table 2 - Search parameters to gather relevant academic and grey literature for review. Selected literature excludes duplicate documents. Note that the Google search produced many results; the first three pages of results were considered, as documents began to

Search	Database	Keywords	Hits	Selected
1	Web of Science	EU; Europe; climate; adaptation; policy; review	82	17
2	Web of Science	EU; strategy; adaptation; climate change; review	32	4
3	Web of Science	EU; Green Deal; adapt	137	12
4	Google	EU; adaptation; review	N/A	9

Analytical approach

This section describes the “bottom up” process to review the documentation used within the CSA or available for the CSA (e.g. from Climate Adapt portal or SECAP) to enable climate adaptation (Section 2.3.1), and the “top down” process to review the academic literature that considers key EU policy (Section 2.3.2).

Policy review of Case Study Areas

The policy review process comprised three main steps:

- Document translation
- Document rationalization and keyword selection
- The policy review process.

These are described in detail below.

Document translation

The eight CSAs are in eight different countries, resulting in many documents being published in languages native to their respective CSAs. To prepare these documents, the D6.5 beneficiary (CNR) used an online Artificial Intelligence (AI) application to perform the translation operation. DeepL was selected because it is considered among the most reliable in terms of translation accuracy. To verify the suitability of the AI translation, the team translated a test document for each CSA and requested the CSA leads to confirm the quality of the translation.

Document rationalization and keyword selection

A total of 230 documents were collected for this policy review, and the overarching process is illustrated in Figure 2. The WP6 team rationalized these documents by filtering those of most relevance specific to each CSA using the following CARMINE reports and resources:

- The hazards and specific objectives as detailed in WP1, specifically D1.2; and in WP2, specifically D2.1.
- The priority capabilities of each CSA, and their influenceability and relevance as detailed in WP3, to foresee the needs and vision that each CSA for the respective hazards. Each

CSA has identified its priority capabilities in relation to its hazards. These capabilities are defined as the freedoms, opportunities, or possibilities that enable people to live the lives they wish to and value. Each CSA has analyzed how their respective hazards affect their capabilities. Regarding influenceability, each CSA has considered strategies that could be implemented to enhance or restore their respective capability. These enable each CSA to articulate an initial vision for the near future, encompassing both needs and existing strengths. This policy analysis considered this information to support document rationalization.

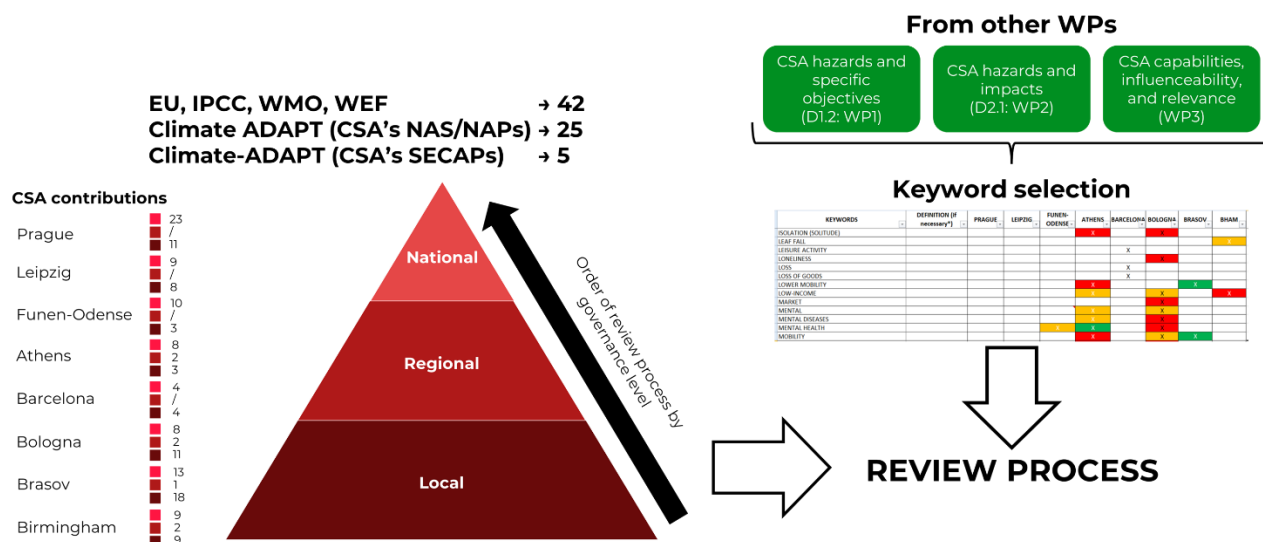


Figure 3 - Overview of documents collected, rationalized, and analyzed for the policy review

For each CSA, CNR extracted keywords that summarized the hazards, impacts and capabilities as previously mentioned. The WP6 team requested each CSA lead to prioritize relevant keywords in order of importance: green (somewhat relevant for the CSA), yellow (moderately relevant for the CSA), and red (very relevant for the CSA), as summarized in Figure 3. These were used to undertake a manual keyword search in every translated document, helping to distill the most important sections of text from documents for review in meeting the objectives of each CSA. Priority focus was given to keywords highlighted in red, but all other (yellow and green) keywords were also considered as part of the search.

KEYWORDS

KEYWORDS	PRAGUE	LEIPZIG	FUNEN-ODENSE	ATHENS	BARCELONA	BOLOGNA	BRASOV	BHAM
ABANDONEMENT								
ACCESSIBILITY								
ACCESSIBLE		X						
AIR CONDITIONING								
AIR POLLUTION / POLLUTION		X						
AIR QUALITY								
ASSISTANCE								
ATTRACTIVITY								
BUILDING								
CHRONIC								
CLIMATE EDUCATION								
CLIMATE JUSTICE								
DAMAGE								
DAMAGE TO HOME								
DELIVERY (OF FOOD)								
DISABLE								
DISEASE								
DISRUPTION								
DROUGHT		X						
DROUGHT-RESISTANT (INFRASTRUCTURE)								
DRY SUMMER								
ECONOMIC RISK								
ELDERLY	X	X						
ENERGY		X						
ENERGY ASSET		X						
ENERGY EFFICIENCY		X						
ENERGY POVERTY								
EQUITABLE								
EXPOSURE								
EXTREME RAINFALL								
FIRE								
FLOODED AREA								
FLOODING	X							
FLOODING BUILDING								
FLOOD-PROOFING								
FLOOD-RESILIENT								
FOOD								
GO OUTSIDE								
HABITAT								
HEALTH	X							
HEALTH ADVICE	X							
HEALTH SERVICE								
HEALTHCARE	X							
HEAT / EXTREME HEAT	X							
HEAT STRESS								
HEATWAVE	X	X						
HEAVY RAINFALL								
HYGIENE								
IGNITION								
ILLNESS	X							
INDOOR								
INDUSTRY / INDUSTRIES								
INJURIES								
INSURANCE								
ISOLATION (SOLITUDE)								
LEAF FALL								
LEISURE ACTIVITY								
CONFIDENTIALITY								
LOSS								

Figure 4 - Prioritization of keywords as provided by CSA leads (a large version of the figure is available in the Appendices chapter)

Review process

CNR extracted the relevant objectives and planned adaptation actions (or lack thereof) across documentation to identify the extent of existing policies in addressing the challenges according to the actions. A bottom-up approach was utilized to ascertain the significance of the hazards relevant to each CSA to evaluate implementation of climate change adaptation in policy. This was achieved by starting with the review contents in local level documentation, and verification sequentially for similar content at higher levels, such as regional and national. Moreover, this approach facilitated the verification of uniformity of action at all levels and validating the consistency of or specifying the point of economic and political barriers to adaptation implementation.

A final overarching review was conducted to evaluate the overall alignment of the policies analyzed across the CSAs to key themes in EU policy on adaptation, which align with the key themes of the CARMINE project objectives. These themes are identified in Section 3.2 following a summary of the EU policy, and the resulting scores presented in Section 3.4. Each theme is assessed via expert judgement by WP6 team per CSA according to its climate hazards and capabilities, in terms of how well they are featured throughout all the policy documents reviewed. The scoring matrix is on a scale of 1 to 5 per theme, where a score of 1 suggests that there is little or no evidence across CSA policies addressing the theme, and 5 shows strong evidence. This is a similar approach previously undertaken to evaluate alignment of national adaptation plans to ISO14090 principles on climate change adaptation (Greenham et al., 2022). It is a high-

level, indicative approach that allows for quantification of qualitative information. Its purpose is to highlight general strengths and opportunities in CSA policy, which will be useful reference resource that informs the development of further WP6 deliverables such as D6.1, *Multi-level climate change governance framework*.

Academic and grey literature review

The academic and grey literature review was carried out by UoBIR; focusing on a top-down review of EU policy on adaptation, which includes critiques of the key EU documents, as well as the research evidencing their incorporation at national, regional, and local levels where it has been reported in studies. Key findings were summarized for each document, then grouped into themes that comprise the sub-headings of Section 4 on: (i) perspectives on the overall evaluation of EU adaptation policy from published critiques (Section 4.1); (ii) research evidencing the extent that EU adaptation policy has been applied into adaptation progress at different levels of governance across Europe (Section 4.2); (iii) suggestions in literature of any factors that may be influencing the extent of implementation of adaptation across Europe (Section 4.3), and (iv) any examples in the literature highlighting conflicts, trade-offs and synergies across other policies relevant to adaptation (Section 4.4; Section 4.5).

Discussion and synthesis of state-of-the-art implementation options

Following the review of all documents, key highlights are discussed throughout Section 5. This includes a review of implementation options across the policies at all levels reviewed for each CSA, and any key findings in terms of challenges, gaps, barriers, or opportunities, as well as the evidence of integration with EU policy, and any aspects of policy implementation that has not yet taken place. Following this, there is a broader consideration of policy direction and implementation options not specific to the CSAs, which is based on the findings of the academic and grey literature review.

Policy review

Overview of EU documentation

This Section begins with an overview of the three key EU documents on adaptation to climate change, which enables the identification of principal themes which are considered throughout all stages of the review.

EU Green Deal

The EU Green Deal (European Commission, 2019) is the EU's growth strategy. It focuses on a green and just transition, outlining policy initiatives towards these with the goal of reaching climate neutrality by 2050 and therefore becoming the first climate-neutral area in the world. It emphasizes that all policy areas must contribute to fighting climate change. Figure 4 illustrates the various elements of the EU Green Deal. Its key goals include (European Council, 2025):

- **Climate neutrality:** Drastic reduction of greenhouse gas emissions for the EU to become the first climate-neutral area in the world
- **Circular economy:** New economic model where products are reused, repaired and recycled, reducing waste and conserving resources
- **Clean industry:** Push for cleaner, more sustainable and energy-efficient industries which thrive in the EU and global markets
- **Healthier environment:** Plan to restore nature and work towards zero pollution to ensure a healthy environment for future generations
- **More sustainable farming:** Greener farming practices to protect the environment while providing healthy and affordable food
- **Climate justice and fairness:** Plan to make the transition fair and inclusive to help people most affected by the transition and leave no one behind.

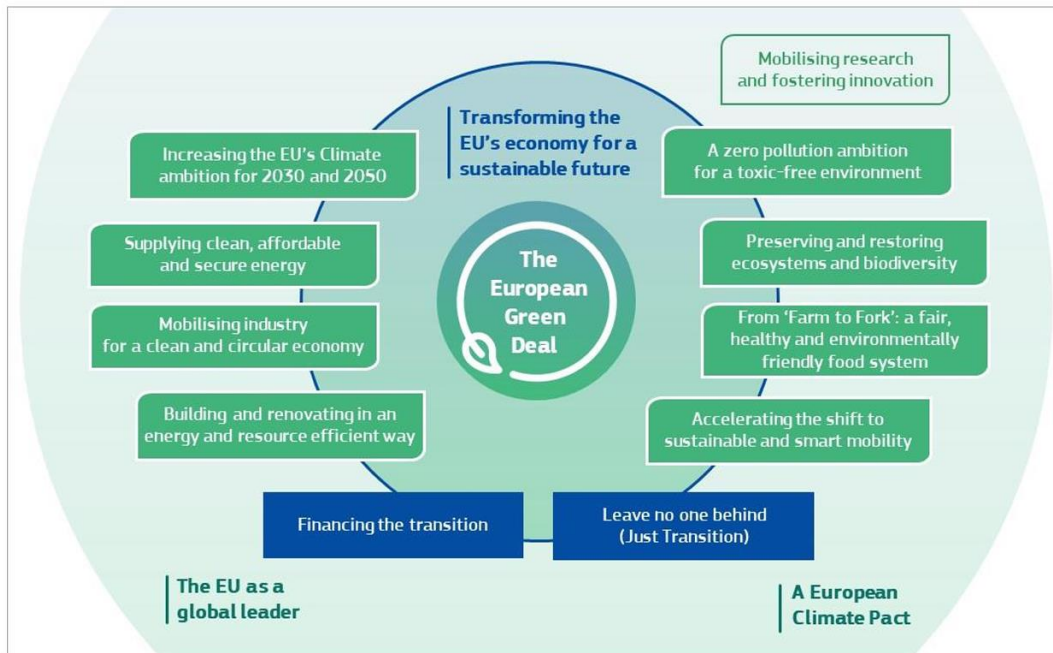


Figure 5 - The various elements of the EU Green Deal. (Source: European Commission, 2019)

EU Strategy on Adaptation to Climate Change

The EU Strategy on Adaptation to Climate Change (European Commission, 2021a) outlines the European Commission's commitments and vision in achieving a climate-resilient society, fully adapted to the unavoidable impacts of climate change by 2050. The 2050 goal aligns with climate change mitigation targets (i.e. decarbonization and net zero emissions) as outlined in the Paris Agreement (UNFCCC, 2015) and the European Climate Law (European Union, 2021). It forms a key component of the EU Green Deal.

EU Member States are the main implementation partners of climate change adaptation, and this strategy recognizes that more ambitious and proactive EU-level action will help meet the Member States' adaptation needs. Furthermore, even if adaptation challenges are considered local and specific, solutions are often widely transferable and applicable at larger scales. This underpins the purpose of D6.5, as the review draws out solutions and implementation options from local and regional policy, strategy, and plans for the benefit of other CSAs.

To forge a climate-resilient EU, the strategy outlines the following aims:

- **Smarter adaptation:** improving knowledge and managing uncertainty
 - Pushing the frontiers of knowledge on adaptation
 - More and better climate-related risk and losses data
 - Making Climate-ADAPT the authoritative European platform for adaptation
- **More systemic adaptation:** Support policy development at all levels and sectors
 - Improving adaptation strategies and plans
 - Fostering local, individual, and just resilience

- Integrating climate resilience in national fiscal frameworks
- Promoting NbS for adaptation
- **Faster adaptation:** Speeding up adaptation across the board
 - Accelerating the rollout of adaptation solutions
 - Reducing climate-related risk
 - Closing the climate protection gap
 - Ensuring the availability and sustainability of freshwater

The strategy acknowledges that the adaptation ambition must match global leadership made to date in climate change mitigation. Therefore, the EU will work with Member States and more broadly to unlock financial resources towards climate change adaptation, as well as strengthening engagement and exchanges on adaptation practices.

EU Mission on Adaptation to Climate Change

The EU has five Missions, which focus on bringing concrete solutions to some of Europe's greatest challenges. One of these is *Adaptation to Climate Change: support at least 150 European regions and communities to become climate resilient by 2030*. There is a Mission Charter (European Union, 2022), with the first signatories announced in June 2022. There are currently 312 Charter signatories. CSAs with signatories include Barcelona, Brasov, Bologna (wider Emilia-Romagna region), Leipzig, and several municipalities across Athens. While the Charter is non-binding, it represents a willingness to take actions that strive towards climate resilience by 2030. Like the EU Strategy on Adaptation to Climate Change, this EU Mission also forms a key component of the EU Green Deal.

Some of the actions outlined that create the conditions to achieve climate resilience and support the Mission include:

- Using the best available knowledge to carry out climate risk assessments in the region and ensure that everyone has access to the results
- Use this knowledge to support citizens, entrepreneurs, scientists, and policymakers in designing and undertaking action for adaptation to climate change
- Design trajectories by which the region will become climate resilient by 2030
- Involve citizens in decision-making and allow them to participate in testing or assessing different adaptation solutions
- Mobilize resources and develop activities in the region to reach the adaptation goals
- Support demonstration and deployment of climate adaptation solutions
- Participate in the exchanges of experience and collaboration activities with other regions
- Take stock of the collative progress of achieving the Mission objectives and contribution to adjusting its course and steer its actions

Signatories gain access to the Mission Implementation Platform, which provides a range of support and resources to undertake actions. It comprises a theoretical bottom-up governance model; the intention is to encourage action at the regional and local level instead of filtering down to the national level as an attempt to deliver more transformative adaptation action. The regional focus is particularly important as this level is often overlooked from a governance perspective. Of

the five Missions, the Adaptation Mission specifically addresses the regional level, which aligns with the objectives of the CARMINE project and can further support the Mission.

EU evaluation parameters

The themes below are drawn from the three EU policy documents outlined in Section 3.1. They collectively depict a comprehensive, multi-level, and inclusive approach to tackling climate change, aligning long-term resilience goals with immediate adaptation and mitigation actions. These are the key themes which underpin the analysis by which the levels of implementation of climate change adaptation policy across the EU can be measured:

- Clear and defined adaptation actions
- Policy integration across levels and sectors
- Knowledge and data-driven action
- Community and stakeholder engagement
- Finance and resource mobilization
- NbS
- Ambition and leadership

Policy review of Case Study Areas

This section outlines the climate challenges in each CSA and reviews the local, regional, national and international policy available to support climate adaptation.

Prague, CZ

Prague, the capital city and its greater metropolitan area resides in the Czech Republic. The CSA focuses on the adverse health impacts of heatwaves and air pollution exposure, particularly on the most vulnerable, such as low-income groups, elderly residents, and tourists, specifically regarding mortality and morbidity.

Local

Prague has a strong system of local policies related to environmental protection, climate change adaptation and sustainable urban development. They have overarching objectives, as well as specific measures, which are geared towards a substantive reduction in these risks. Twelve resources were identified for the local-level review.

Climate Change Adaptation Strategy of the Capital City of Prague (2017) and Climate Plan for the City of Prague 2030 - Prague on the way to carbon neutrality (2021): These strategic documents set the goals of mitigating the Urban Heat Island (UHI) effect, enhancing green infrastructure, and improving air quality. While it does not specifically mention vulnerable populations, interventions such as increasing green spaces (parks, trees planting) and promoting cool pavements yield direct benefit to all residents by reducing ambient temperature and improving air quality, conditions important for the elderly and those with pre-existing conditions. Furthermore, policies on reaching the carbon neutral target demonstrate co-benefits in the long-term improvement of air quality.

Adaptation Strategy of the City of Prague (2020): This strategy explicitly specifies measures of adaptation for climate change that involve vulnerable groups. It includes the development of an early warning system, which comprises 431 sirens across the city.

Prognosis, concept and strategy of nature and landscape protection in Prague (2009): This document outlines actions for the preservation of green areas, both natural and constructed, which are important for the reduction of heat and for improving air quality. The green spaces considered include river green banks, the city-wide green system, green wedges, and public green and promenades. The document also considers the relationship between green space and waterways.

Rainwater management standards in the territory of the capital city of Prague (2017): This document details options and technical solutions for stormwater management such as roofs with retention layers, reinforced permeable surfaces, accumulation tanks, seepage areas, and more. Effective management of rainwater can significantly decrease the flood risk in the city and when combined with green infrastructure, it can contribute to the evaporation of water which in turn cools down the local air.

Sustainable Mobility Plan for Prague (2019) and its Action Plan 2024-2026 (2024): The plan aims to make public transport, cycling and walking attractive alternatives to car travel to reduce vehicle emissions, one of the major sources of air pollution.

Territorial Energy Concept 2013-2033 (2013): This concept focuses on the energy performance of buildings, which impacts indoor thermal comfort during heatwaves, particularly for low-income households who may not have access to regulated cooling and heating systems. Energy efficiency also helps cut emissions of pollutants. The Concept is complemented by other strategies such as the Sustainable Mobility Plan for Prague.

Digital Flood Management Plan for Prague (2019): The digital plan integrates local flood management plans for all areas of Prague. It includes an overview of existing management plans, data requirements, and approaches to flood risk management such as improving drainage, collaborative working between authorities and emergency services, and approaches to reporting.

Action Plan of the Strategy of Environmental Education of the Capital City of Prague 2022-2025 (2021) and Regional Strategy of Environmental Education and awareness of the city of Prague 2016-2025 (2015): These strategies focus on raising awareness of actions that people, including the most vulnerable groups, can undertake to protect themselves when extreme heat or pollution occur. This involves communication campaigns on staying hydrated, finding shade, and paying attention to air quality alerts.

Prague Strategic Plan (2016 update): This is the principal document for future city development and incorporates principles of sustainability and resilience, supporting vulnerable groups through the promotion of good urban planning. There is a strong level of integration in policies focused on disability; the adaptation to the urban environment to the needs of disabled people is detailed in term of actions such as: impaired mobility and orientation; removing of barriers; flexibility of the labour markets benefitting the disabled; financial supports for no-profit organizations; training of officials, and subsidies for health services. The Plan also includes a chapter on social inclusion, with actions comprising the optimization of social and health service distribution along with adequate capacities during crises.

Regional

Prague has a limited focus in a regional capacity as local-level documents often capture the regional scope of the wider metropolitan region of Prague and therefore there are no regional-level policies specific to climate change adaptation and the CSA challenges. While there are other

regional-level documents such as the **Regional Strategy of Environmental Education and awareness of the city of Prague 2016-2025**, there is no specific policy at a regional level dealing with necessary topics for this CSA review as a separate administrative layer.

National

The Czech Republic has developed and adopted a broad policy base at the national level to support local activities in climate change, environmental protection, and public health. Nineteen resources were identified for the national-level review.

National Action Plan on Adaptation to Climate Change (2017) and Strategy on Adaptation to Climate Change in the Czech Republic (2015): These documents establish the national climate change adaptation agenda and include actions to address extreme weather events, such as heatwaves. The document analytically explores multiple risks such as long-term drought, floods and flash-flooding, heavy rainfall, extreme high temperatures, extreme winds, and wildfires. Cross-cutting areas and economic instruments for adaptation are mentioned, including details on relevant tools and actions. This plan also identifies actions for legislative support and costs of climate change adaptation, including the societal cost of inaction.

Climate Protection Policy of the Czech Republic and National Energy (2017) and Climate Plan for Czech Republic (2023): These policies focus on mitigating greenhouse gas emissions, for long-term climate change adaptation and mitigation approaches on the various sectors of the civil society. The plan reports trends in GHG emissions, the objectives and priorities in reducing GHGs and details policies and measures in the following sectors: industry, energy sector, final energy consumption, transport, agriculture and forestry, and waste.

National Environmental Policy (2021) and State Environmental Policy (2021): These policies lay out the broad framework for environmental protection, including air quality management. They provide guidelines for emissions and pollution control that directly affect the health of all citizens. The National Environmental Policy is the main strategic document of the Ministry of Environment and formulates visions for the state of the environment in 2050. The document integrates international conventions, strategies, legislation as well as national sectoral strategies and legislation. Specifically, the State Environmental Policy reports, for each chapter, the implementation strategy of each objective, and how this aligns with European Regional Cooperation Programmes and LIFE Programmes. Cross-sectional instruments (Chapter 4) reports actions for international cooperation.

National Emissions Reduction Program (2019) and National Clean Mobility Action Plan (2019): These plans support the reduction of emissions and air pollutants through cleaner technologies and sustainable transport, contributing to improved public health and the reduction of respiratory disease.

Flood Risk Management Plans (2021-2027) and National River Basin Plans (2022): These plans consider resilience to extreme weather events more broadly, and include: (i) the protection and improvement of surface water and groundwater and aquatic ecosystems; (ii) reducing the adverse effects of floods and droughts; (iii) the management of surface water and groundwater and the sustainable use of such water for the provision of water management services; and (iv) improving water conditions and protect the ecological stability of the landscape.

Long-term building renovation strategy (2020): This strategy focuses on increasing the energy efficiency and passive cooling of buildings, thereby helping to make buildings more heat-resilient and to improve indoor air quality, which is important for more vulnerable populations. The strategy includes the national stock of residential and non-residential buildings, both public and private,

and considers options for renovation, barriers to renovation, and how reducing GHG emissions will impact indoor air quality.

Hydrogen Strategy of the Czech Republic (2024) and National Energy Policy/State Energy Policy (2024): These strategies concern the national energy mix represented by cleaner fuels, decreasing of the concentrations of air pollution caused by fossil fuel combustion. The updated Hydrogen Strategy envisages that hydrogen will replace part of fossil fuels in transport, as a carrier for energy transport and storage, as a raw material for the chemical industry and as a heat source for specific technologies.

Strategic Framework Czech Republic 2050 (2024): This is a long-term strategy, which includes climate resilience and public health as key foundations for future policy making. The Czech Republic's objective is to achieve emission reductions in line with the commitments under the EU Fit for 55 package and to contribute to achieving the EU goal of climate neutrality by 2050. The Czech Republic aims to reduce the share of fossil fuels (without carbon capture technology) in primary energy consumption to 50 % by 2030, and 0 % by 2050, as well as to completely reduce the use of coal for electricity and heat generation by 2033.

National Act n°. 469/2023 Sb. Energy act (2023), National Act n°. 100/2001 Sb. on environmental impact assessment (2001), National Act n°. 114/1992 Sb. on nature and landscape protection aimed at landscape and biodiversity protection (1992), and National Act n°. 17/1992 Sb. on general environmental protection (1992): These Acts on environmental protection, environmental impact assessment, and nature conservation all indirectly support building a response to the impacts of heatwaves and air pollution by promoting sustainable development and improving environmental quality. Specifically, National Act n°. 469/2023 obligates the energy sector to protect its most vulnerable customers.

Report on the Environment of the Czech Republic (2023): The Czech Republic have seeing improvements in several areas of environmental protection, including GHGs reduction, waste management and water quality, as well as intensive land use and climate change impacts. This report addresses climate change air quality, water quality, biodiversity, waste management, forests and energy. It reports also challenges and future directions. The Czech Republic faces a complex set of environmental challenges but has a strong foundation for progress through continue investment in environmental protection, technological innovation and implementation of policies.

Leipzig, DE

Leipzig is a city within the West Saxony region of Germany. The Leipzig CSA focuses on the impacts of heatwaves in terms of thermal comfort and wildfire risk.

Local

There are a wide range of policies relevant to climate change adaptation in Leipzig. Six resources were identified for local-level review.

The Koopstadt Leipzig Climate Strategy (2012): This strategy provides climate targets combining both mitigation and adaptation. For vulnerable populations, it calls for specific goals to reduce UHI effects, improve air quality, and increase resilience to extreme weather events. Adaptation actions specified include the optimization of green spaces in cities, sustainable mobility, and reducing emissions (indirectly impacting respiratory health), and the provision of early warning systems for heatwaves. Rainwater management and water balanced development (i.e. where possible water balance is maintained via evaporation and infiltration) are also required to maintain water supply levels. This is managed by the office of Urban Greenery and Water.

Energy and Climate Protection Programme 2014-2020 (2014): Although this programme has ended, its aims and results have fed into current policy regarding energy efficiency and renewable energy. For example, energy efficiency can be considered a lever for building retrofitting and renewing air conditioning. The programme demonstrated that decreasing fossil fuel dependence, while decreasing air pollution levels, which is an important predictor for respiratory health, can also be exacerbated by high atmospheric particulate levels during wildfire events.

Freiraumstrategie Leipzig (Open Space Strategy Leipzig) (2017): This strategy is important in addressing heatwaves and air pollution. It focuses on the creation and conservation of public open spaces such as parks, greenways, and squares, providing air-cooling effects, improved air circulation, and opportunities for recreation which are more comfortable for residents, particularly the elderly, children, and those who are vulnerable to heat stress due to pre-existing conditions.

Fachkonzept Freiraum und Umwelt (INSEK 2030) (Open Space and Environment - Integrated Urban Development Concept 2030) (2018): This long-term urban development concept includes commitments regarding sustainable land use, promoting green infrastructure, improving diversity of species, and watercourse developments. For the most vulnerable populations in cities, it supports equitable access to green space, the strategic placement of green infrastructure to protect the most at-risk areas from heat and flood risks, creating “cool zones” for public use during heatwaves. It proposes several packages of active measures to achieve the commitments described, with details on the prioritization of actions. Specifically, the actions are multifunctional use of area; sustainable network of open spaces; green blue infrastructures; open spaces for sustainable land management; participation and civic engagement; control of urban densification.

Straßenbaumkonzept Leipzig 2030 (Street Tree Concept Leipzig 2030) (2019): Street trees are a nature-based solution and an effective method for urban heat. This vision includes a plan for how trees will be planted and maintained in the city, and which trees species to plant. Street trees provide direct benefits for pedestrians, and the concept also emphasizes the relationship between urban vegetation and active mobility.

Masterplan Grün-Blau Leipzig 2030 (Green-Blue Masterplan Leipzig 2030) (2021): This provides an integrated approach to the development of green (such as parks and trees) and blue infrastructure (such as sustainable drainage systems). The city requires these, both to cool the surface and to limit or prevent flooding. By incorporating blue infrastructure and porous surfaces, surface runoff is better managed and temperatures can be reduced locally.

Regional

Only one resource was identified for regional-level review.

West Saxony Climate Adaptation Strategy (2008): This provides a structure for local adaptation efforts (on heat, air quality, and flooding), encourages cross-municipal action on these issues. The strategy recognizes that heatwaves, flash floods, and changing precipitation patterns as important hazards for the region. The strategy is based on a structure which focuses on public participation, a sectoral plan that considers cross-cutting issues, an urban development strategy, and a strategic vision summarizing the basic principles of interventions.

National

Seven resources were identified for national-level review.

Master Plan for Charging Infrastructure (2019): This plan is aimed primarily at the development of electric car charge points, bringing the co-benefits of improving air quality and reduced vehicle

emissions. This also benefits respiratory health, particularly in urban areas, and those sensitive to pollutants. The Master Plan includes a stronger focus on a range of issues, such as: close integration of electric mobility and the power grid; expanding the charging infrastructure for heavy commercial vehicles (i.e. lorries and buses) on motorways and commercial premises; making the necessary sites available as quickly as possible and with no unnecessary bureaucracy, particularly along motorways.

Strukturstärkungsgesetz (Structural Development Act) (2020): While not directly linked to climate change, this law supports structural change in coal-mining areas which may indirectly support climate adaptation by encouraging economic diversification and sustainable development. Investing in green technologies and infrastructure in these areas can result in cleaner air and more climate-resilient communities.

Energy-efficient Construction and Restoration Policy (2021): This policy aims at increasing energy efficiency in buildings with the objective of decreasing energy use and greenhouse gas emissions. Indirectly, this may result in improved indoor air quality and lower temperature fluctuations, improving thermal comfort, particularly for vulnerable populations, which protects them from the impacts of heatwaves, and requiring less energy-intensive cooling systems.

Klimaschutzgesetz (Federal Climate Change Act) (2022 update): This law enforces Germany's climate action and enacts binding emission reduction targets of a reduction in GHG by a minimum of 65% by 2023, and a minimum of 88% by 2040. Although predominantly focused on mitigation, it sets the frame for all climate policies, including adaptation to climate impacts. The Act also creates a council of experts to oversee the tasks.

Climate Action Programme 2030 (2019): This programme specifies measures and regulations for climate targets by 2030. The targets are in line with the "Fit for 55" package and the corresponding measures are related to the energy sector, building sector, industry (decarbonization), transport and Land Use, Land-Use Change and Forestry (LULUCF). It sets out how to respond to the impacts of climate change, such as measures to improve infrastructure resilience to extreme weather, and safeguarding people's health. It also outlines the interactions required across various initiatives and frameworks in place at national and international levels (EU Building directive, Clean Tech Europe, Energy Efficiency directive).

Climate Action Plan 2050 (2016): Germany's long-term plan describes the country's route to net zero GHG emissions by 2050. It directs all national-level policies towards a climate-resilient future, making sure that adaptation for the most at-risk people is included in long-term planning throughout all levels.

2024 German Strategy for Adaptation to Climate Change (2024): The Sendai Framework for Disaster Risk Reduction (SFDRR) and the 2030 Agenda for Sustainable Development, underscoring the importance of climate adaptation. The strategy foresees seven clusters: infrastructure; land and land use; human health and care provision; urban development, spatial planning and civil protection; water; economy; and a cluster with cross-sectoral. The strategy is based on a strong risk-assessment vision: an indicator-based monitoring system will measure progress towards the targets indicated in the strategy for each sector. The precautionary approach is broad-based collaborative and participatory process, which includes representatives of federal states, associations, including municipal umbrella organizations, and the scientific community. Action areas in forestry adaptation, sustainable forest management and resilience to adverse weather conditions along with human health and care provision are extensively reported in terms of targets to be monitored.

Funen-Odense, DK

Odense is the third largest city/municipality in Denmark, and the largest city/municipality on the island of Funen. This CSA focuses on protecting the city's population, buildings, infrastructure, and economic activities from flooding; this includes coastal and storm surge-driven flooding; sea level rise; and inland flooding as a consequence of heavy rain.

Local

The local level review is guided by documents published for Copenhagen, recognizing that those are representative of similar approaches being taken throughout Denmark which also related to Funen-Odense. Four resources were identified for the local-level review.

Odense Adaptation Plan (2024): This adaptation plan is a prime example of "blue-green infrastructure". Instead of relying solely on traditional "grey" infrastructure, the city integrates water management with nature and urban development. The core of Odense's urban adaptation is to manage rainwater on the surface, a strategy developed in close partnership between the municipality and the local water utility, VandCenter Syd. A major component of the plan focuses on the Odense River, creating resilience along its urban stretch. Large green areas along the river are designed to act as temporary floodplains. During extreme rainfall, these parks are allowed to flood, holding back substantial amounts of water. These projects combine recreational value with flood protection.

Copenhagen Climate Adaptation Plan (2011): The Copenhagen Climate Adaptation Plan is one of the key strategic documents in relation to climate change adaptation and is highly applicable to the challenges in Odense. While centered around Copenhagen, its methods and approaches are reflected in other Danish municipalities, as they face the same national guidelines and challenges. It adopts the A2-IPCC future scenario for assessing future climate impacts, which represents a future works characterized by high population growth, regionally oriented economic development, and slower technological change – one of the higher overall emissions scenarios. This scheme is a direct response to recent intense precipitation events and the resulting flood impacts. It recognizes the economic losses of buildings, infrastructure, and socio-economic activities because of such events. The plan considers a variety of measures, including:

- **Cloudburst Management Strategies:** achieved by diverting water from vulnerable locations, developing a temporary water holder, or improving drainage. This also foresees an immediate financial benefit by avoiding physical damage to buildings and infrastructure.
- **Green Infrastructure solutions:** Supporting green spaces, permeable surfaces, and urban greening to absorb and manage rainwater, relieving pressure on conventional drainage systems and reducing flooding risk (safety valves).
- **"Blue-Green" solutions:** This combines water management with urban greening to deliver attractive and usable spaces which can accommodate large volumes of water in the event of heavy rainfall.

For other forms of flooding such as storm surges and sea-level rise, attention is already implied under a wider climate resilience-oriented rubric:

- **Risk assessments and mapping:** Identifying vulnerable areas for several climate impacts, such as potential coastal flooding.

- Building climate-resilient infrastructure: Fostering the development of infrastructure that is resilient to future climate pressures.

This emphasis on “cloudbursts” reflects the large economic loss due to heavy rainfall that causes widespread destruction in basements and on ground floors of buildings, as well critical infrastructure.

Copenhagen Climate-Resilient Neighborhood Strategy (2011): Principles of climate resilience are embedded within broader Copenhagen climate adaptation agendas – along with comparable approaches being developed elsewhere in Danish cities. This includes:

- Decentralized water management: Solutions supporting water retention and runoff in villages to minimize the impact of rainfall.
- Community engagement: Engaging local residents and entrepreneurs in the design and execution of adaptation measures, promoting a sense of shared responsibility for protecting structures and economic activities.
- Green space and porous surfacing: Introducing capacity into districts for retention of rainfall to reduce risk of flooding and protect local infrastructure and businesses.

DK2020 (2020): This is a national public-private partnership initiative that aims to encourage municipalities in Denmark to implement ambitious climate mitigation and adaptation strategies, as well as other policies compatible with the Paris Agreement and the EU Floods Directive. It is not specific local policy for Funen-Odense rather it facilitates municipalities to develop their own detailed climate plan. DK2020 plans require municipalities to:

- Conduct vulnerability assessments: Assess the specific needs of areas prone to climate impacts, such as flooding from storm surges, sea-level rise, and heavy precipitation.
- Establish targets for adaptation: Identify specific ambitions for reducing climate risks and for increasing resilience.
- Produce adaptation actions: Plan out initiatives to protect people, buildings, infrastructure, and economic activities.

With DK2020, Funen-Odense must address coastal and pluvial flooding. Indeed, economic costs factor in implicitly to the decision making, as the idea is for the local economy to be impacted as little as possible. By considering the Paris Agreement, the program emphasizes long-term thinking on climate change. DK2020 also takes social vulnerabilities into account. The approach focuses on risk-management actions for the Municipalities along with international perspectives and the opportunity to foster knowledge exchange.

Regional

In the highly decentralized Danish governance system, the primary authority for planning and climate adaptation projects rests with the 98 municipalities (Kommuner). While the five Regions create strategic development plans, their role is coordinative rather than regulatory. Therefore, there were no regional resources to review.

National

Ten resources were considered for the national-level review.

City of Copenhagen Cloudburst Management Plan (2012): While this is specifically a local plan, all municipalities in Denmark have a similar plan and therefore can be treated as national. This requires the development and updating of Flood Risk Management Plans to manage coastal

and pluvial flooding and reduce economic losses associated with flooding. The plan provides the following information:

- Preliminary flood risk assessments: to determine areas at potentially high risk to flooding.
- Flood hazard and risk maps: to illustrate the spatial distribution and severity of flooding and accompanying adverse impacts to human health, economic activity, infrastructure, and the broader environment. These maps are crucial tools for understanding and managing losses.
- Flood Risk Management Plan: describing measures to reduce flood risk. This includes structural measures (e.g. dykes and barriers) and non-structural measures (e.g. land-use planning, early warning systems).

Action Plan for Climate-Proof Denmark: How to manage cloudburst and rainwater (2012):

This plan provides actions towards greater engagement between Municipalities and stakeholders to facilitate a greater knowledge base. Building on this, a more robust national climate adaptation agreement was established in late 2023, significantly strengthening the framework for local action. For Odense, this new plan provides critical reinforcement by formally dividing responsibilities: the Danish state takes a leading role in coastal protection, while municipalities and their utilities are tasked with managing inland flooding. This national directive validates Odense's long-standing partnership with VandCenter Syd for tackling river and cloudburst flooding, while also providing stronger state backing for major projects like the planned storm surge barrier in the Odense Fjord. Furthermore, the 2023 agreement mandates that Odense must have a comprehensive, standardized risk management plan in place by the end of 2025, ensuring its strategies remain aligned with a unified national standard. In essence, the national government has elevated the holistic approach that Odense already pioneered—simultaneously addressing threats from the sea, the river, and the sky. This national validation strengthens the city's mandate to continue its ambitious investments and solidifies its role as a key practical model for Denmark's climate-proof vision.

Coastal Protection Act (2016) and Flood Protection Act (2017): The Coastal Protection Act, a follow-on of the Flood Protection Act is intended to protect from coastal erosion and flooding. This is particularly pertinent to Funen-Odense which has a coastline and is at risk of storm surges and sea level rise. Key aspects include:

- Authorization for Coastal Protection Works: the legislative basis for the construction and preservation of coastal defenses (dykes, revetments, and artificial dunes). These measures provide the physical protection of people, property, and infrastructure from coastal flooding.
- Coastal Development Regulations: limiting building and other activities in coastal zones to reduce losses and the construction of new structures that are vulnerable to coastal hazards.
- Sources of finance: how the costs of coastal defenses are allocated across the state, municipalities, and sometimes property owners, reflecting a shared financial interest in protection.

Service Level Act (2020): This Act sets out standards and accountability in public services. Regarding flooding, actions may include:

- Defining the responsibilities of public agencies such as utilities related to the maintenance and improvement of the drainage infrastructure for stormwater management, to reduce flooding in buildings and the related economic losses.
- Organizing the preparation of response systems that work in floods, including evacuation processes and financial support for affected populations and businesses.
- Supporting mechanisms for those individuals and businesses directly impacted by flooding.

Climate Act (2019): This Act is Denmark's national climate framework law that includes ambitious targets for reducing greenhouse gas emissions. Although predominantly mitigation, it also serves to underscore adaptation actions. The Act sets out to:

- Embed Adaptation as a National Priority in Law, legally requiring that local governments must make climate adaptation central to their policy, ensuring they will act on and invest in protecting against climate impacts such as flooding.
- Supporting climate-resilient development, by promoting the integration of climate change into planning and operations of all sectors (including flood resilience). The Climate Act creates a framework of policy direction that requires the creation and implementation of more detailed flood management plans. It emphasizes the need for commitment over the long-term to mitigating and adapting to the economic and societal costs of climate change and foresees revisions by local governments at least once every five years.

Denmark is pursuing an approach to actions that are integral part of the national spatial plans. The Planning Act constitutes the general national framework of the land use planning system in Denmark. Specific flood and erosion prevention rules relating to act include:

- Incorporation of climate risk in spatial planning: Flood and erosion risks in land-use planning for urban development, industrial area, or agriculture. This has direct implications for the protection of buildings and economic activities (i.e., development can be directed away from high-risk areas, or resilience measures can be required)
- Requirements for climate-proof development: Ensuring new buildings and the construction of new infrastructure takes climate change into account. Such an analysis would consider economic damage via planning and development controls.

Revised Planning Act 2018 (2022 update): As previously stated above, the Planning Act necessitates iterative revisions to incorporate new adaptation actions into spatial planning. These updates would specifically relate to how land-use, development of cities, and infrastructure projects are required to account for flooding from a variety of sources. Some important features include:

- Risk-Based Zoning: encouraging development to relocate from flood-prone areas.
- Flood-Resilient Construction Criteria: requiring prescriptive design of specific buildings in flood-prone areas to mitigate damage and loss of value.
- Green Infrastructure considerations: championing nature-based approaches in urban design to increase water uptake and drainage capacity. The vulnerability of buildings and infrastructure, and thus the potential economic losses are directly affected by the Planning Act.

National Action Plan (2012) and Climate Action Plan (2024): The National Action Plan provides an overall summary of the Danish approach to adaptation. It emphasizes water as one of several climate-related challenges. It addresses:

- Integrated Water Management: this includes coastal zone management and inland water management, addressing coastal flooding (storm surges, sea level rise) and pluvial flooding.
- Vulnerability assessments and risk management: effectively characterized, communicated and addressed climate-related risks across different sectors and regions.
- Sector-specific adaptation measures: setting specifications for activities within sectors (e.g., agriculture, urban development, infrastructure) to increase their adaptive capacity to the impacts of climate change, such as flooding.

The National Action Plan emphasizes the significance of safeguarding economic operations and infrastructure by promoting their maintenance and reducing their vulnerability to the impacts of climate change. It also evaluates the costs of not responding to extreme weather – compared with the economy-stimulating benefits of being proactive. The Climate Action Plan features revisions and updates to legislation regarding carbon capture, renewable energy, phasing out oil, energy saving and efficiencies, and climate-friendly urban development and construction.

National Adaptation Strategy (2008): This Strategy establishes the guiding principles and strategic focus for future action plans and laws. It focuses on:

- Positive action governance at national, state, and local levels; acknowledging the impacts of climate change and that flooding is a national issue which demands a strategic response.
- Identifying critical vulnerable sectors e.g. infrastructure near coastal areas, in urban areas, essential infrastructure and services.
- Adaptation principles, which have been set out to help guide adaptation, e.g. integrating adaptation into existing policies, promoting knowledge exchange and collaboration.

The National Adaptation Strategy initiated the process of devising programs that would help protect people, buildings, infrastructure, and the economy from the impacts of flooding.

Athens, EL

The Athens Metropolitan Area consists of 40 municipalities, as outlined for the purposes of this CSA. It is in the Region of Attica, Greece. The Athens CSA is focused on how best to protect the vulnerable population, outdoor workers, and tourists from extreme heat and the UHI effect, to reduce heat-related impacts including fatalities and morbidity. This also considers the impact of wildfires, wildfire smoke and air pollution occurring during heatwaves, as well as drought and water scarcity that can affect the implementation and effectiveness of NbS for urban heat mitigation.

Local

Athens has shown a proactive level of local policy action regarding the health effects of heatwaves, particularly for those most vulnerable to heat across the city. Three resources were identified for the local-level review.

Athens Climate City Contract (City's involvement in EU Mission for Climate Neutral and Smart Cities) (2024): As a Member of the EU Mission for Climate Neutral and Smart Cities,

Athens prepared an integrated plan for climate neutrality and adaptation. The document provides a vision on green and blue infrastructure and other strategic approaches to complement the policy “No one left behind”. Though the specific protection for vulnerable population in this contract is generally executed via other city strategies, its inclusion represents a value of integrated climate action, of which protecting people from climate-exacerbated threats, like heatwaves, is inherently part of. The initiative promotes entrepreneurial cross-sector approaches and citizen participation in climate neutrality.

The City of Athens aims to reduce GHG emissions by 80% and offset the remaining 20% mainly through NbS in the city and afforestation/reforestation activities in the region. The 2030 climate neutrality target (issued before the 2050 target year in the 2022 Climate Action Plan) will include the municipality of Athens and the other seven municipalities of the Central Sector of Athens. The Climate City Contract is composed of: Part A, an evaluation of the current state of climate action in Athens using the C40Cities City Inventory Reporting and Information System; Part B, an Action Plan with 10 strategic priority areas and detailed impact pathways for the main emission sectors and the solutions to offset emissions, including NbS; and Part C, governance innovations and actions to support social innovation initiatives. Strategic priority areas focus on actions and commitments that address; energy efficiency of buildings (public and residential) for reduced emissions and safer indoor thermal comfort, renewable energy sources, the UHI effect, water management, and circular economy.

Governance innovations include the Athens Climate Forum (an institutionalized continuous engagement process with stakeholders and citizens of Athens), the Athens Climate Youth Assembly (an engagement process with Athens’ youth on climate issues), the Athenian Energy Alliance (capacity development and cooperation network with 17 neighbouring municipalities).

Athens Resilience Strategy for 2030 (2017): This is a key part of Athens’ response to climate risk. This strategy is built on four key pillars: Open City, Green City, Proactive City, and Vibrant City. It promotes sustainable, inclusive and resilient urban development through integrating nature, enhancing mobility, and addressing climate challenges. The strategy includes 65 actions and 53 supporting actions aimed at fostering better governance, transparency, and collaboration with residents. This document does not stand alone; it is supported by several documents that have been produced in alliance with the Cities Resilience journey (i.e. “Advancing equity for Athens’ resilience”). It specifically deals with the frequency, intensity, and duration of heatwaves that are likely to increase, and by reducing health and socioeconomic impacts at the core, the strategy intends to support data-driven policymaking. The plan supports the provision of a ‘Heatwave Action Plan’ in partnership with 100 Resilient Cities and C40Cities, which is managed by the National Observatory of Athens (NOA), whereby:

- Heatwave warnings are implemented in partnership with NOA.
- Green spaces and “cooling spots” (such as shaded public spaces, air-conditioned public buildings) are designed for immediate relief from the heat
- Cool materials are utilized to cover urban infrastructure and optimize the radiative properties of the built surfaces
- ‘Cooling routes’ are created in areas with a high UHI effect, including through the use of the EXTREMA global app.
- Municipality staff in collaboration with local community partners support the most vulnerable inhabitants in the city, including unhoused people, the elderly, those with cardiovascular and respiratory conditions, people with disabilities or mobility issues that

cannot leave their homes, pregnant women and infants, individuals with obesity, and low-income households living in older buildings and experiencing energy poverty. Municipality staff along with Hellenic Red Cross volunteers check in on vulnerable people in their homes through phone check-ins and visits through the Help at Home+ program and Streetwork outreach teams of social workers, nurses and psychologists of the City of Athens Reception and Solidarity Centre visit unhoused people day and night during heatwave. The heatwave phone line is activated by City of Athens municipality clinics.

- The coordination of municipal social services and collaboration with Hellenic Red Cross and other local social service organizations for carrying out these plans.

The plan also emphasizes the goal of decreasing incidents of heat-related illness through public awareness and prevention. Furthermore, there are targets to plant more trees and install pocket parks across the city. The outcomes are anticipated to lower temperatures by as much as 10% due to this additional green infrastructure, as well as reducing 15% in cooling demand during the summer.

Note: most of these programs and initiatives are in the central municipality of City of Athens.

City of Athens Climate Change Action Plan (2022): This plan is one of several documents that implement a resilience strategy. It aims at reducing greenhouse gas emissions by 61% by 2030, with a long-term goal of achieving climate neutrality by 2050. Key goals include expanding green spaces, reducing the UHI effect, enhancing infrastructure resilience, promoting renewable energy, addressing energy poverty, and improving public health. There is evidence of collaboration with international institutions such as C40Cities, ICLEI, Hellenic Red Cross, and the International Federation of Red Cross and Red Crescent Societies. Key elements of this partnership are the development of new strategies to deal with hot weather events and UHI such as (but not limited to):

- Helpline for hot weather calls (Help at Home+).
- Deployment of mobile health teams and volunteer teams to disseminate health information, provide first aid, and distribute isotonic drinks and water (Hellenic Red Cross).
- Prioritization of the most vulnerable parts of the population, including the elderly, people aged 65 and over, young children, carers of babies, pregnant women, people with chronic health disorders, and disadvantaged populations such as those living in poverty, without a home or without social security (including migrants and refugees). This demonstrates the city's comprehensive level of knowledge on marginalized groups.

Regional

The Attica region in which Athens is located also plays an important coordinating role in broader climate adaptation and disaster risk reduction (including wildfires). Three resources were identified for the regional-level review.

EU Cohesion Policy (1988): This is relevant at the regional level as it is a tool through which regions such as Attica can channel funds for climate change adaptation and disaster risk reduction. Although not a policy document it lays out the financial blueprint for regional projects. Climate-related measures that may be financed under this fund include making infrastructure more resilient to extreme weather conditions, supporting greening activities to address heat and wildfire risks, and enhancing the ability of civil protection systems to respond to disasters. Starting from the great emergency of 2007 (67 victims) there are reports on large evacuations following

forest fires near Athens during heatwaves to emphasize the necessity of these investments made possible by the EU Cohesion Policy.

Regional plan for climate change adaptation: Analysis and Assessment of Climate Change Risks, Region of Attica (2020): The regional plan is mandated under Greece's National Climate Change Adaptation Strategy. This document includes a detailed and extensive assessment of climate change risks for the region of Attica, including heatwaves and wildfires. It also pinpoints vulnerable areas and communities using socio-economic and spatial data. The plan identifies 93 proposed mitigation and adaptation measures, including options for integrated water management and land use planning for wildfire hazard mitigation and boosting the capacity of the health sector to adapt and prepare for the effects of climate change, specifically:

- For water: maintaining ecological supply, irrigation networks, water supply networks, increasing water use efficiency.
- For health: training for health professionals, improvement infrastructures of the health system, early warnings.
- For wildfires: reduction of the flammable understory, early warning and fire detection systems, forest classification, prevention infrastructure.

There are significant aspects of the regional plan that need to be addressed in future iterations. The assessment of socio-economic vulnerability and risk factors primarily focuses on economic indicators such as Gross Domestic Product (GDP), (un)employment, and poverty, and statistics on age and gender distributions by municipality or subregional area. The plan and its measures also do not address risk, impacts and needs of children and youth, or risk in school facilities and schoolyards. While there is an assessment of poverty across municipalities, there is no assessment or discussion of food insecurity or energy poverty. The plan constitutes the strategic underpinning for regional interventions, guiding resource priorities, and the creation of localized response. However, public engagement was limited, consisting only of one public event and thematic discussions with primarily representatives of government agencies, utilities managers and academics, both occurring in 2020.

This plan does not apply an All-of-Society approach (which is central to the Sendai framework). Housing and the social sector or civil society are not addressed as sectors. The role and needs of local authorities are not considered, and it follows that there are no measures addressing support for local authorities and their role in climate adaptation and risk reduction or mitigation. Notably absent from this document is consideration of social sector organizations and their role in community resilience, risk reduction, adaptive capacity, and emergency preparedness, response and recovery, and therefore no proposed measure to support social infrastructure and community resilience. The indicators for monitoring progress on the 93 proposed measures also require elaboration, as the monitoring indicator for many measures is 'the number of studies or programmes and seminars' and several measures do not have a monitoring indicator.

River Basin Management Plan of the Attica River Basin District (2024 update): This document is a management plan which considers the complex network of rivers in the Attica Basin. The document is of paramount importance in the definition of water management also to face drought and water scarcity, though recommendations are implemented on an ad hoc basis (Schmidt, Guido et al., 2023). Drought and water scarcity are also addressed in the National Climate Change Adaptation Strategy (2016) and in the Regional Plans for Climate Change Adaptation, but there remains a need to integrate water resource management with sustainable development and heat risk management (Karavitis & Oikonomou, 2024).

National

Greece has a complex landscape in terms of climate change and disaster risk management, which brings about serious consequences for the country regarding heatwaves and wildfires. There is no national strategy or plan dedicated to the CSA climate challenge focus area of extreme heat, though in a 2024 European survey, the National Public Health Institute reported that a heat-health action plan is being developed (European Climate and Health Observatory, 2024). Ten resources were identified for the national-level review.

Worker heat stress protection framework: While not yet adopted as legislation, this regulation proposes a worker safety framework which includes practices addressing workers exposed to heat, acknowledging that they are explicitly at risk to heatwaves. Field studies in Greece revealed severe symptoms while working in direct heat and sunlight. The framework indicates an increasing awareness for preventative measures such as efficient heat warning systems based on thresholds of potential danger. If formalized, this framework would be essential in limiting heat morbidity and mortality, which may include rest breaks, hydration, and modified work hours during extreme temperatures.

Greece alignment to **United Nations Sustainable Development Goals:** Greece's climate adaptation plan is focused on safeguarding vital infrastructure, enhancing quality of life for human life, enhancing resilience, enabling deeper adaptability, and fostering innovation. It aligns closely with the UN Sustainable Development Goals (SDGs), in particular SDG 3 (Good Health and Well-being), SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action). It is well documented that disadvantaged populations are more likely to suffer from extreme temperatures, leading to increased health risks, productivity losses, and higher energy costs.

National Biodiversity Strategy and Action Plan (2014): This plan indirectly addresses heatwave and wildfire resilience through maintaining ecosystem health. Healthy ecosystems like well-managed forests and green spaces can serve as natural buffers against extreme heat and lessen the risk and severity of wildfires. This approach to protecting biodiversity and ecosystem services helps to maintain “natural climate solutions” and a stronger environment for the future considering the negative impacts of climate change. According to the plan, the risk of wildfire in the greater Athens basin is graded on a scale of 1-5, (1 being the worst) therefore it is possible to target biodiversity actions to mitigate against these hazards.

Modernization of Spatial and Urban Planning Legislation (Law 4759/2020): This legislation was delivered within the Ministry of Environment and Energy and financed by the EU Recovery and Resilience Facility. Its purpose is to integrate sustainability and resilience into spatial planning. Municipalities are required to include climate adaptation measures and emergency management or resilience plans in their urban plans. Although not specifically targeting heatwaves or wildfires, revamping urban planning can help achieve more climate-resilient urban areas. This includes green infrastructure, urban sprawl management, and natural area protections, all of which can help limit UHI effects and decrease the risk of fire spreading in the rural-urban interface. The law's emphasis on comprehensive approaches to urban interventions and mandate to local authorities can help to guarantee that new construction and renovations consider climate impacts.

National Climate Change Adaptation Strategy (2016): This strategy was published by the Ministry of Environment & Energy and outlines the framework and measures for climate change adaptation, which includes heatwaves and wildfires. This strategy mandated the 13 Regional Authorities of Greece to produce 7-yearly regional plans and establishes a National Council for the Adaptation to Climate change to coordinate, monitor and evaluate the plans. This approach

should provide direction for regional and local adaptation plans, so that the national response to climate change adaptation is coherent. It also supports mechanisms of early warning systems, public awareness, and formulation of heat-health action plans.

National Energy and Climate Plan (2019): This plan was mandated by the EU for member states to meet overall EU GHG emissions targets. The 2025 update complies with emissions reductions targets in European Green Deal, European Climate Law, Fit for 55 package, and the phase out of the EU's dependency on fossil fuels well before 2030 set out in the Repower EU plan. Policy priorities related to heat health risk include:

- Urban bio-climatic regenerations
- Promoting efficient heating and cooling
- The use of renewable energy systems for heating and cooling needs and addressing energy poverty.

The plan sets a summer target of 27 degrees Celsius for indoor environments, aligning with international recommendations for maintaining indoor comfort. It includes urban interventions for greening and cooling urban areas, acknowledging that the high cost of such projects makes it necessary to prioritize them based on their location in areas that are urban overheating hotspots, and where building upgrades and energy poverty measures will also be implemented. The plan lacks any analysis or policy measures on gender equality and social inequalities, though it mentions achieving both economic and social cohesion. Within this framework, the Ministry of Environment and Energy also approved an **Action Plan to Combat Energy Poverty (2021)**.

National Civil Protection Plan “Xenokrates” (2003): The Greek bodies responsible for the implementation of civil protection measures includes the General Secretariat for civil protection along with several other authorities. The mission of this plan is to protect citizens' lives, health, and properties. The plan (Ministerial decision n° 1299/2003) sets the framework for risk management planning. This is Greece's complete outline for dealing with natural hazards, such as heatwaves and wildfires. It allocates responsibilities in preparing for, responding to, and recovering from such incidents between government departments, emergency services, and local authorities. “Xenokrates” features guidelines for emergency evacuations of cities due to wildfires, the activation of cooling centers in response to heatwaves and streamlining of relief efforts to shield vulnerable groups, such as tourists.

There remains a need to integrate climate and disaster risk assessments and planning at the national level in Greece. In 2020, Greece began developing a **National Disaster Risk Management Plan**. There is no public documentation of the process or output, other than the Inputs document published by World Bank Group (2021).

Social Climate Plan (2025): This was announced in June and published for consultation in July. It includes energy efficiency building upgrades for energy-vulnerable households (as well as a heating allowance for vulnerable households using fossil fuels), student housing and very small businesses, new electric and more accessible buses and taxis, and soft mobility infrastructure.

Barcelona, ES

The Barcelona Metropolitan Area is in the Region of Catalonia, Spain. This CSA focuses on ways to protect the population from the impact of heatwaves and droughts, as well as resulting wildfires.

Local

Considering its Mediterranean climate and the Collserola Natural Park located within the Metropolitan Area of Barcelona, the city is at high risk of impacts from heatwaves, droughts, and wildfires. Six resources were selected for the local-level review and are categorized into those focused on heatwaves and drought, and those focused on wildfires.

Safeguarding the public in heatwaves and drought

Barcelona's Metropolitan Climate Plan (2018): This covers both climate change mitigation and adaptation. Its mitigation goal is a 45% cut in greenhouse gases by 2030, and towards carbon neutrality by 2050. Adaptation considerations pertaining to heatwave planning include:

- Climate refuge expansion: By 2030, all Barcelonians should be within a five-minute walk of a summer climate refuge. Examples include air-conditioned public places such as libraries, civic centers, or specially designated cool spots.
- Green infrastructure construction: the plan includes the expansion of the green areas with 40 hectares within the urban area (to have 1 m² of green space per inhabitant). This greening initiative has been effective in the fight against UHI effect, via natural cooling.
- Water management: Specific drought policy does not feature as strongly as heatwave policy, but the overall policy objective of resilience would suggest prudence in more efficient water use during drier periods. Nevertheless, greening can also support water retention as a co-benefit.

Wildfire Prevention and Management

These documents focus on the management of Collserola Park, an 8000-hectare natural zone located inside the metropolitan region, where wildfires are a significant risk, especially during hot, dry periods.

Special Plan for the Protection of the Natural Environment and Landscape of the Serra de Collserola Natural Park (2021): This plan focuses on the conservation of biodiversity and the improvement of ecosystem services by means of dynamic and adaptive management. It combines traditional land management (silvo-agricultural mosaic) and improving the functioning of the connected spaces, and habitat conservation. This alternative fire prevention strategy acknowledges that healthy, managed ecosystems are inherently more resistant to fire.

Collserola Wildfire Prevention Plan (2021): This plan details a comprehensive approach to preventing wildfires across Collserola Park. It comprises passive and active measures that help identify the most vulnerable areas, vegetation, and infrastructure to wildfires, ensuring that these are of priority protection. The approach to wildfire prevention in the plan includes:

- Passive prevention: this approach focuses on reducing the park's vulnerability to wildfires. It includes:
- Vegetation management: the establishment and maintenance of firebreaks in both urbanized and forested areas by targeted tree cutting and clearing of scrub to minimize buildup of fuel.
- Education and outreach: educating the public on wildland fire dangers and fire-safe behavior.
- Active prevention: This approach seeks to limit the spread of wildfire fires and increase the rate of response. It includes:

- Strategic forest management to reduce wildfire behaviour and propagation potential.
- Real-time information risk monitoring systems
- Early warning fire detection systems
- Resource coordination of firefighting resources for efficient action
- Maintenance and upkeep of hydrant and helicopter base infrastructure
- Hazard control of possible ignition sources including power lines and the clearing of roadside vegetation.

TREES FOR LIFE Master Plan for Barcelona's Trees 2017-2037 (2017): The plan aims to increase urban tree cover by 5%, reaching 30% of the city surface areas, and enhance the city green infrastructure to improving environmental quality, citizen health and wellbeing.

Barcelona Resilience Action Plan (2020): is a comprehensive plan designed to enhance the city's ability to withstand and recover from various challenges including climate change, social inequalities, and economic shocks. It foresees preventive and proactive measures to minimize vulnerabilities; response and recovery actions to emergencies; collaboration and participation across municipal, departments, residents, and stakeholders.

Barcelona Nature Plan 2021-2030 (2021): it is a participative strategy to transform the city in a greener and more sustainable environment, and it aims to increase green areas to improve biodiversity and to foster the connection between citizens and nature. Specific actions are an increase of 160 has the green areas within 2030; to create 100 biodiversity refuges; to double the participation of citizens in activities linked to nature.

Regional and national

Due to the limited number of resources, regional and national policy reviewed for Barcelona is combined. Five resources were selected for this review and are categorized into those focused on heatwaves and drought, and those focused on wildfires.

Population protection during heat waves and droughts

Climate Change Law of Catalonia (2017): Law 16/2017 aims to reduce GHG and transition to a low-carbon economy. It establishes measures for mitigation and adaptation, including Climate Fund financed by taxes on CO2 emissions. The Law promotes coordination among public administrations, citizens, and social associations. The Law integrates adaptation strategies into various sectoral policies, such as agriculture, water management, health, and tourism.

Catalan Strategy for Adaption to Climate Change for the 2030 horizon (2023): This strategy includes many measures, which fall into categories of: natural environment; social-economic activities; and territory. It also considers actions regarding soil health and water retention, and monitoring, which are important for drought resistance and wildfire prevention.

Wildfire Prevention and Management

Pla INFOCAT (2024 update): This is the specific plan for emergency response due to forest fires in Catalonia. It provides operating guidelines, material, and coordination mechanisms to manage wildfires, including prevention, detection, and suppression. It puts emphasis on preparedness and coordinated action among different agencies. The plan outlines an early warning system to alert the population which is under being implemented.

Catalonia Wildfire Prevention Plan (2011): This plan covers the entire territory of Catalonia beyond Collserola Park. It includes actions regarding:

- Forest management: encouraging measures that support resistance and resilience of forest ecosystems to the impacts of climate change (particularly to wildfires), and the inclusive protection of biodiversity. This also includes potential fires characteristics and their treatments and methods to extinguish fires.
- Early Warning Alert Systems: strengthened alert systems for fire danger and risk, triggered by meteorological conditions and vegetation dryness.
- Resource Management: sending units to strategic places during wildfire emergencies, including the deployment of air units across the region.

Catalan Forestry Law 6/1988: This is the principal law on Catalan forest management. It sets out the law as the basis for forest plans, conservation, and fire prevention regulations. It includes actions such as restrictions on land use change in forest areas, obligations for landowners with respect to fire breaks, and a penalty framework for actions that negligently cause fire.

Bologna, IT

The Metropolitan City of Bologna is part of the Emilia-Romagna region, Italy. The CSA is working to develop and implement climate change adaptation policies, particularly regarding heatwaves and air quality, with the objective of safeguarding the most vulnerable groups.

Local

Bologna's strategy on climate resilience is two pronged, combining environmental sustainability and social justice. The city acknowledges that there are many groups of society who are more vulnerable to heat stress and air pollution (e.g. elderly, children, people with pre-existing health problems, low-income groups, people living in poorly insulated housing). Nine resources were identified for the local-level review.

The Bologna Metropolitan Plan for the Social Economy (2025): This plan makes a “paradigm shift” toward an economy that serves public interest and collective well-being. Although not climate-focused, the pursuit of social justice, quality of life, and cohesion has the potential to indirectly contribute to promoting the resilience of vulnerable groups - for example, through the facilitation of stronger communities or by addressing underlying socio-economic inequalities, which compound climate vulnerability. Collaborative, sustainable housing, community welfare and local development can support greater climate resilience.

AGENDA 2.0 Sustainable Development Metropolitan City Area (2021): This provides the direction taken toward the sustainable development of the metropolitan city of Bologna. It emphasizes that sustainable development must also focus on social equity. It serves as a framework for the integration of climate resilience into social development goals, and demonstrates that urban vulnerability and exposure to climate impacts develop quickest in those areas which have the least capacity to adapt, or who also bear a disproportionate burden of their economic and social marginalization.

The Sustainable Urban Mobility Plan (2019): This plan for Bologna specifically aims to enhance environmental health by reducing GHGs, smog, and road accidents. It has ambitious goals, including a 40% reduction in emissions from traffic by 2030 from 1990 levels, a target extended to the whole metropolitan area. Through the promotion of active transport (walking, cycling) and

a reduction in vehicle emissions, direct air pollution exposure (which is particularly damaging to fragile lungs) is addressed. Measures such as speed limits around schools and in residential areas help to make urban settings healthier, especially for children and older people.

The Bologna Charter for the Environment (2017); the SECAP Bologna Municipality (2021); the SECAP Monitoring Plan (2023); the Metropolitan Area Development Plan (2021): These documents all form part of Bologna's adherence to climate change adaptation and mitigation. The Sustainable Energy and Climate Action Plans (SECAPs) are essential because they set out concrete actions for mitigating emissions and climate adaptation. Bologna was one of the first Italian municipalities that implemented a local adaptation plan, the BLUE AP project, related to heatwave management. Although the content of these documents focuses on how this risk (heat) is addressed for vulnerable groups, they are not explicitly considered, the overarching focus on climate adaptation suggests that initiatives such as early warning on heatwaves, cooling centers, and urban greening can counteract the UHI effect, as well as public communication campaigns aimed at the protection of at-risk groups.

Pact for Work and Sustainable Development (2020): This Pact recognizes the high-level uneven distribution of the climate and pollution impacts on labor relations, particularly upon the poorest workers and minorities across the population. Despite its focus on jobs, "a climate-neutral and ethical development model" implies caring for everyone, such as workers who are vulnerable because their work directly exposes them to heat and pollution.

Bologna Urban Health Report (2020): This document promotes cross-sectoral interventions for livability, health, and urban well-being. It assesses the health determinants in the urban environment, which include air quality and temperature. It indicates health inequities and suggests ways to help vulnerable populations from public health threats in the environment.

Regional

The Emilia-Romagna region in Italy is designing integrative measures that address climate change, often with a social dimension. Two resources were identified for the regional-level review.

Climate Change Mitigation and Adaptation Strategy for the Emilia Romagna Region (2018): This regional strategy frames local climate action in Bologna. Local plans often establish goals and financing mechanisms for climate-resilience projects, including those that benefit vulnerable sectors of the population. The Emilia-Romagna region established the "Osservatorio Clima" (Climate Observatory) that is a permanent regional structure with competencies for studying, monitoring and disseminating climate information across the region.

Pact for Jobs and Climate (2020): Like the local "Pact for Work and Sustainable Development," this regional pact focuses on a just transition, warranting that climate action does not make existing social inequalities worse and that disadvantaged workers and communities are helped to transition to a greener economy.

National

Following a protracted six-year deliberative process, Italy has formally adopted a comprehensive climate change adaptation plan. However, the necessity for an adaptation plan was already addressed by the introduction of a series of other legislative acts relating to climate change adaptation and mitigation in specific sectors. Four resources were identified for the national-level review.

Act N° 62 (2024): This act is particularly important because it introduced, for the first time in the Italian legislation, the concept of "Project of Life". This act promotes inclusion and opportunities

for all people affected by disabilities. The approach is a multidimensional and based on customized assessment of the needs of individuals. This act is closely linked to the Bologna CSA because it considers how elderly and disable people move within the town. City regeneration and specifically NbS should help protect these vulnerable groups (“accomodamento ragionevole” - reasonable accomodation, that means all that is reasonable applicable to solve specific problems to increase disable inclusion).

Department for policies for persons with disabilities: This department facilitates and coordinates disability action at national government level, with a view to ensuring full and effective participation and inclusion in society. Although this is not explicitly about climate change, a full disability policy must reflect: (i) how climate change (such as heatwaves affecting services or poor air quality making respiratory conditions worse) disproportionately impacts people with disabilities and (ii) ensure access for all people to adaptive measures and emergency assistance.

Italy's National Plan for Adaptation to Climate Change (PNACC) (2023) and National Strategy for Adapting to Climate Change (SNACC) (2022): The PNACC, which implements the SNACC, is an instrumental step forward in Italy's climate resilience. These reports consider and evaluate the impacts of climate, vulnerabilities, and adaptation throughout sectors and regions. They highlight vulnerable people as the main beneficiaries of adaptation actions, including those at city and regional level (as seen in Bologna).

Building a national strategy for adaptation to climate change: Analysis of the European and national politics concerning the adverse impacts and vulnerability to and risks of climate change (2015): This is the analytical and legal rationale for Italy's adaptation proposal. It stresses the importance of mainstreaming adaptation into sectoral policies and recognizes the unequal geographical distribution of climate risks, including the most vulnerable areas and ecosystems such as the Alps, which can be relevant for wider strategies for urban regions, including Bologna.

Brasov, RO

The Brasov Metropolitan Area is within the region of Transylvania, Romania. The CSA focuses on protecting housing, industry, agriculture, and tourism from water scarcity, excess water, as well as heatwaves. It also considers protecting against flooding of buildings and infrastructure, and the needs of vulnerable groups.

Local

The local policy context of Brasov is characterized by an increasing understanding of climate change as a policy challenge. Many of the policy documents, either directly or indirectly address related CSA issues. Sixteen main resources were identified for the local-level review.

Sustainable Development Strategy of Brasov County 2021-2030 (2021) and Sustainable Development Strategy of the Brasov Municipality 2030 (2018): These strategies establish the basics of sustainable development, including climate resilience. They prioritize green infrastructure, resource efficiency, and community well-being that form the foundations of climate change adaptation. This includes the goals of economic protection and diversification, indirectly benefiting the commercial and tourism sectors. The 2021-2030 strategy foresees various specific objectives such as:

- Improving efficiency and reducing pollution: measures are based on energy efficiency of buildings, public lighting, encouraging the use of renewable resources, improvement in air quality monitoring, and promotion of green investments.
- Promotion of adaptation to climate change and prevention of risks: measures on habitat protection, assessment of adaptation, restoring forest systems, and raising awareness on climate change.
- Developing sustainable transport: modernization of major transport infrastructure, smooth traffic flow, increasing safety on roads.
- Ensure access to adequate and fair housing: supporting integrated development of rural and urban communities, ensuring decent living and security.
- Develop, expand and diversify the business infrastructure: supporting the development and expansion of business infrastructure.
- Creating the framework for tourism management and marketing: encourage establishment of management organizations, sustainable tourism management, information and valorization, strengthening the capacity of the administration to collect, access, and rapidly utilize tourism data, implementing marketing strategies, increasing institutional partnership.

The Sustainable Development Strategy 2030 explicitly refers to population change, housing, the labour market, an economic framework, tourism, education, science research, and social services (along with the issues of social inclusion and disadvantaged groups), traffic, transport and logistics, and the environment. The strategy refers to Brasov as the Romanian “Green Capital” and explicitly reports a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis for the different sectors.

Climate Neutrality Action Plan (2022) and Sustainable Energy and Climate Action Plan (SECAP) 2020-2030 (2021): These are the main tools that define Brasov’s climate response. They also deal with energy efficiency of buildings (to reduce the impact of heatwaves), renewable energy (to reduce dependence on climate-vulnerable energy sources), and to a lesser extent, water and waste. The SECAP includes a series of measures and strategies in key sectors such as buildings, transport, energy, urban planning, public procurement, community involvement, and waste management. The aim of the plan is to reduce emissions and promote the use of renewable energy resources. The SECAP commits a reduction of local emissions by 55% by 2030, compared to the 2008 baseline. Sector-specific vision and key measures:

- Sector 1. Buildings, Equipment, and Facilities: measures in the building sector target certain aspects such as: (i) improving the insulation of buildings to reduce heat loss; (ii) efficient systems for the production, distribution and use of heat and hot water; (iii) ventilation and air conditioning systems; and (iv) use of renewable energy sources.
- Sector 2. Transport: measures include (i) the implementation of a differentiated taxation system for parking lots; (ii) the development of the modal transport concept (iii) encouraging the use of electric vehicles for transport, powered by electric vehicle charging stations; (iv) replacing or supplementing outdated diesel buses with electric or hybrid buses for local public transport.

Climate Change Adaptation Plan (2016): The plan identifies five core vulnerable sectors, namely infrastructure and urbanism, public health, biodiversity, tourism and leisure and education. Each sector has specific risks and vulnerabilities, general and specific objectives defined, followed

by measures to achieve them, with a short- and long-term horizon for implementation (2020, 2050). The document wishes to implement the plan's vision for the development of the area, looking especially at heat island control, decreasing the health risks related to climate events, enhancing the biodiversity climate resilience, adapting the touristic activities to further climatic realities and improving awareness about climate change.

Regional Masterplan for Water and Wastewater (2013): This plan considers both managing water shortages and excess water. It outlines ways to manage water resources efficiently (to reduce the impact of scarcity) and manage sewage infrastructure (to reduce flood risks with better drainage). This enables the Brasov Metropolitan Area to sustain production and commercial activities by securing a dependable source of water and preventing flooding caused by poor drainage. This Masterplan identifies the investment priorities necessary for compliance with EU directives in the water and wastewater sectors for the period 2013-2042. All municipalities in Brasov County are part of the Intercommunity Development Association in the Water Sector (IDA – from fragmentation to aggregation of WSS Utilities in Romania). The Association was established in 2007 and aims to implement joint regional development projects in the field of drinking water and wastewater.

Integrated Waste Management Plan: Brasov County 2020-2025: The technical plan deals with waste management and contributes to further documentation on water issues (ground water and wastewater). Sector-specific visions and key measures include:

- Implementation of the "Pay for what you throw away" economic tool.
- Sustaining and developing existing actions on individual composting of bio-waste.
- Reducing the amount of wasted food by 2025 compared to 2017.
- Preventing the generation of printed paper waste.
- Introducing topics in the school curriculum regarding the provision of waste generation.

Legal and Technical Regulations Regarding the Development of Planning Documents for Building on Sloping Lands (2022): This document is important in terms of flooded areas and landslide risk, especially for mountainous areas. The regulations aim to prevent the irresponsible consumption of existing landscape resources by proposing a control mechanism for local landscape transformation. The regulations have a positive impact on preventing inappropriate urban development in such areas, which would otherwise contribute to increased GHG emissions. The document states minimum requirements and rules regarding construction regulations on sloping lands.

Green Infrastructure Strategy 2024-2043 (2023): This strategy is essential for climate adaptation. Green infrastructure (i.e. parks) can play a large role in managing stormwater, which reduces flood risk, and reduces UHIs. In addition, it directly benefits businesses and tourism by lowering damage and raising comfort levels. There are also agricultural benefits through soil health enhancement and moisture retention. The document provides guidance addressed to architects, planners, and policy makers, offering a variety of urban solutions and associated costs.

Urban Masterplan Brasov (2010, revised in 2024), and the master plans of Săcele, Codlea, Zărnești, Râșnov, Ghimbav and Predeal cities, and other 11 communes from BMA: the objectives are to modernize and adapt the economy, to conserve the natural and cultural heritage, to develop regulations and quality standards, and to improve infrastructure, connectivity, and sustainable mobility. The plan also foresees the major problem and risk of uncontrolled urban

development, as well as health and social protection. The majority of masterplans do not explicitly mention climate change adaptation.

Integrated Urban Development Strategy of the Brasov Metropolitan Area 2021-2030 (2021):

The Urban Development Strategy is an integrated plan which aims to integrate climate into decisions about land use, zoning, and infrastructure. This includes mapping flood-prone areas, allocating green infrastructure areas, and directing urban expansion to reduce exposure to climate risks. For business and tourism, that means relocating strategically away from the highest-risk zones and building climate resilient infrastructure.

Local Strategy for the District Heating Service for the Population in Brasov Municipality 2023-2033 (2023):

Although the focus of this Strategy is on heating, it also considers the energy aspect of heatwaves such as the potential for district cooling, or how heat supply from renewable sources can alleviate strain on the grid during peak demand periods. The objectives of the strategy are to ensure the continuity, quality, and safety of thermal energy supply to the population, increase efficiency in thermal energy supply, modernize and expand the district heating system, decarbonize the heating/cooling system to reduce greenhouse gas emissions in the Municipality of Brasov, promote the use of renewable energy resources, and encourage investments in the district heating system.

Sustainable Urban Mobility Plan 2016-2030 (2023); Integrated Air Quality Plan 2023-2027 (2023); Study for the Local Parking Policy (2022); and Noise Action Plan 2027 (2023):

These four documents represent a coherent policy approach to Brasov's urban mobility planning. The Sustainable Urban Mobility Plan of Brasov ensures the implementation of European planning and management concepts for sustainable urban mobility, adapted to the specific conditions of the city and its surrounding municipalities. It includes a list of measures to improve mobility in the short-, medium-, and long-term. The second of its five objectives is to reduce air, water, soil pollution, noise pollution, GHG emissions, and energy consumption. The operational objectives include: reducing air pollution emissions and noise and vibration levels; preserving and enhancing biodiversity; reducing water and soil pollution risk; reducing material consumption and waste production; and increasing the number of eco-friendly vehicles. The Integrated Air Quality Plan could be considered a complementary document, which analyses the levels of key air pollutants and its projections for 2023-2027, using a 2019 baseline. The study of the local parking policy also links to these documents and is based on three key premises: (i) parking is not free; (ii) parking is not a fundamental right, and; (iii) parking is a generator of traffic. Therefore, the measures proposed are highly relevant for reducing GHG emissions. It comprises four key objectives:

- To create efficient and integrated management of the existing parking stock,
- To create a digitized parking service,
- To meet parking needs while minimizing urban space consumption,
- To develop a coherent network of transfer parking facilities to reduce traffic flows towards the central area of Brasov.

As another accompanying policy, the Noise Action Plan includes a list of streets where the noise levels exceed the maximum limits (Law n°121/2019) and the proportion of the population exposed to noise pollution. The main source of noise identified is road traffic. The plan also includes a forecast for 2027. This plan highlights ongoing measures to reduce noise pollution and identifies additional ones, such as increasing the use of electric and hybrid means of transport, increasing the use of public transport, and the installation of sound-absorbing panels along roads.

Regional

Only one resource was identified for the regional-level review.

Regional Operational Programme for Region Centru (2024): This programme sets out regional development priorities and funding such as the European Social Fund+ (ESF+), Cohesion Fund, and the European Maritime and Fishery Fund (EMFF). This includes investment in infrastructure, environmental protection, and sustainable tourism that can help to build climate resilience, as part of Smart Specializations. The relationship between the Centru Regional Operational Programme and climate change adaptation lies in its strategic focus on sustainable development and climate resilience. Through its priorities – particularly those related to green infrastructure, energy efficiency, and sustainable urban mobility, this programme supports actions that help communities better prepare for and respond to the impacts of climate change, specifically:

- Priority 3: A Region with Environmentally Friendly Communities promotes investments in energy-efficient buildings and green-blue infrastructure, which contribute to reducing greenhouse gas emissions and enhancing climate resilience.
- Priority 4: A Region with Sustainable Urban Mobility encourages decarbonized transport and non-motorized mobility, reducing the environmental footprint of urban areas.
- Priority 8: An Attractive Region includes urban regeneration projects that integrate climate adaptation measures, such as green spaces and sustainable land use.

These initiatives align with broader EU climate goals and help local communities in the Centru Region transition toward a low-carbon, climate-resilient future.

National

National-level policies in Romania provide guidelines and resources to the local and regional level. Nine resources were identified for the national-level review.

National Climate Change Adaptation Strategy 2024-2030 (2024): This Strategy contains the comprehensive national approach on climate adaptation, with targeted advice and support for sectors such as agriculture, tourism, and infrastructure. It likely influences local climate adaptation plans. The Strategy outlines several key objectives aimed at enhancing Romania's overall resilience to the impacts of climate change. These objectives are designed not only to address immediate climate challenges but also to lay the groundwork for long-term sustainability. The main objectives include:

- Strengthening Resilience
- Reducing Vulnerability
- Integrating Climate Adaptation
- Promoting Sustainable Development.

To achieve these objectives, the strategy proposes specific actions across 13 key sectors, each tailored to address the unique challenges posed by climate change. Sectors include:

- Water Resources
- Agriculture
- Energy

- Public Health
- Transport
- Data and Monitoring
- Institutional Coordination.

Specifically for Public Health, the strategy includes comprehensive measures to enhance the healthcare system's capacity to manage climate-related health issues. This involves improving early warning systems for heatwaves, strengthening the response to climate-related diseases, and increasing public awareness about these risks. The goal is to protect the most vulnerable populations, particularly the elderly and those with pre-existing health conditions. For Transport, the strategy addresses the resilience of transport infrastructure by reinforcing roads, railways, and bridges to withstand extreme weather events. It also promotes the shift towards low-emission and electric vehicles, contributing to a reduction in the transport sector's carbon footprint and enhancing overall sustainability.

National Flood Risk Management Strategy (2010): This strategy is critical to managing excess water. It focuses on areas of potential implementation which will affect buildings, infrastructure, and assets from commercial, industrial, and agricultural sectors. The strategy also includes the results of the ROFLOODS Project (strengthening the capacity of the central public Authority in the water field in order to implement the second and third stages of the second cycle of the Floods Directive). The National Flood Risk Management Strategy aims to increase the quality of life by reducing damage caused by floods, reducing the impact of risk management measures (on a temporal and spatial scale) on ecological systems, utilizing the appropriate resources for construction, maintenance and operation of infrastructure and flood risk reduction measures, and maintaining appropriate continued economic activity (agricultural, industrial, commercial, residential, and recreational) in flood zones.

National Plan for the Development of Hydrographic Basins in Romania (2015): This plan is essential for water management on a larger scale, dealing with water scarcity and floods. It has an impact on water use in Brasov and on flood regulation, both upstream and downstream. It aims to identify the future socio-economic and environmental requirements regarding water resources, the identification of feasible options for balancing the available water sources and water demand, the preliminary assessment of the potential risk to watershed flooding; identifying the actions, measures, solutions, and works necessary to achieve the accepted degree of flood protection for settlements and goods, reducing the effects of droughts, excess moisture, and soil erosion, using the potential of water, and meeting environmental requirements on water resources.

National Forestry Strategy (2022): Forests are crucial for water interception, managing erosion, and regulating microclimates. By promoting healthy forests, this approach indirectly helps to manage not only water shortages (by enhancing water infiltration) but also water excess (by controlling runoff and preventing landslides). The National Forestry Strategy provides the institutional and regulatory framework of forestry activities for more efficient and sustainable management of the National Forest Fund.

Neutral Romania 2050 (2022) and National Integrated Plan for Energy and Climate Change 2021-2030 (2024): These place more emphasis on mitigation, but they also identify the needed for climate resilience to protect economic sectors in the transition towards a low-carbon economy. The strategies outline the intent to achieve:

- Total greenhouse gas emission reductions and through enhancements of carbon sinks.

- Emissions reductions and enhancements of removals in all individual sectors including energy production, industry, transport, the heating and cooling and buildings sector (residential and tertiary), agriculture, waste and land use, land-use change and forestry.
- Progress on the transition to a low greenhouse gas emission economy, including reducing greenhouse gas intensity, reducing carbon dioxide intensity as part of gross domestic product, increased long-term investment, and more strategies for related research, development and innovation.
- d) To the extent feasible, expected socio-economic improvements following decarbonization measures, including macro-economic and social development, reduced health risks, and improvements in environmental protection.
- e) Links to other national long-term objectives, planning and other policies and measures, and investments.

Masterplan for National Tourism (2023): This Plan incorporates climate change impacts into tourism development strategies that encourage diversification of tourism products (beyond just skiing), sustainable tourism practices, and the setup of resilience-building for tourist destinations (like Brasov). The document highlights that the average length of stay is about 2.2 days for both Romanian and foreign tourists. Such a short average length suggests that Romania needs to develop its services and products further, thus leading to longer stays by tourists. In terms of the international dimension, tourism demand increased by more than 20% over the last decade. These numbers pose a challenge to achieving an economic-environmental balance.

Territorial Development Strategy of Romania (2018) and Romania Urban Policy 2022-2035 (2022): These national spatial planning documents were developed as part of national spatial planning, considering constraints affected by environmental and climate risks. Romania's territorial development strategy is a long-term policy document that outlines the vision for the development of the country's territory up to 2035 and sets out national development objectives, measures, actions, and projects. The Territorial Development Strategy represents the planning exercise for the development of the national territory and discusses the following questions:

- What measures and projects can contribute to increasing the national capacity to generate economic growth and maintain and attract an innovative workforce?
- What areas require specific interventions to capitalize on or protect natural and built capital?
- How can a balance be ensured between economic, environmental, and cultural policies to plan the development process coherently and preserve national identity?

Birmingham, UK

Birmingham is part of the West Midlands region of the UK. It faces numerous climate change challenges, primarily regarding pluvial flooding, especially in storm events, and future higher temperatures. As a Biophilic City and a Tree City of the World, the Birmingham CSA focuses on the role of vegetation management to build climate resilience.

Local

Birmingham's local policies evidence sustainability and climate resilience, including explicit attention paid to addressing pluvial flooding, extreme heat, and the role of green infrastructure. Seven resources were identified for the local-level review.

Birmingham City of Nature Plan (2022): This plan is a key component of Birmingham's profile as a Biophilic City – one that learns from and embraces nature and its natural systems. The City of Nature Plan emphasizes the vital role of green space for biodiversity and health. Although it may not specifically address pluvial flooding and extreme heat risk, the focus on maintaining and extending natural habitats, permeable surfaces, and urban forests naturally leads to doing so. The plan investigates the connection between green management and climate change by encouraging trees and green spaces to intercept rainfall, protect the city from runoff, provide shade and evaporative cooling – a way of natural cooling that counteracts the UHI effect. It supports NbS as a critical part of climate adaptation, and it also integrates the elements of environmental justice and ecosystem services.

Birmingham Food Systems Strategy (2022): This strategy is an eight-year vision towards a food system and economy where food choices are affordable, healthy, and appealing for all citizens, with less harm to the environment from the food system in Birmingham. It aims to lessen the environmental impact of the food system as it may have indirect connections to climate change adaptation, through local food production, reduced food miles, and perhaps in some cases, an impetus to include urban agriculture, which in some instances includes green infrastructure. Thus, it implies the promotion of stable land use for food production to promote sustainable land use, which might include green infrastructure for water retention and temperature regulation.

Birmingham Clean Air Strategy (2022): This plan is designed to target air quality, giving the public health impacts during periods of extreme heat that can exacerbate respiratory problems. It also suggests urban greening as an approach to combating the impacts of pollution, which would result in not only cleaner air but also local cooling. The relationship between green space management to climate change is made explicit through the function of vegetation in removing air pollutants and carbon sequestration, two critical components of climate change mitigation and adaptation. Specifically, the strategy is grounded on pollution climate mapping and the creation of a Clean Air Zone in Birmingham city centre.

Electric Vehicle Charging Strategy (2021): This strategy aims to provide an extensive public electric vehicle charging network throughout Birmingham – this spending is for an infrastructure to support electric vehicles and is focused on climate change (largely through a zero-carbon transport system). The size of the foreseen infrastructure is highly dependent on market need, but a reasonable number to properly conducting the strategy should reach over 5000 charge points.

Birmingham Development Plan 2031 (2017): This is the key spatial planning framework document. It defines development in the city into the future. It includes sustainable drainage systems (SuDs) policy for new development, a key part of the solution to pluvial flooding. It also addresses the inclusion of green infrastructure to mitigate the UHI. The plan delves into the interconnection of green management with climate change through its zoning regulations, requirements for green infrastructure in new developments, and the designation of green corridors and open spaces that are conducive to both flood resilience and cooling. This plan is the critical guide to incorporating green infrastructure into the built environment to mitigate the effects of climate change. The plan is organized in different specific policies regarding all the critical aspects of the city. Within the main objective is the creation of an economically successful, safe and healthy city.

Route to Zero Action Plan (2021): This describes the city's approach to reducing carbon emissions as part of a just transition. It incentivizes the development of green technologies and practices, which can have co-benefits for adaptation. For example, retrofits and investments in social housing to meet carbon reduction targets are an opportunity to consider climate resilience

of homes. Investment in nature as part of the Urban Nature development and Urban Forest Accelerator is an opportunity to create and maintain NbS.

Birmingham Transport Plan 2031 (2021): This document promotes the shift to sustainable modes of transport, reducing emissions, and improving air quality. Though not specifically designed to address pluvial flooding or extreme heat, they link indirectly. For example, encouraging active travel (e.g. walking and cycling) will serve to reduce impervious surfaces where new projects integrate pervious materials. The focus on green transport corridors could also include tree planting, which benefits both flood attenuation and cooling.

Regional

The West Midlands region of the UK is governed by a regional authority, the West Midlands Combined Authority. This Combined Authority has some distinct governance powers, but it also supports the functioning of the seven local authorities within, including Birmingham. Four resources were identified for the regional-level review.

West Midlands Climate Change Adaptation Plan 2021-2026 (2021) and **West Midlands Adaptation Reporting Power (2024):** Both documents directly address pluvial flooding and severe hot temperatures across the West Midlands. They offer strategies for adaptation, which include regional flood management plans, early warning systems, and measures to mitigate the UHI effect. The plans consider the role of green infrastructure and NbS. The Climate Change Adaptation Plan specifies the roll-out on local tree planting programmes, ensuring that all schemes contribute to climate adaptation objectives, including the reduction of flood risk. This plan has a specific risk assessment with actions devoted to health, communities, and the built environment. The plan also reports several case studies. The Climate Adaptation Reporting Power is a complementary report, submitted cyclically to national government under national climate change policy mandates (discussed further in Section 3.3.8.3) in which all the actions are accompanied by indicators. Specifically, all potential climate threats are reported in terms of risks and impacts; urgency scores; climate drivers; and likelihood.

Transport for West Midlands Strategic Transport Plan (2016) and the forthcoming **Local Transport Plan** (for the West Midlands region) guide how the transport system will be developed within the region. The Local Transport plan comprises six “big moves”; these are:

- Behavior change
- Accessible and inclusive places
- Safe, efficient, and reliable network
- Walk, wheel, cycle and scoot
- Public transport and shared mobility
- Green transport revolution.

Climate resilience, specifically the need to include climate adaptation, flood risk, and the role of green infrastructure are feeding directly into the next plan, and many of the measures proposed for sustainable transport have co-benefits for climate adaptation (e.g. green transport corridors).

National

The national framework in the UK is the legislative and policy framework on which climate change adaptation hangs. Six resources were identified for the national-level review.

2012 National Planning Policy Framework (2023 update): This is a crucial policy document which provides direction for planning decisions in the UK. It highlights the role of sustainable development and places a duty on local planning authorities to prepare for climate change, for example, by way of protecting against flood risk and the UHI effect. It encourages the use of Sustainable Drainage Systems (SuDS) and the incorporation of green infrastructure in new developments. The connection between green management and climate change in this framework is manifested through promoting green infrastructure, open spaces and SuDS as part and parcel of good design and as elements that add to climate resilience.

Environment Act (2021): This Act establishes the statutory framework for environmental protection and improvement, including biodiversity net gain and water management. Not just about climate change, this has direct implications for pluvial (from healthier river systems and better water retention) and for ecosystems (that contribute to cool) that support it. Biodiversity net gain is at the heart of the Act and contributes to green management, which in turn helps mitigate climate change; healthy ecosystems are less prone to climate impacts and can deliver vital ecosystem services for adaptation.

Water Act (2010): This Act aims to simplify, improve and modernize the management of water and reduce flood risk in England and Wales. It imposes obligations on authorities regarding flood risk and sustainable water use. It forms the basis of many local and regional flood alleviation projects and supplies the legislation for taking SuDS and other pluvial flood management measures forward. The Act's connection to green management and climate change is due to its provision for natural flood management (NFM) methods which includes reinstating wetlands, woods and other natural features to slow the movement of water and increase water storage.

Climate Change Act (2008): This Act is predominately mitigation-focused (reduction of emissions to net zero) targets, which indirectly affect adaptation through drives towards transitioning to a low-carbon economy, and to provide for a system of carbon budgeting. Investments in renewable energy and energy conservation can thereby release resources for adaptation. Further, the green economy focus could promote the adoption of green technologies and practices that also serve adaptation purposes.

Climate Change Act Adaptation Reporting Power and National Adaptation Programme (2008): this requires prescribed entities (including utilities and transport service providers) to report their climate change risks and adaptation measures every five years via the Adaptation Reporting Power (see Section 3.3.8.2). These feed into the national adaptation plan.

Climate Adaptation Research and Innovation Framework (2025): This is a strategic initiative aimed at enhancing the country's resilience to climate change impacts. It focuses on fostering research and innovation to better understand and address the challenges posed by climate change, including extreme weather events, rising sea levels, and other environmental changes. This framework aims to bring together various stakeholders, including government bodies, research institutions, and industry, to collaborate on developing effective adaptation strategies. The framework emphasizes the importance of integrating scientific research with practical applications to ensure that communities and ecosystems can adapt to changing climatic conditions.

Policy alignment to EU themes

Table 3 provides an overarching evaluation of how well the policies at all levels per CSA align to key themes across the EU Green Deal, the EU Strategy on Adaptation to Climate Change, and

the EU Mission on Adaptation to Climate Change. It shows that CSA policy is quite well aligned with EU themes on adaptation. Out of a possible total score of 35, all CSAs scored between 27 and 31. Different CSAs have different strengths, as the highest scores among the themes are spread. This implies that there are opportunities to review the policy feature in for a theme in a high-scoring CSA apply methods or approaches to other CSAs which may not score as highly.

The themes with the highest average score that demonstrate the most alignment are *Clear and defined adaptation actions* and *Knowledge and data-driven action* (Average of 4.75). It suggests that all CSAs have sufficient information to inform adaptation actions within their respective policies. On the other hand, the lowest average scoring theme was *Policy integration across levels and sectors* (average of 3.38). This was the only theme in which no CSA scored a maximum of 5, which implies that there may be some lack of cohesion in climate change adaptation governance that needs wider consideration. The theme with the highest range of scores was *Community and stakeholder engagement* (range of 3), followed by *NbS* and *Ambition and Leadership* (both a range of 2). Therefore, these themes could have more targeted attention paid to them in climate change adaptation policy across the CSAs.

Table 3 - Evaluation scores of CSA alignment to EU adaptation policy key themes. Scores are on a scale of 1-5, where 1 = no evidence of alignment with parameter and 5 = strong evidence of alignment with parameter.

	Prague	Leipzig	Funen-Odense	Athens	Barcelona	Bologna	Brasov	Birmingham
Clear and defined adaptation actions	5	5	5	4	5	5	5	4
Policy integration across levels and sectors	3	3	3	4	3	3	4	4
Knowledge and data-driven action	5	5	5	5	5	4	5	4
Community and stakeholder engagement	4	4	5	3	2	5	3	4
Finance and resource mobilization	4	3	5	3	3	3	4	4
NbS	5	4	5	3	5	4	3	4
Ambition and leadership	5	5	4	5	4	5	5	4
Total score	31	29	32	27	27	29	29	28

Literature Review

Progress in adaptation in EU Member States is growing. However, while science on adaptation moves fast, the governance of adaptation moves even faster (Biesbroek et al., 2010), which can impact policy coherence. Research shows that there are many challenges limiting the pace and extent of implementation at the necessary scales. This section explores the perspectives across both peer-reviewed academic literature and grey literature on EU policy regarding adaptation progress and discusses some of the potential underlying factors influencing the extent of implementation.

Evaluation of EU adaptation policy

The overarching perspective in literature is that the EU Commission has developed a sound policy for climate change adaptation. The EU framework is thought to be comprehensive and climate adaptation is incorporated into relevant policy areas, complemented by a range of relevant tools and initiatives to share knowledge on adaptation (European Court of Auditors, 2024). The 2021 EU strategy on adaptation makes progress on the previous (and first) EU adaptation strategy from 2013, which focused on knowledge creation, towards one focused on the development of solutions, from planning to implementation (Albrecht, 2024).

More specifically in a review of the EU Mission on Adaptation to Climate Change by Rayner (2023), it was noted that:

- The Mission has absence of a clear definition of “resilience”, and uncertainty regarding the interpretation of “just” resilience, which could lead to differences across EU Member State on outputs, outcomes, and impacts in regions and communities.
- It is not clear how participatory ideals would be delivered in practice and how transformative concepts could win stakeholder approval.
- Research should consider how to coordinate the bottom-up governance approach outlined enough for coherent outcomes across boundaries.
- Questions remain on the synergies across economic, social, and environmental policy siloes, especially between mitigation and adaptation as they are two separate Missions which could be pursued simultaneously in the same area.
- Questions remain on how the public and private sector develop relationships to deliver new visions, particularly with raising sufficient finances and given the likely restricted EU fiscal rules on public spending.

While adaptation ambition in current EU policy is high, action to date has not kept up with said ambition (European Court of Auditors, 2024). There are likely several reasons for this. One reason may be due to ambiguity in legislative guidance and targets regarding adaptation. For instance, there are no measurable or legally binding targets, nor a timeline for adaptation delivery, compared with climate change mitigation e.g. limiting warming to 1.5°C above pre-industrial levels by 2050 (Albrecht, 2024; European Environmental Bureau, 2021). Therefore, policymakers may find goal setting for adaptation and measuring progress challenging, and thus less motivated to undertake adaptation planning if there is no standardized way to report on and monitor it.

EU climate policy evaluations prior to the more recent EU policy initiatives, which focused on mitigation (as adaptation policy remained at early development stages) commonly agreed on findings that climate change is framed as a market and/or state failure; that voluntary measures are often ineffective; that EU-level policies drive policies in latecomer EU Member States; and

that a lack of monitoring and weak enforcement are major obstacles to effective policy implementation (Haug et al., 2010). In addition, a past review of biodiversity policy implementation highlighted obstacles in improving EU policy in part due to its low level of enforcement and nonbinding nature (Santamaría & Méndez, 2012). Arguably, similar challenges remain in the present-day regarding adaptation.

Application of adaptation policy at different governance levels

Several studies have reviewed adaptation policy design and implementation across Europe, with results demonstrating varying levels of progress. At the national level, there have historically been challenges in developing detailed climate change adaptation plans due to context specificity of adaptation (Biesbroek et al., 2010). This also emphasizes the importance of taking a local approach to climate change adaptation policy, which recent literature focuses on.

Local-level adaptation plans in Europe have generally improved in quality over time (Figure 5), but the overall quality of all plans remained low overall in accordance with the study criteria (Reckien et al., 2023). This study reviewed a sample of 327 European cities of the former EU-28, showing that 161 (51%) had an adaptation plan published between 2005 and 2020 – noting that this is before the EU Strategy on Adaptation to Climate Change was published. While adaptation plans became more detailed, they were, however, not necessarily broader in terms of topics and sectors addressed. Key evaluation areas that scored lowest in overall quality across plans were (i) monitoring and evaluation; and (ii) societal participation, and the rate of improvement in quality over time for the different evaluation areas differed. These findings highlight that local plans, despite making gradual progress, fall short of achieving a comprehensive and larger-scale impact at a broader European level.

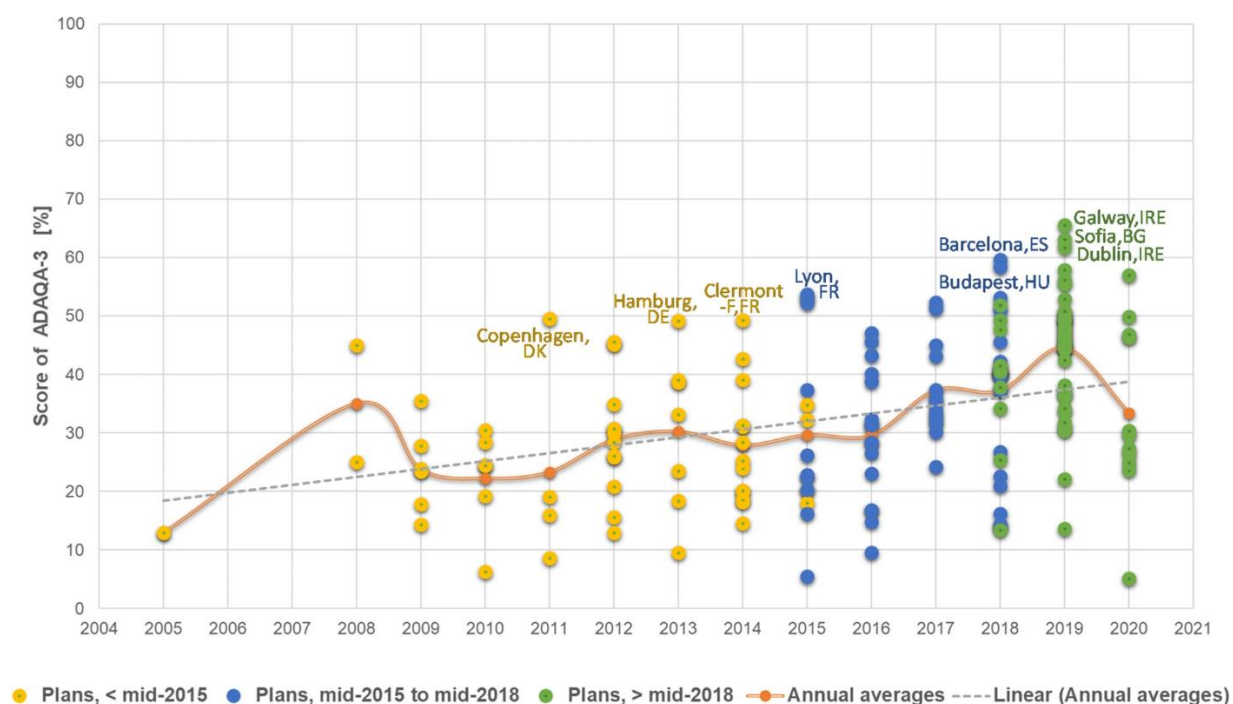


Figure 6 - Climate change adaptation plan scores in European cities over time (Source: Reckien et al., 2023)

There are further nuances and geographical variation with progress on adaptation policy across regions of Europe. For example, a study of 11 southeastern European countries showed little national level direction and a lack of common structured framework across energy, climate, adaptation, and urban planning. However, there were more defined, local level adaptation measures addressing specific vulnerable sectors, which were also integrated with other territorial strategies (Pietrapertosa et al., 2018). Another study of nine coastal regions in northwestern Europe identified that the length and history of collaborative working across stakeholders was positively associated with progress in adaptation planning which contradicted with past EU guidelines at the time; seeking agreement with stakeholders responsible for implementation at the penultimate stage (Rutherford et al., 2020).

The literature has also evaluated policy supported through other EU initiatives. The Mayors Adapt initiative, set up in 2014 as part of the Covenant of Mayors (CoM), is an EU initiative for local governments to implement policy on adapting to climate change. It provides support for CoM signatories in developing, implementing, and monitoring adaptation plans. A review of 137 municipalities across the EU that submitted climate risk assessments via the CoM platform by November 2018 showed a low level of agreement in assessments from municipalities from similar climatic regions – arguing that there is potentially low effectiveness in the reporting template of the CoM specifically regarding the risk assessment for adaptation (Hernandez et al., 2020).

Factors influencing adaptation progress

Effective climate change adaptation policy is often hindered, or limited by a range of factors, particularly at the local level. Literature that has reviewed these challenges or barriers to the progress or implementation of climate change adaptation policy are grouped into three key themes: government underreaction (for several underlying reasons); approach in policy design; and international crises and externalities. These factors may complicate the integration of adaptation into policy which can increase long-term risks and costs to cities and their citizens.

Government underreaction

Government underreaction in planning for climate change is a known factor affecting adaptation progress, and the reasons for this can be complex and multiple, as well as intentional or unintentional – or even a combination of both.

Capacity challenges within local governments can limit the ability to develop adaptation plans. Financing is a particular issue for EU Municipalities in successfully implementing investment initiatives in their locales (European Investment Bank, 2025). Consequently, human and technical resources are constrained, which can de-prioritize climate action in local governments in place of delivering essential services for the public. Research has investigated some of the underlying causes of sustained underreaction or lack of implementation in climate change adaptation policy. These include:

- General lack of expertise on climate change in local governments (Haasnoot et al., 2024), as limited in-house knowledge can directly impact the extent and detail of plans.
- Climate change itself has low visibility, which enables governments to downplay urgency (Howlett & Kemmerling, 2017). This is arguably a justification in regions that may not have yet felt the extreme effects of climate change.
- Framing climate change as unavoidable (Howlett & Kemmerling, 2017), which justifies inaction in the framing of climate change being perceived as inevitable or beyond decision-makers' control.

- A lack of indicators to measure the effectiveness of adaptation policy (Biesbroek et al., 2010), and it is well known that monitoring and evaluation adaptation actions are the most challenging and weaker parts of adaptation plans as a result (Reckien et al., 2023).
- Waiting for “certainty” before acting (Haasnoot et al., 2024) – climate change typically defies the traditional approach for decision-making in governance due to the extent of future uncertainty, which makes climate change adaptation policy a particular challenge to design. However, Haasnoot et al. identify that the consequence of waiting too long to act may lead to increased climate risks and costs.
- A lack of generally accepted instruments to implement adaptation (Biesbroek et al., 2010), as institutional problems associated with multi-level governance and policy integration regarding how adaptation actions can be designed, organized, and financed are perceived as a greater challenge than finding technical solutions – this is discussed in more detail further below.

Governance coordination and cooperation is also part of the challenge. It is acknowledged that adaptation cannot be delivered in isolation. Climate change impacts and consequential adaptation actions are typically local, and to ensure the return on investments are truly felt at a larger scale, adaptation must be an integral part of all relevant policies (i.e. mainstreamed) to ensure they remain appropriate as the climate changes (Biesbroek et al., 2010). Therefore, for adaptation planning and implementation to succeed, multiple stakeholders (government, private sector, NGOs) must collaborate, but conflicting interests and fragmented responsibilities make coordination difficult. There is also uncertainty in long-term funding and investment which discourages effective adaptation planning. Public involvement is crucial but often insufficient, leading to resistance and delays in project implementation. There can also be overlapping policies and jurisdictional conflicts, which create inefficiencies and hinder decision-making. Finally, as previously discussed, many adaptation projects lack clear success metrics, making it difficult to assess effectiveness and adjust strategies accordingly (Dieperink et al., 2016).

Unlike many other areas of environmental policy, adaptation is likely to be motivated in many cases by self-interest and hence undertaken voluntarily (Biesbroek et al., 2010). This also implies that reasons for underreaction can be linked to intentional actions to not act. Research has shown that intentionally downplaying the climate emergency to avoid pressure to act is a tactic in blame avoidance (Howlett & Kemmerling, 2017), as is denying hazardous events having taken place in the name of shifting the focus on other economic, political, social, or cultural topics (Haasnoot et al., 2024).

The challenges outlined in this section are not exclusive to adaptation. Climate mitigation, even with its greater global emphasis to date and strong policy mechanisms, faces implementation challenges in governance where there is a lack of guiding policy at higher levels. For example, Knez et al. (2022) identified that in a study of Balkan nations, the only EU Member State in the study sample (Croatia) had progressed further in mitigation policy planning than the non-member nations, demonstrating that EU policy may play a role in influencing policy progress. Nevertheless, the implementation of specific activities remained low.

Approach in policy design

There are different approaches in designing adaptation plans. Two key approaches previously studied in EU adaptation policy are (i) dedicated – which are policies and measures that are specifically designed for climate change adaptation, such as standalone climate adaptation plans; and (ii) mainstream – a means of integrating climate considerations into existing sectoral policies, such as urban planning, transport, or health. Reckien et al. (2019) analyzed 885 European cities

of the former EU-28 and identified that of 321 local climate plans which mentioned adaptation, 29% of them were mainstreamed to some extent, while the remainder were dedicated. While a dedicated approach is more focused, it can be isolated from broader policy agendas, whereas a mainstream approach may have greater coherence with other policy goals, adaptation priorities may become diluted which has implications for implementation success.

International crises and externalities

Major international crises can also both obstruct or accelerate EU initiatives for a green transition and growth in climate change adaptation. Historically, crises such as the 2008 financial crash stalled progress in climate action. However, recent crises such as COVID-19 and the war in Ukraine have provided the EU with opportunities to fund green transitions through recovery programs which boost energy independence via renewables and wean off Russian fossil fuel imports, for example, simultaneously supporting the adaptation agenda. Conversely, these same crises with their deepening economic impacts risk a growth in far-right populist parties making greater gains in European Parliament, who are known to weaken climate ambitions within EU Member States (Rosamond, 2023) and would consequently further limit the implementation of adaptation initiatives.

Policy conflicts and trade-offs

Planning and implementing climate change adaptation policy in the EU may result in trade-offs impacting social, economic, and environmental dimensions. Trade-offs may be at the expense of adaptation and therefore reduce the efficacy or extent of adaptation plans and actions. They can also be in favor of adaptation, thus at the expense of another system, service, plan, or action. A particular challenge for governments is striking the right balance of resource allocation between essential service delivery with longer-term strategic planning that impacts citizens, such as adaptation measures. Literature reviewing adaptation policy in Europe addressed different trade-offs.

EU Member States and other nations within Europe are largely developed, and therefore adaptation initiatives may be seen as a lower priority because of a perception of adaptive capacity (Kyriakopoulos & Sebos, 2023), potentially due to the relative availability of money and resources at the global level – which could make policy trade-offs at the expense of adaptation more likely to happen. However, there has been substantial damage and loss across Europe due to extreme weather events in recent years. For example, 2022 saw record-breaking temperatures and an extended period of drought over the summer months, facilitating the spread and intensification of large fires across multiple regions of Europe. Additionally, winter storms at the start of 2022 were particularly impactful, with three landing sequentially in one week across northwestern Europe; and the isolated anomalies in heavy precipitation and flooding around the end of the summer season, particularly across southern parts of Europe (C3S, 2023). Furthermore, current shifts in the European policy landscape towards simplification and better alignment between regulations, referred to as “omnibus” and “cutting red tape”, may lead to deregulation regarding environmental protection. These recent events underscore the risk of deprioritizing adaptation via policy trade-offs.

A well-known example of adaptation policy conflict is with mitigation policy, largely linked to other environmental trade-offs. Kyriakopoulos & Sebos (2023) highlight there being considerations to make between the immediate local advantages of adaptation and the long-term global benefits of mitigation. Resource challenges are often the crux of the issue, as a decision on one resource for

adaptation purposes could negatively impact at least the same resource in terms of mitigation progress, or vice versa. Examples include:

- Delivering a large adaptation infrastructure project such as flood defenses may be carbon-intensive to construct, increasing greenhouse emissions.
- Building well-insulated housing to limit winter heating energy costs could result in increased energy consumption for cooling in warmer months to reduce overheating risk.
- Hydropower dam construction upstream affecting the ability of wetlands and floodplains acting as a buffer to the impacts of floods and drought.
- Opposing needs for increased irrigation and reduced water consumption (European Court of Auditors, 2024).

Some trade-offs may be economic; a hypothetical example being enhancing building codes and increasing land use restrictions as an adaptation solution. The intent of such enhancements and increased restrictions from a planning perspective is to protect citizens from the impacts of climate change. However, it may constrain development, be more costly to implement, and therefore not optimize local economic growth. The challenge is exacerbated further for vulnerable populations – as they are often disproportionately impacted by climate change (IPCC, 2022). This leads to challenges in balancing finances, climate risk, and social equity.

Further to this, there is a need to balance social and cultural factors in developing adaptation plans. Broadly speaking, the extent of citizen and stakeholder engagement impacts social equity and policy legitimacy, but on the other hand, such engagement can also lead to shifting responsibilities unfairly from government to individuals (Mees et al., 2018). Nevertheless, engagement with stakeholders is particularly important in local settings for climate adaptation as expert knowledge can be drawn upon to tailor plans and actions appropriately. Trade-offs may relate to the knowledge co-produced; potentially influenced by the type of engagement. Mees et al. outline these as follows:

- **Hierarchical co-production:** Government mandates citizen actions through regulations (e.g., building codes)
- **Incentivized co-production:** Citizens are encouraged to participate through subsidies or awareness campaigns
- **Deliberative co-production:** Citizens and authorities collaborate through dialogue and decision-making processes.

A relevant example regarding the consideration of social and cultural factors in adaptation that could apply to several CSAs is fire management. Oliveras Menor et al. (2025) argues that traditional firefighting approaches are no longer sufficient, and that past fire suppression policies at the expense of former indigenous and local fire management practices have led to landscapes with a greater fuel load that heightens fire risk and increase emissions from wildfires in a continued warming climate. In Europe, programs building a more integrated fire management approach have taken place across France, Spain, and Portugal. If such an approach were expanded further, however, additional potential trade-offs may require consideration, such as the impacts to air quality exposure (which is especially politicized in recent years), more NbS, and water resource management.

Trade-offs in adaptation policymaking are ostensibly unavoidable, whether decisions impact other policy areas or dilute adaptation policy itself. Nonetheless, recent extreme weather events attributed to climate change across Europe raise the urgency of action, and thus the necessity of

acknowledging and managing trade-offs across policy areas to avoid maladaptation, protect the most vulnerable communities, and scale up climate resilience.

Synergies with other policies

While this Section has largely discussed a range of challenges in planning and implementing climate change adaptation policy, there are also synergies across policies that support climate change adaptation goals, which can be positively exploited to support implementation. As the EU Strategy on Adaptation to Climate Change highlights the need for “more systemic adaptation”, it directly addresses a synergistic approach to policymaking.

At the EU level, there are synergies related to climate change adaptation across many policies. Specifically, Albrecht (2024) identified adaptation being mainstreamed through other directives and regulations across sectors, which include:

- **The Environmental Impact Assessment (EIA) Amendment Directive 2014/52/EU:** Adaptation is considered a reason for the adoption of the Directive, on the grounds of not doing so having negative environmental impacts and endangering economic development. EIAs are also required to assess the impacts of projects on their vulnerability to climate change.
- **Regulation on infrastructure funding e.g. Regulation 2021/1060/EU:** European funds are expected to align with climate change adaptation. This regulation example outlines common provisions for funds such as the European Regional Development Fund, the European Social Fund Plus, and the Cohesion Fund and the funding from these link to the climate proofing requirements of medium- and long-term infrastructure investments.
- **Taxonomy regulation:** Appointed in 2020, this regulates transparency for companies and investors in investments in projects and economic activities. Climate change adaptation is subject to this regulation as one of six environmental objectives used to determine the environmental sustainability of investments.
- **The Floods Directive 2007/60/EC/D:** This is considered a mandatory consideration of climate change adaptation, as it requires the impact of climate change flood hazards to be accounted for as part of preliminary flood risk assessment and flood risk management plans and is subject to periodic review.
- **The Water Framework Directive (WFD) 2000/60/EC:** While not explicitly mentioning climate change, it is implied that it be considered in river basin management. Its iterative approach to reviewing and updating obligations complements the iterative approach as advised for undertaking adaptation planning appropriately (e.g. ISO 14090:2019).

As discussed in Section 4.4, there are also synergies between climate change adaptation and mitigation. Biodiversity and nature-focused policies are an example of achieving this as there are co-benefits to implementation. Programs to increase vegetated land such as afforestation, reforestation or urban greening at scale not only provide carbon sequestration effects that can offset some greenhouse gas concentrations, but also alleviate flood risk and heatwaves, while also enhancing biodiversity and wellbeing (Hautamäki et al., 2025; Hasegawa et al., 2024; Ariluoma et al., 2021). As such, adaptation is explicitly featured in the EU Forest Strategy for 2030, in that forests are considered a “natural ally in adapting and fighting against climate change” (European Commission, 2021b).

More broadly, Kyriakopoulos & Sebos (2023) highlighted some sectors with favorable synergies with climate change adaptation. For instance, decisions on land use may be beneficial. Focusing

on compact urban developments may lead to lowering land demand, reducing hazard exposure and providing the ability to avoid risk-prone areas for development altogether, in conjunction with protecting valuable ecosystems. Another, as previously discussed, is green infrastructure, with its co-benefits around mitigation, ecosystem services, thermal comfort, stormwater management, food security, and supporting socio-economic resilience.

As the EU has positioned itself as a leader in promoting NbS through its adaptation policies, there are several instances of these synergies in action at the local level. Through supporting initiatives of SECAP and CoM, some examples identified by Scorza & Santopietro (2024) include:

- Barcelona's urban forest plan, which acknowledges co-benefits regarding climate mitigation and moderating city temperatures
- Copenhagen's Cloudburst Management Plan to address pluvial flood risk which includes a range of measures, including green roads in side streets to complement larger infrastructure interventions
- Antwerp's heat stress mapping, which helps identify UHIs and inform adaptation at three scales (city-wide, local, and individual citizen). This includes mandatory green roof installation on any new or renovated buildings, as well as permeable and green parking lots.

As challenging as implementing adaptation may seem, the literature shows examples across Europe where synergies are possible, particularly across sectors. Indeed, there are challenges around a limited evidence base, financing gaps, and governance barriers, as policies are often fragmented and voluntary, which make scaling up a challenge (Calliari et al., 2022). NbS are increasingly featured in literature as a suitable adaptation solution with social, economic, and environmental co-benefits. Therefore, taking a cross-cutting approach to NbS, leveraging a wide range of existing sectoral EU policy and guidance would help reinforce EU aspirations to scale up NbS and deliver more systemic adaptation that provides an inclusive and just response to climate change.

Discussion: State-of-the-art implementation options

Synthesis of policy review and literature review

The review of academic and grey literature draws several important conclusions about the efficacy of climate adaptation policy from across the EU and specifically the CSAs in the CARMINE project.

The academic and grey literature reviewing adaptation policy across the EU has a largely consistent consensus. The latest EU adaptation policies are ambitious and comprehensive. However, the pace of adaptation has not picked up at the appropriate speed to respond to the climate challenge that lies ahead. This is due to a vast and complex range of challenges and barriers in governance at multiple levels. While there are opportunities to leverage synergies and limit trade-offs through utilizing other existing policies that address adaptation and its co-benefits, this will require engagement across governance levels (vertical), as well as cross-sector and among bordering governments (horizontal), particularly at the local-level.

The policy review demonstrates that the CSAs show commitment to climate adaptation and alignment to EU policy. However, there are different levels of implementation of adaptation policies, and CSAs' policies align differently in accordance with key EU themes. This section highlights some of the key findings from the policy review for each CSA (Section 5.2), identifying some of the policy structures that work well, where there are gaps, and whether there are any other policy mechanisms or actions that could help each CSA in addressing their climate change challenges. Broader implementation considerations are then introduced based on the literature review (Section 5.3), which may be applicable to other CSAs.

Specific Case Study Area policy implementation considerations

In organizing the systematic review of policies, the CSAs were asked to provide clear indications of the implementation objectives for these policies. The assessment facilitated the identification of levels of compliance and any discrepancies between existing policies and the specific objectives of the CSAs. It is important to note that there may be some differences, which can be more pronounced at times, in the various levels of implementation across policies, particularly regarding integration vertically across levels, and horizontally across sectors. The potential integration gaps may impact resource mobilization and stakeholder engagement, resulting in a potential degree of uncertainty regarding the application of financial techniques, and consequently, a lack of attention in participating stakeholders. The following sections consider CSA-specific strengths and opportunities based on the policy reviewed, to provide some possible future direction in enhancing the implementation climate change adaptation policies and initiatives.

Prague, CZ

In Prague, the local and national policies address both heatwaves and air quality directly and indirectly. The coherence of climate change adaptation, sustainable mobility, and environmental protection provides a strong rationale for protecting the local urban population. National policy is on sound footing, but the efficacy of implementation for protecting the most vulnerable is dependent on local delivery. Opportunities include:

- Ensuring priority is given to local authorities through dedicated national funding and resources to deliver initiatives aimed at vulnerable populations during heatwaves and instances of heavy air pollution.
- Developing detailed and widespread national guidance to local governments on how to identify, access, and support vulnerable groups during these events.
- Investing in national level data collection and research on the health effects of heatwaves and air pollution upon specific vulnerable groups to enable more targeted policy interventions.

However, to provide more protection for the most vulnerable in the population, including those on low incomes, those who are retired, and tourists, Prague might also require:

- Direct incorporation of the requirements of such specific vulnerable target groups in all relevant policy documents and action plans.
- Strengthening focused outreach and support programs tailored for these populations, including clear communication about health warnings and access to cooling resources.
- Bolstering the collaboration of environmental, health, and social services departments to involve a multidisciplinary approach to preparedness and response.
- Disaggregating data to reveal gaps in coverage and to advise revisions to policy going forwards.

Leipzig, DE

Leipzig's local plans demonstrate all-inclusive climate adaptation, having considered a range of factors such as population, vegetation, buildings, wildfire smoke, and flooding. The city scale takes advantage of a multi-level policy framework by integrating local urban planning documents focusing on green and blue infrastructure with regional strategies that promote inter-municipal cooperation. These local steps are substantially supported by strong national laws and funding, like the Federal Climate Change Act and Coal Phase-out Act, that make for a cleaner environment and reduced climate risk.

Attention is being paid to NbS (e.g. street trees, green-blue infrastructure, and open spaces), especially locally, with specific relevance for addressing the UHI effect and stormwater hazards. Although specific policies regarding respiratory effects of smoke from wildfire may not be as detailed at the local level, the overall commitment to improve air quality by reducing ambient pollution and promoting clean mobility indirectly confronts this issue. The shift toward integrated urban planning and disaster risk reduction at all levels of governance reflects an understanding of the interconnectedness of these climate challenges, and the need for a coordinated and holistic solution prioritizes the health and safety of Leipzig's most vulnerable.

Funen-Odense, DK

Funen-Odense demonstrably works within an integrated policy context to address the impacts of climate change, particularly flooding, sea level rise, storm surges, and heavy rainfall. At the local level, municipalities develop detailed climate adaptation plans that build on efforts such as DK2020, which addresses the management of heavy rainfall (e.g. cloudburst plans/green infrastructure) and coastal vulnerabilities. These plans also support reducing damage, harm, and economic loss by preventing people, buildings, manufacturing, and economic activities from becoming exposed and at risk.

Flood regulations exist in Denmark, in the form of the Coastal Protection Act, the Flood Protection Act, and the Planning Act, specifying regulations to decrease flood risk. The implementation of the European Floods Directive by means of the National Flood Risk Management Plans has been appropriately handled to deal with the uniform evaluation, mapping, and management of flood hazards with a particular attention to the reduction of the economic costs. These efforts are guided by the National Action Plan and National Adaptation Strategy, which have identified the increasing risks of sea level rise and more intense precipitation.

Athens, EL

The multi-level policy context in Athens and the Region of Attica is underpinned by national, European, and global directives, addressing the growing risks of heatwaves and wildfires. Athens demonstrates a strong focus on vulnerable community demographics (heat-exposed workers, vulnerable populations, tourists) through the City of Athens' Resilience Strategy and Climate Change Action Plan, with actions in place such as cooling centers, targeted support, and awareness campaigns. This is important as Local Authorities across Greece are increasingly obligated to address climate actions, disaster risk management, and resilience, often as conditions for funding. It requires more national legal and institutional frameworks to support local delivery of sustainable and equitable heating and cooling plans for its inhabitants and address the UHI effect in hotspots across the metropolitan area. Nevertheless, the City of Athens is a leader nationally in climate resilience to date, being one of the first cities in Greece to conduct a comprehensive assessment of climate risk and developing a long-term resilience strategy from 2015.

Municipalities across the Attica region have demonstrated collaborative efforts to address climate risks. As a member of the EU Mission "100 Climate-Neutral and Smart Cities by 2030", it receives help with accessing funding and financing. The City of Athens and other municipalities in the region and across the country participate in international city networks to access tools, exchange knowledge, develop new approaches and access pilot project funding. Increasingly, they work together to share this knowledge with municipalities throughout Greece. Examples include the launch of ClimaNet and the Athenian Energy Alliance.

The Attica region aims to achieve broader resilience of the wider region in anticipation of more climate change extremes, not only to heatwaves and wildfires, but also other causes via the EU Cohesion Policy and climate change adaptation plans. However, despite these efforts, the continuing challenges associated with more frequent and intense heatwaves and wildfires – as evidenced in recent events and by scientific projections – suggest that ongoing adaptation, enhanced implementation, and further investment in resilient infrastructure and social protection systems is required. It is also essential to ensure that climate change is incorporated into policies that stretch from local to global levels to more effectively protect the health and well-being of those who live and work in Athens and the vitality of the natural ecosystems they depend on.

The Athens CSA, through its Living Lab engagement, highlighted some risks and obstacles to implementing climate change adaptation policies such as:

- Inadequate implementation of extreme heat mitigation policies leading to higher mortality and other human health impacts.
- An absence of national policy/strategy/framework for extreme heat.
- Inadequate policies on data collection to measure progress and impact of government policies and programs.

- Inadequate stakeholder engagement/input processes and participatory processes, due in part to the lack of a comprehensive strategy and commitment for substantive participatory processes and engagement by the central government.
- The metropolitan governance level being less of a priority, with an absence of a metropolitan governance body with jurisdiction over metropolitan environment and climate related measures.
- No policy to invest in social infrastructure (organizations and facilities serving local communities/residents, building social connection and social capital, and delivering social services), or resilience for social infrastructure.
- Conflicting political priorities, for example, the continued promotion to increase tourism contributing to overtourism with consequential negative environmental impacts.
- No policy to require multi-benefits in procurement, thus limiting the ability of municipalities and other government agencies to select appropriate partners and contractors to implement NbS.

These considerations lead to the necessity to approach the issues with specific business models at a cross-sectoral level.

Nevertheless, there are several resources to provide opportunities. Greece will soon access funding from the Social Climate Fund to support its national social climate plan. The National Strategic Reference Framework program will also factor climate vulnerability and project alignment to climate adaptation policy. The Green Fund, supervised by the Ministry of Environment and Energy, supports net zero goals, urban regeneration, and fire prevention. Funding from the EU LIFE Programme is also supporting the implementation of the national adaptation action strategy and 13 regional action plans through 2025 as well as preparations for the second adaptation policy cycle after 2026.

Barcelona, ES

The Barcelona Metropolitan Area highlights the complexity of the multi-level strategic planning that is required to protect against heatwaves, droughts and wildfires. At the local scale, specific plans such as the Metropolitan Climate Plan and the Collserola Wildfire Prevention Plan respond to short-term needs by creating climate refuges, delivering green infrastructure, and carrying out targeted fire management. These strategies are complemented by high-level and longer-term others that respond to challenges in Catalonia particularly for forest protection and management.

Barcelona recognizes the central role of its forests in its policies, and more specifically, the risk of fire, which can have a very serious impact not only on ecosystems as such, but also air quality and, therefore, on citizens' health. Consequently, a considerable part of its adaptation efforts focuses on all forest fire prevention measures. This focus is reflected in many documents and can therefore be considered a central pillar of territorial policy. The Sendai Framework for Disaster Risk Reduction, which demonstrates this key role, should also be highlighted. In addition to these issues, there are also numerous lines of action that accompany this type of issue, but which are specifically climate-related and concern the provision of climate services offered by the territory. A direct consequence of this is the attention that is also being paid to health in general and, specifically, to preventive actions against the effects of climate change on human health and workers. The 2021-2030 Climate Change Adaptation Plan clearly highlights the synergy and circularity of actions that aim to integrate environmental and climate issues, underpinning a specific culture of land protection.

Bologna, IT

The Bologna Metropolitan area demonstrates a proactive, inclusive approach to climate-related and environmental health risks, particularly for the most vulnerable groups across the population. Regional coordination through Emilia-Romagna's evidence-based frameworks strengthens these interventions, while national policy tools offer standardization, funding, and legislative backing.

Continued investment in green infrastructure, real-time monitoring, and social outreach are essential to sustain and enhance resilience in the face of growing environmental pressures. The potential implementations are NbS specifically designed for the disabled and elderly with limited mobility, along with a plan to support the daily life actions (moving within the city) to be discussed with the project's stakeholders, in dedicated working groups, which can be integrated with other existing policies already developed by other CSAs (such as the food policy developed by the city of Birmingham).

Fragile populations, particularly the elderly with chronic ailments and disabilities need specific attention to ensure the "Project of Life" plan will be fully developed in an environment capable to protect them and assuring the best possible accessibility to concrete daily acts. It must also consider their need to access appropriate nutrition to maintain a healthy standard of living. The aim of the CSA Bologna Metropolitan city is to investigate the role of NbS in contributing to the creation of safe paths to reach markets in the complex urban environment and, also, to investigate the delivery policies to allow proper distribution of groceries and produce, considering the issue of urban pollution due to transportation. This daily act of life can be utilized to implement other urban policies. Some policies related to this CSA that could be implemented include: Farm to fork strategy (healthy and accessible food for all); Pathway to a Healthy planet for all (including the elderly and disabled); Transit Oriented Development strategy (reducing pollution in the delivery activities); Small business act for EU (proximity markets and socialization); Strategy for the rights of person with disabilities 2021-2030 (policies for the disabled); EUROPE 2020 A strategy for smart, sustainable and inclusive growth (inclusion of the most vulnerable for the Project of life); United Nations Convention on the Rights of Persons with Disabilities (policies for the disabled); Delivering on EU Food Safety and Nutrition in 2050: Future challenges and policy preparedness (health and accessible food).

Brasov, RO

At the local level, Brasov has strategies in place such as the Climate Change Adaptation Plan, Green Infrastructure Strategy, Regional Operational Programme for Region Centru, and Regional Master Plan for Water and Wastewater which include measures that could contribute in building resilience to water scarcity, water excess and heatwaves. Brasov is an important economic, cultural, and touristic part of Romania. The adaptation policy reflects this well, with emphasis on dealing with the near-term effects of climate change on tourism (e.g. winter sports), agriculture, and industry. The focus on spatial planning instruments such as the Urban Master Plan Brasov and the Integrated Urban Development Strategy for the Brasov Metropolitan Area points to an increasing trend to mainstreaming climate into key development planning and broader decision-making. Specifically, one of the major impacts is due to the change in snow coverage directly impacting winter tourism. Regarding flood protection and vulnerable groups, attention is focused on new or modified infrastructure, green measures, and early warning systems. A truly resilient Brasov will require effective, well-coordinated action under these policies, aiming at safeguarding economic prosperity as well as social well-being from increasing climate change threats. Regarding opportunities it is important to mention: (i) the creation of a Metropolitan region like entity could bring together the high number of strategies and plans at other scales than the local level; (ii) the high level of protection of regional green infrastructure, which is included in Natura

2000 network, in having an approved management plan; and (iii) increased consideration of climate change adaptation measures in sectorial strategies.

Birmingham, UK

Birmingham's policies, from its localized 'City of Nature Plan' to the guiding principles within national and international frameworks, reflect a long-term awareness of the importance of green infrastructure and NbS as not only as solutions mitigate pluvial flooding and future higher temperatures but as a mechanism to address environmental injustice. The city's distinctive character as a Biophilic City and Tree City offers a solid foundation to embed vegetation management as an integral part of climate change adaptation for a more resilient, healthy, and liveable city. As such, it is essential to investigate how tree canopy cover influence surface runoff rates and temperature in different regions of the city and the broader metropolitan area. It would also be valuable to explore how potential changes in phenological behaviour of vegetation species are influenced by local climate change and their implications for green space management (e.g. watering regimes) in the future.

Broader policy implementation considerations

The literature review in Section 4 highlighted three key considerations that could enhance adaptation policy implementation more broadly. These considerations are not specific to any governance level and therefore can be considered at multiple levels.

Stakeholder engagement and governance coordination

Stakeholder engagement and governance coordination are not mutually exclusive, as the aim of improving both helps break siloed working practices, connecting climate action both horizontally (across sectors and neighboring governments) and vertically (across governance levels). Therefore, these are considered complementary actions as the literature reviewed highlighted strong connections between them.

Stakeholder engagement plays a critical role in adaptation planning, as it enables decision-makers to integrate local knowledge and experience in a holistic manner, thereby facilitating the design and implementation of adaptation actions that are locally grounded and scaled. Different stakeholders should play different roles in terms of their contributions, and through explicitly defining and clarifying these for a complex network (Dieperink et al., 2016), the knowledge shared can be more streamlined. For adaptation of urban areas, Nissanka et al. (2024) outlined roles and responsibilities of different built environment stakeholders, where governments must drive policy and investment, while local communities and private entities implement sustainable practices, as follows:

- **National governments** establish a long-term vision and policies for climate adaptation; promote investment in low-carbon options; bridge policies with private sector involvement; support innovation in climate adaptation strategies.
- **Local governments** communicate climate adaptation plans to the public; monitor and reports on adaptation progress at the local level, oversee local climate change adaptation initiatives and planning.
- **Communities** lead grassroots initiatives and sustainable practices; engage in decarbonizing everyday activities; promote knowledge-sharing and social cohesion in climate adaptation.

- **Civil organizations and professional bodies** act as a link between policy and practice; advocate for vulnerable communities; provide expert consultancy on disaster response and climate adaptation.
- **Academia and research** conduct research on climate adaptation strategies; develop educational programs to build knowledge and skills; bridge gaps between policymakers and private sector stakeholders.
- **The private sector** incorporates climate resilience into business models; reduces carbon emissions in operations; engages in Corporate Social Responsibility (CSR) initiatives that support climate adaptation.

Clark et al. (2025) emphasizes that engaging with multiple stakeholders through an all-of-society approach is essential in building more climate- and disaster-resilient societies. This can be realized through the support of informal leaders, spontaneous volunteers, and provision of inclusive spaces. Capacity is therefore built based on trust, co-creation, and learning. This ultimately reduces vulnerabilities through targeted communication that recognizes the diversity and agency of the population and enables organizational change. Engagement is also recommended to focus on outcome-oriented contributions to policy design and implementation, and results of such activities be formalized (Dieperink et al., 2016).

Stakeholder engagement should feed into all levels of governance, and therefore governance coordination must be cohesive to facilitate this, which can arguably support addressing conflicts, trade-offs, and synergies. Studies emphasize the need for better governance coordination at different levels e.g. Lenaerts et al. (2022) and Rayner (2023), as well as across sectors e.g. Pietrapertosa et al. (2018), as it helps drive action. For adaptation, this is crucial, as the local-level impacts of climate change mean that nations, regions, and even cities or parts of cities experience different impacts – further exacerbated by geographical environmental, social, and economic characteristics.

Different governance levels have different roles to play in coordinating the fragmented landscape of managing climate change impacts. The supranational role of EU in adaptation specifically is necessary for good reasons: it supports partnerships in developing scientific knowledge, as well as supporting cross-border spillovers from adaptive action (or lack thereof) from member states (Rayner, 2023). National governments can also carry out a similar role at cross-boundary spillovers at the regional and local level, and local governments could also consider this at the hyper-local or neighbourhood scale as appropriate. Other essential mechanisms to support government coordination across all these scales include (i) clear leadership; developments of visions including a range of options and solutions connected by scale, geography, and time; and (iii) focusing on innovative development areas to trigger participation (Dieperink et al., 2016).

Reporting indicators for monitoring and evaluation

The literature highlights that monitoring and evaluation is a particular challenge for governments at multiple levels, and policy and strategy on adaptation often reflects this. Reckien et al. (2023) identified this across city-level policies in Europe, and this is not a European- or local-specific issue; similar challenges are identified, for example, across national adaptation plans in low-income countries across Africa and South Asia (Greenham et al., 2022). The European Court of Auditors (2024) identified that gathering reporting at EU level from Member States is also challenging, as there is a lack of common indicators of a reference basis to assess progress. Nevertheless, it is recognized that global indicators (or in this case, EU-level indicators) might fail to account for regional-, local-, or even project-specific contexts (Bilgram et al., 2024). An approach outlined by Vincent (2024) identifies effective adaptation measurement requiring a

sound adaptation logic or theory of change that defines what adaptation looks like, to help measure the process. Therefore, this requires identifying sound principles for adaptation design, which should focus on:

- Reducing vulnerability
- Taking a participatory approach (see previous section on stakeholder engagement)
- Being robust to current and future climate risks
- Being equitable and contributing to equity
- Being adaptable (in terms of consistency with adaptation pathways or adaptive learning)
- Considering multiple scales and embeddedness (see previous Section on government coordination)

Ultimately, there is no single method and there are no specific indicators at all governance levels to support increased implementation. Instead, there should be a broader understanding that adaptation is a process and not a fixed outcome, and in addressing principles for adaptation design, indicators for monitoring and evaluation can be applied and monitored on an iterative basis and fed vertically across governance levels with a common level of understanding among them.

Decisive action

This literature identified that failing to act is common across multiple governance levels. There are many reasons that this may happen, including feeling the need to wait for “certainty” before implementing adaptation actions, which ultimately can increase costs and risks. Therefore, early steps in adaptation are necessary to prevent this (Haasnoot et al., 2024). This may also explain why progress in adaptation to date has seemingly been fragmented and voluntary. To address this; accelerating implementation and scaling up adaptation, decisive action is necessary at all governance levels. It must also acknowledge that certainty on the future effects of climate change is not guaranteed – and that “something” is better than “nothing” when planning for adaptation.

To facilitate action that limits waiting for certainty, research has considered some options that may improve the implementation of climate change adaptation actions. These include:

- **Developing adaptation pathways**, where sequencing a set of possible adaptation actions are laid out over time, which are reviewed intermittently to devise the long-term pathway over time (Haasnoot et al., 2013). Progress in adaptation pathways to date has progressed from the academic idea into practice and can utilize both quantitative and qualitative information (Haasnoot et al., 2024).
- **Taking a dual-track approach to developing adaptation policy**, where municipalities or local governments develop and adopt dedicated and mainstreamed plans jointly, or start with a dedicated adaptation plan, then later mainstream local climate issues relevant to their locality (Reckien et al., 2019), supporting a more adaptive governance approach (Fournier et al., 2016).
- **Revising support, processes, and resources available from the Covenant of Mayors.** As reviewed by Hernandez et al. (2020), the platform and broader processes supporting CoM signatories identified a low level of agreement among similar regions on their climate data reporting, which may link to the challenges with fragmented response to adaptation. Suggested solutions to address this to deliver more cohesive action across the EU include:

- Considering the role of Covenant Territorial Coordinators in supporting Municipalities or local governments which may be too small or lack resources specifically in climate change adaptation.
- Revising to the reporting platform, particularly regarding wording and terminology.
- Improving the reporting timeframe to better align with climate models' and data timelines.
- Reviewing reporting from CoM signatories to validate submissions, ensuring that information is not intentionally being unreported.

Next steps for policy outcomes in the CARMINE project

This review of climate change adaptation policy across the EU feeds into upcoming activities on the CARMINE project, particularly for ongoing and future tasks within WP6. Firstly, the review has supported the development of the draft D6.1 *Multi-level climate change governance framework* (Figure 6). Details on the development of this draft framework are provided in Milestone 12 report (submitted M18). The framework provides structure for the overlapping policies at local, regional, national and international to identify synergies, feedback loops and governance structures. The draft framework will be shared with the CSAs and discussed by the stakeholders who attend the second Living Lab Workshop (WP1). This will provide feedback that will refine and enhance the framework. The discussions will consider:

- How existing policy sits within the framework and what other synergies exist within EU policy relevant to adaptation.
- What good practice examples that were highlighted within this Deliverable that may be replicable in other areas.

These discussions will feed into the development of the R&I pathways (T6.2), the policy recommendations (T6.3), and thereby support the achievement of Strategic Objective 5 of the CARMINE Project: *“To conduct the participatory development of better coordinated and impactful modelling and risk assessment, in support of roadmaps of R&I priorities on adaptation, informed policies, and cross-sectoral plans towards the 2030-2035 timeframe and beyond (i.e., 2050)”*.

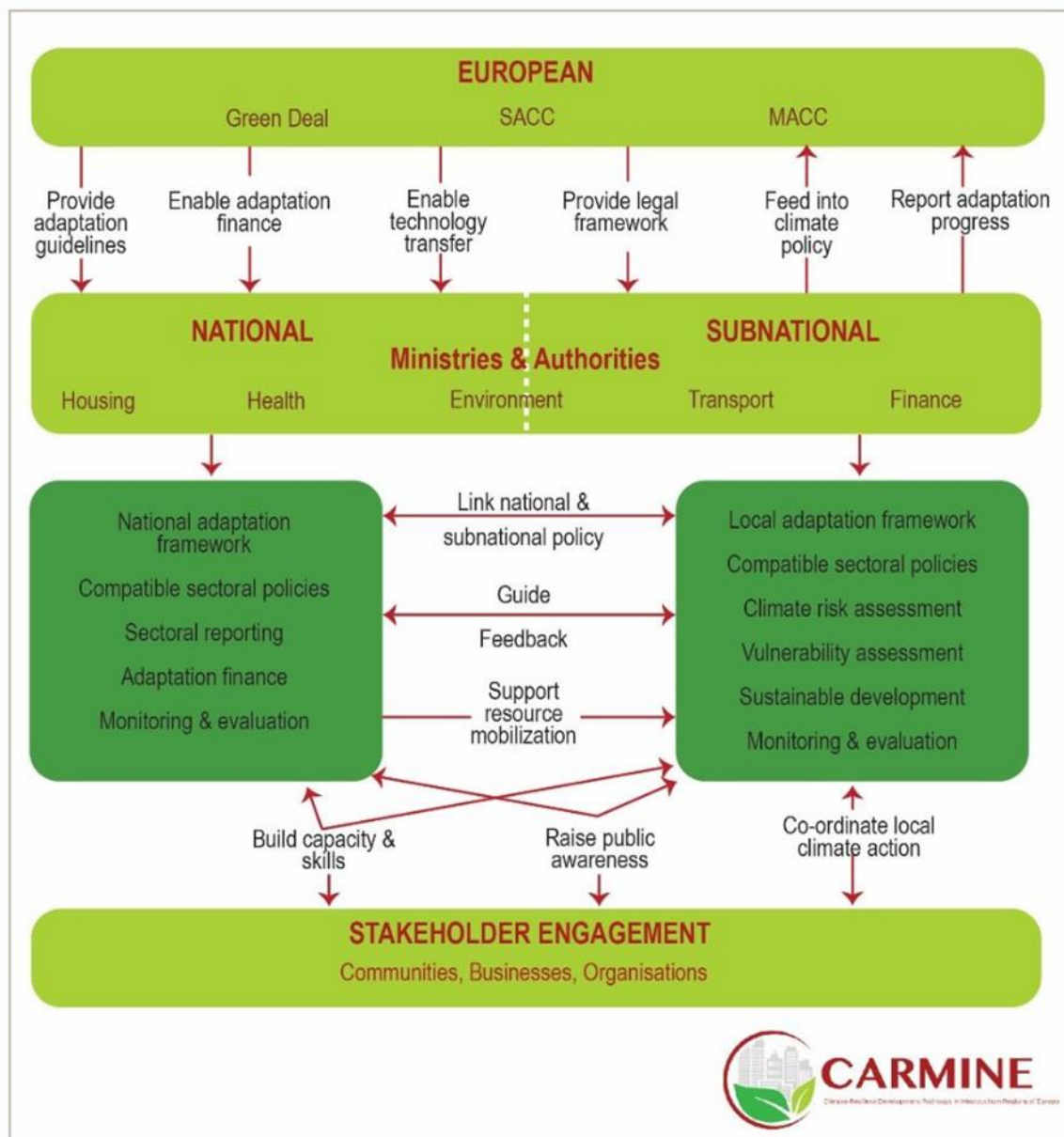


Figure 7 - Draft multi-level climate change governance framework. For more details see Milestone 12 report

Conclusion

As part of WP6 of the CARMINE project, a key task was to review the implementation of specific EU policies on climate change adaptation, which this report, D6.5 focuses on. This review has highlighted the substantial and varied level of complexity of climate change adaptation policies across metropolitan regions of Europe. It has also identified good practice already in place in existing policies, or that may emerge from the specific nature of CSAs, and there is a broadly well-evidenced alignment of CSA policy at multiple governance levels (local, regional, and national) in meeting the key themes of EU climate change adaptation policy. This is further underpinned by the academic and grey literature review, which suggests that the overarching guidance and direction of climate change adaptation policy in the EU is comprehensive and ambitious, with good practice generally increasing as EU members states' local adaptation policy improves – albeit gradually – in quality.

Other key objectives of this task were to identify policy synergies, challenges, and trade-offs among the various CSAs, and to make direct use of the specific climatic diversity of real cases on which experience has already been gained. Synergetic policy themes from one CSA could be easily transferred to other contexts in another CSA, thus partly resolving its identified challenges, as there is a concrete basis and lived experience to utilize. The policy analysis identified several examples, thus facilitating the transfer of knowledge gained from one metropolitan area to another (e.g. Birmingham → Bologna) in its local policy. Indeed, some challenges and trade-offs are likely to be unavoidable which may impact social, economic, and environmental dimensions. Resources and funding are largely connected to this. It is therefore that such pipelines are channeled appropriately through multiple governance levels, and that policymakers and relevant stakeholders at all levels are well-informed of how adaptation decisions impacted and are impacted upon other policies to limit trade-offs when implemented.

The policy analysis demonstrates the potential for integrating elements of land use policy, air quality policy, and climate policy to the benefit of climate change adaptation. There are local, regional, national, and international policies used among the CSAs. While some policies are adaptation-focused, others consider adaptation as a co-benefit of other policy foci such as air quality improvement and carbon mitigation, and some feature climate resilience or adaptation more explicitly as being integrated within a broader policy (e.g. sustainable transport). It emphasizes the importance of integrating cross-sectoral (horizontal) objectives from the local to the national (vertical) level. Furthermore, to consider emerging needs at the local scale, economic support for implementation is crucial. The establishment of a cohesive framework at a higher (national) level would facilitate the development of sustainable economic processes, supported by resources available on a larger scale which the local level may be able to access.

Furthermore, there are significant overlaps among climate change adaptation policies in the different CSAs, primarily due to economic and geographical factors. This review draws on a range of examples regarding management models and trade-offs on similar issues, which can benefit CSAs in considering new approaches to facilitate their scaling up of climate change adaptation implementation. Specifically, the SECAP was shown to function as a foundational leverage mechanism for implementation, regarding both specific adaptation actions and economic management. Stakeholders are recognized as pivotal agents of change, with their needs and availability being given due consideration. However, it is important to note that SECAP also encompasses elements of economic and social fragility. This policy analysis also identified that generally, monitoring of these elements is often not subject to effective temporal evaluation processes, which can become factors that delay progress in adaptation.

This review explored and revealed policy strengths and opportunities across the CSAs, and beyond, which can be utilized to support the implementation of climate change adaptation policy and its implementation across Europe. These findings are valuable for the CARMINE project as WP6 progresses the development of a multi-level climate governance framework. They can be leveraged to optimize the framework design to facilitate stakeholder engagement across sectors, CSAs, regions, and nations; increase the capacity to monitor and evaluate; and enable decisive climate change adaptation action, through a more cohesive policy approach.

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Appendices

This chapter provides supplementary material for D6.5. It contains all the documentation that the WP6 team were provided for the policy review.

Figure 3 – Prioritization of keywords as provided by CSA leads (page 17)

KEYWORDS	PRAGUE	LEIPZIG	FUNEN- ODENSE	ATHENS	BARCELONA	BOLOGNA	BRASOV	BHAM
ABANDONEMENT					X			
ACCESSIBILITY						X		
ACCESSIBLE		X				X		
AIR CONDITIONING				X		X		
AIR POLLUTION / POLLUTION		X		X		X		
AIR QUALITY				X		X		
ASSISTANCE			X					
ATTRACTIVITY							X	
BUILDING			X	X				
CHRONIC				X		X		
CLIMATE EDUCATION				X		X		
CLIMATE JUSTICE				X		X		
DAMAGE					X			X
DAMAGE TO HOME			X					X
DELIVERY (OF FOOD)			X			X		
DISABLE						X		
DISEASE			X			X		
DISRUPTION			X	X				X
DROUGHT		X		X	X		X	X
DROUGHT-RESISTANT (INFRASTRUCTURE)					X			
DRY SUMMER				X	X			
ECONOMIC RISK			X	X				X
ELDERLY	X	X	X	X		X		
ENERGY		X		X		X		
ENERGY ASSET		X						
ENERGY EFFICIENCY		X						
ENERGY POVERTY				X		X		
EQUITABLE						X		X
EXPOSURE				X		X		
EXTREME RAINFALL								X
FIRE				X	X			
FLOODED AREA							X	X
FLOODING		X	X				X	X
FLOODING BUILDING			X					X
FLOOD-PROOFING			X					
FLOOD-RESILIENT			X					
FOOD			X	X		X		
GO OUTSIDE				X		X		
HABITAT					X			
HEALTH		X	X	X	X	X	X	X
HEALTH ADVICE		X		X				
HEALTH SERVICE				X		X		X
HEALTHCARE		X		X		X		
HEAT / EXTREME HEAT		X		X		X	X	X
HEAT STRESS		X		X		X		X
HEATWAVE	X	X		X	X	X	X	X
HEAVY RAINFALL			X					X
HYGIENE					X			
IGNITION					X			
ILLNESS		X		X		X		
INDOOR				X				X
INDUSTRY / INDUSTRIES			X					
INJURIES			X					
INSURANCE			X	X		X		
ISOLATION (SOLITUDE)				X		X		
LEAF FALL								X
LEISURE ACTIVITY					X			
LONELINESS						X		

KEYWORDS	PRAGUE	LEIPZIG	FUNEN-ODENSE	ATHENS	BARCELONA	BOLOGNA	BRASOV	BHAM
LOSS					X			
LOSS OF GOODS					X			
LOWER MOBILITY				X			X	
LOW-INCOME				X		X		X
MARKET						X		
MENTAL				X		X		
MENTAL DISEASES				X		X		
MENTAL HEALTH			X	X		X		
MOBILITY				X		X	X	
MORBIDITY	X	X		X		X		
MORTALITY	X			X				
NEIGHBOUR SUPPORT			X	X	X	X		
OVERFLOW								X
PATHWAY						X		
POWER OUTAGE			X	X				
PRECARITY								
PREGNANCY				X				
PROTECTED SPECIES					X			
RELOCATION (ASSISTANCE)			X					
RETROFITTING (BUILDING)		X	X					
SAFE (OUTDOOR ACTIVITY)	X	X						
SAFETY				X	X	X		
SANITATION					X			
SEA LEVEL RISE			X					
SECURITY	X	X						
SHOPPING						X		
SMOG	X					X		
SNOW DEFICIT							X	
SOCIAL SUPPORT						X		
SOCIALIZATION			X		X	X		
SOLITUDE						X		
STORM SURGE			X					
STREAM FLOODING			X					
STRESS			X			X		
TEMPERATURE				X	X	X		X
THERMAL COMFORT	X	X		X		X	X	X
TOURISM				X	X		X	
TRANSPORT			X			X	X	X
TRANSPORT INFRASTRUCTURE			X					X
TRANSPORT LINK								X
TRAUMA			X					
TREE HEALTH				X				X
TREE MAINTENANCE								X
UHI		X		X	X	X	X	X
URBAN GREENING			X	X		X		X
VEGETATION PHENOLOGY								X
VEGETATION				X	X			X
VEGETATION MODELLING					X			X
VULNERABLE / FRAGILE		X	X	X	X	X	X	X
WATER				X	X			
WATER AID (IN TERMS OF FOOD STORAGE)			X					
WATER CONSERVATION							X	
WATER DISTRIBUTION					X			
WATER EXCESS								X
WATER MANAGEMENT			X				X	
WATER SCARCITY				X	X		X	
WATER-BORNE DISEASE			X				X	
WILDFIRE		X		X	X		X	
WORKER				X			X	
WORKER SAFETY				X			X	

Climate policies: CSAs contributions (table)

Dear CSA lead

Thank you for providing us with overview information on climate policy in your CSA. This information is summarised in the spreadsheet "Policy Summary".

Task 6.1 asks us to identify conflicts, trade-offs, and synergies between EU climate adaptation and governance approaches and policies to support adaptation plans and strategies at the regional and local level and explore the Mitigation-Adaptation nexus.

In order to do this, we need to understand the policy that supports climate adaptation in your CSA at international, national, regional and local levels. This could be policy specifically for climate adaptation, or it could be policy for climate mitigation or green infrastructure or flood management that has co-benefits for climate adaptation.

Please could you fill in the template for your CSA area. Two examples are provided, for Bham and Bologna (please note some of the details may be missing as we complete the spreadsheet too).

Thank you for your time in advance.

The WP6 team (Letizia, Teo, Emma, Sarah and Deanne)

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
IN-PR-01	International	Europe 2020	The objectives of Europe 2020 are interrelated and essential for overall success. The Commission proposes to translate the EU objectives into national targets and guidelines, ensuring that each Member State adopts the Europe 2020 strategy to its specific situation. In relation to the climate change, "A less resource-intensive Europe" - efforts to the decoupling of economic growth from resource use, supporting the transition to a low-carbon economy, increasing the use of renewable energy sources, modernising the transport sector and promoting energy efficiency. Paris Agreement replaces the Kyoto Protocol in 2020. It is a legally binding international agreement that is part of the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement declares the following goals: - holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. - enhancing the ability to adapt to the adverse impacts of climate change and strengthening climate resilience and low-emission development in a way that does not compromise food production. - aligning financial flows with low-carbon and climate-resilient development. - providing financial support to developing countries to support their efforts to achieve climate neutrality by 2050. However, the agreement does not only include climate targets, but also measures for a healthier environment, agriculture or waste management. In other words, it is a comprehensive plan for the decarbonisation of the entire economy, including the sources for financing. This will be achieved by turning climate and environmental challenges into opportunities across all policy areas and ensuring that the transition is inclusive and fair for all. - no net greenhouse gas emissions by 2050 - economic growth decoupled from resource use - no individual or region left behind	The goals of Europe 2020 are obligate for member states and should implement them into their sectoral policies	EU/national
IN-PR-02	International	Paris Agreement	Paris Agreement replaces the Kyoto Protocol in 2020. It is a legally binding international agreement that is part of the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement declares the following goals: - holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. - enhancing the ability to adapt to the adverse impacts of climate change and strengthening climate resilience and low-emission development in a way that does not compromise food production. - aligning financial flows with low-carbon and climate-resilient development. - providing financial support to developing countries to support their efforts to achieve climate neutrality by 2050. However, the agreement does not only include climate targets, but also measures for a healthier environment, agriculture or waste management. In other words, it is a comprehensive plan for the decarbonisation of the entire economy, including the sources for financing. This will be achieved by turning climate and environmental challenges into opportunities across all policy areas and ensuring that the transition is inclusive and fair for all. - no net greenhouse gas emissions by 2050 - economic growth decoupled from resource use - no individual or region left behind	1) Nationally Determined Contributions (NDCs) to mitigate and adapt to climate change. The contributions of each country must be reported every 5 years. Binding for all member states. 2) Long-term low-emission strategies – i.e. Climate Policy of the Czech Republic	national
IN-PR-03	International	EU Priority: The European Green Deal 2019-2024	The objectives of Europe 2020 are interrelated and essential for overall success. The Commission proposes to translate the EU objectives into national targets and guidelines, ensuring that each Member State adopts the Europe 2020 strategy to its specific situation. In relation to the climate change, "A less resource-intensive Europe" - efforts to the decoupling of economic growth from resource use, supporting the transition to a low-carbon economy, increasing the use of renewable energy sources, modernising the transport sector and promoting energy efficiency. Paris Agreement replaces the Kyoto Protocol in 2020. It is a legally binding international agreement that is part of the United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement declares the following goals: - holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. - enhancing the ability to adapt to the adverse impacts of climate change and strengthening climate resilience and low-emission development in a way that does not compromise food production. - aligning financial flows with low-carbon and climate-resilient development. - providing financial support to developing countries to support their efforts to achieve climate neutrality by 2050. However, the agreement does not only include climate targets, but also measures for a healthier environment, agriculture or waste management. In other words, it is a comprehensive plan for the decarbonisation of the entire economy, including the sources for financing. This will be achieved by turning climate and environmental challenges into opportunities across all policy areas and ensuring that the transition is inclusive and fair for all. - no net greenhouse gas emissions by 2050 - economic growth decoupled from resource use - no individual or region left behind	Financed from the EU funds - Just Transition Mechanism, National Recovery Plan, Modernisation and Innovation Fund (emission allowances), 2025 - social climate fund	EU/national/regional
IN-PR-04	International	European Climate Law (2021)	European Climate Law: - establishes a framework for achieving climate neutrality within the European Union by 2050; - includes, in addition to the binding objective of climate neutrality in the EU by 2050, the aim of achieving negative emissions in the EU thereafter; - provides for a binding EU target of a net domestic reduction in greenhouse gas emissions by at least 55% (compared to 1990 levels) by 2030, and to set a climate target for 2040 within six months of the first global stocktake under the Paris Agreement; - sets out measures to ensure continuous progress towards the global adaptation to climate change goal in the Paris Agreement (see summary).	EU institutions and EU Member States must take all necessary measures to meet the regulation's aims, while taking fairness, solidarity and cost-effectiveness into account. Member States must also: - set up a climate advisory body to provide independent scientific advice to the relevant national authorities; - establish a multilevel climate and energy dialogue involving local authorities, the civil society, the business community, investors, other relevant stakeholders and the public; - submit their 30-year strategy to the Commission by 1 January 2028 and every 10 years after that, updating this every 5 years if necessary.	EU/national
IN-PR-05	International	Fit for 55	Fit for 55 is a package of legislative proposals from the European Commission that aims to reduce European greenhouse gas emissions by 55% by 2030 compared to 1990. This target is an important milestone in achieving carbon neutrality by 2050, to which the European Union has committed itself. The package includes both proposals amending existing legislation and completely new legislative proposals, focusing on areas such as energy, transport, buildings, industry, and land use and forestry. Last but not least, it includes supporting measures aimed at making the transition more socially fair. The proposed measures should bring new opportunities for investment, innovation and job creation.	Obligated for the member states	EU/national
IN-PR-06	International	REPowerEU	In response to the hardships and global energy market disruption caused by Russia's invasion of Ukraine, the European Commission is implementing its REPowerEU Plan to phase out Russian fossil fuel imports. - save energy (13% decrease in 2030) - diversify energy supplies - produce clean energy (45% in 2030)	It is not legally binding but suggests the preparation of new EU legislation and the correction of current Directives (Renewable Energy Directive, Energy Efficiency Directive) which are still in progress.	national
PR-NA-01	National	National Act no. 17/1992 Sb. o životním prostředí a občanské ochrání životního prostředí	sets the general legal framework for environmental protection, orders to keep the principles of sustainability, sets the general financial measures (lower taxes and fees, subsidies etc. for people who help environmental protection)		
PR-NA-02	National	National Act no. 134/1992 Sb. o ochraně přírody a krajiny článek na ochranu krajiny a biodiverzity	Czech Republic doesn't have a climate act, this is (so far) the most important act in terms of environmental and biodiversity protection		

PR-MA-03 PR-MA-04	National National	National Act no. 100/2001 Sb. o postuzování vlivů na životní prostředí National Act no. 469/2023 Sb.	Environmental Impact Assessment (EIA) - the assessment process should include also the impact on climate Energy Act - on business conditions and the performance of state administration in the energy sector	the main strategic document dealing with climate change mitigation, the implementation of the Climate Protection Policy of the Czech Republic should have been evaluated by the end of 2021 and updated by the end of 2023 (not bound) - sets to follow the policies and goals of IPCC and EU - European Parliament and Council Regulation No 525/2013			
PR-MA-05	National	State Energy Policy	Set the national energy policy until 2040				
PR-MA-06	National	State Environmental Policy	The topics addressed by this policy are divided into three main areas (Environment and Health, Climate-Neutral and Circular Economy, Nature and Landscapes), 10 strategic objectives and 32 specific objectives. A vision for 2050 was set for the first time in the policy.				
PR-MA-07	National	Strategy on Adaptation to Climate Change in the Czech Republic	The strategy includes assessment of the climate change impacts as well as proposals for specific adaptation measures - all relevant sectors.				
PR-MA-08	National	National Action Plan on Adaptation to Climate Change (NAP)	Implementation of the Adaptation Strategy - identified economic measures (national and EU subsidy programmes) available for the implementation - all relevant sector including forest and health.				
PR-MA-09	National	Strategic Framework of the Czech Republic (2024)	Sustainable Development Strategy creates a political frame addressing the national long-term priorities for sustainable development. The document fulfills the Czech obligations coming from the Agenda 2030 and the SDGs. This is the first actualization of the framework (the first version is from 2017). It should secure the inter-sectoral (i.e. across all policy areas) coordination in the implementation of the strategy. It includes every 5 years, using a set of indicators.	Provides rules for the preparation of sectoral policies on the national and further on regional level. It focuses on the inter-sectoral coordination in the process of strategies preparation		national/regional	
PR-MA-10	National	Report on the Environment of the Czech Republic	Based on the evaluation reports the national sectoral policies and strategies are coordinated upgraded from the CSA colleagues during the review of the deliverable				
	National	National Environmental Policy (2021)	The National Environmental Policy (NEP) is the main strategic document of the Ministry of Environment and formulates visions and the idealistic state of the environment in 2050. The document integrates international conventions, strategies, legislation as well as national sectoral strategies and legislation. It is divided into three main chapters: Environment and health, Low-carbon and circular economy, Nature and landscape, and 10 more detailed topics. For each specific objective, proposals for typical measures are provided that will contribute to achieving these objectives.	The NEP 2030 represents a top-level, overarching strategic document and is implemented through other thematic strategies under the responsibility of the Ministry of the Environment and other relevant ministries. The NEP objectives are taken into account and further developed them. The NEP objectives will be fulfilled through standard measures specified for individual strategic objectives. The specific form of standard measures will be the subject of yield component and sectoral strategic documents.		national/regional	
PR-MA-11							
PR-MA-12	National	Climate Protection Policy of the Czech Republic	The policy defines the main objectives and measures of climate protection at the national level to ensure the fulfillment of reducing greenhouse gas emissions in connection with the obligations arising from international agreements (Kyoto Protocol, the Paris Agreement and the European Union legislation). This climate protection strategy focuses on the period 2017 to 2030, with a view to 2050, and should thus contribute to the long-term transition to a sustainable low-emission economy of the Czech Republic and to the achievement of the Paris Agreement. The Policy is focused on analysing and proposing solutions of effective GHG reduction in CZE.	Together with the Adaptation Strategy of the Czech Republic, the Policy will lead to strengthening climate protection in the Czech Republic. The Policy will be integrated into individual sectoral policies, and to ensuring the fulfilment of obligations arising from both the Czech Republic's membership in the EU and other international agreements. The Czech Republic has ratified under the Paris Agreement. According to the draft update of the Climate Protection Policy from the spring 2024, the Czech Republic declared a commitment to reduce its emissions by 55% by 2030 compared to 1990.		national	

PR NA.13	National	Strategy on Adaptation to Climate Change in the Czech Republic	The document was prepared in accordance with the EU's Adaptation Strategy. In addition to assessing the likely impacts of climate change in individual key areas (models and prognosis), it contains proposals for specific adaptation and prospective economic instruments as well as education and awareness activities. The linkages with mitigation measures are also addressed within all sectors. The environmental issues caused by climate change in the Czechia are: prolonged droughts, river and flash floods, heavy rainfalls, increasing temperatures, heat waves, extreme winds, wildfires.	The National Action Plan is an implementation document of the Adaptation Strategy of the Czechia. The Action Plan elaborates the framework of measures for the years 2021–2025 set out in the Adaptation Strategy into specific tasks, to which it assigns responsibility, deadlines, relevance of measures to individual manifestations of climate change and sources of financing. The Action Plan contains 108 adaptation measures divided into 322 specific tasks, which are assigned to the relevant ministries, and specifies deadlines for implementation, relevance of measures to individual manifestations of climate change, sources of financing and estimated costs until 2025.	It is implemented by the National Action Plan on Adaptation to Climate Change. The implementation part summarizes the principles and prerequisites for successful implementation of the adaptation strategy implementation tools, setting up the already established system of implementation, monitoring, evaluation and updating and the communication strategy including public involvement.	national/regional
PR NA.14	National	National Action Plan on Adaptation to Climate Change (NAP)		The document is prepared based on Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action. It contains objectives and policies in all five dimensions of the Energy Union for 2021–2050 with a view to 2050. The Czech Republic is committed to meeting the EU's climate-energy goals (emission decrease, increase in renewable energy, energy efficiency, etc.). The document also contains the National Climate Policy. On the other side, the unfinished legislation process of RE-for-55 makes it a bit complicated. The strategic goal of the Czech Republic is to reduce the share of fossil fuels in primary energy consumption to 50% by 2030 and 0% by 2050 and to completely phase out the use of coal for electricity and heat production by 2033.	The plan contains specific measures for implementation, including the responsibilities of individual departments and deadlines for completing the proposed tasks. All the national and local strategic documents are aligned with the tasks and measures given by the National Plan.	national/regional
PR NA.15	National	National Energy and Climate Plan for Czech Republic (2023)		The purpose of the concept is to model the development of an energy mix that will ensure the fulfillment of the climate goals and to ensure the energy security of the Czech Republic. The strategic document that sets out the future goals and priorities of the state in the field of energy in order to ensure sufficient energy at affordable prices for citizens and companies with regard to meeting climate goals. Decarbonizing the energy sector while maintaining competitiveness and energy security is the main challenge of the energy concept.	The document is used for the preparation of the National Energy and Climate Plan, as well as the actualization of National Energy and Climate Policies. The main measures are: the development of photovoltaic power plants, strengthening flexibility of transmission networks, decarbonization of central heating system, building renovations, usage of biomethane and hydrogen etc.	national
PR NA.16	National	National Energy Policy (2024)		The updated Hydrogen Strategy primarily deals with the production and import of hydrogen, which is produced by electrolysis using electricity from renewable sources. The main goal of the Hydrogen Strategy is to reduce the share of fossil fuels in the energy mix and to ensure energy security. The strategy will be a carrier of energy in transportation and it will accumulate the energy. Hydrogen will be a raw material for the chemical industry and a heat source for specific technologies.	This is a crucial document for entities operating in the Czech energy sector, as it shows a clear vision of the state in the field of energy, the outlook for individual measures and support schemes, thereby creating conditions for investments in these sources.	national
PR NA.17	National	Hydrogen Strategy of the Czech Republic (2024)		The document specifies three phases of energy transformation: 1) change of fossil hydrogen to a renewable one; 2) secure import of renewable hydrogen using the global network (Project of common interest - Central European Hydrogen Corridor and Czech German Hydrogen Interconnector); 3) represents the final phase of decarbonization by producing renewable and low-carbon hydrogen in the Czech Republic using newly developed technologies.	The strategy provides new opportunities for Czech businesses oriented on new hydrogen production, storage, and usage technologies. The Czech hydrogen producers will succeed in the world market.	national
PR NA.18	National	Long-term building renovation strategy (2020)		It is based on Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings. The strategy includes an assessment of the building stock in the Czech Republic in the residential and non-residential sectors. It specifies a methodology for determining energy savings for modelling building renovation scenarios and scenarios of possible development of the building stock renovation with indicative milestones for the years 2030, 2040 and 2050. It contains a choice of a building renovation development scenario to be implemented by the Czech Republic. The strategy is a proposal for a cost-effective scenario for the renovation of the Czech building stock, including the residential, public and private sectors, with measurable progress indicators and relevant policies, as a result of which the milestones and goals of the renovation of the building stock in the Czech Republic will be achieved.	The aim is to support the cost-effective transformation of existing buildings by setting up appropriate financial mechanisms that will mobilise private investment and designing policies that will help overcome implementation expectations: new legislation measures, financial support of investment and non-investment areas, education and information activities.	national

PR NA.19	National	National clean mobility action plan (2019)	The document is based on the requirements of Directive 2014/94/EU on the deployment of alternative fuels infrastructure and on the requirements of the Transport White Paper. The action plan deals with electromobility, CNG, LNG and to a limited extent also hydrogen technology (or fuel cell technology).	Updated Transportation and mobility legislation, operational programs and the implementation of the National Environmental Policy to support the purchase of alternative-powered vehicles for state administration	national
PR NA.20	National	National emission reduction program (2019)	The goal of the document is to reduce the amount of pollutants in the air.	The document is one of the implementation strategies of the National Environmental Policy. The sectoral policies must be in accord with the National program.	national/regional/local
PR NA.21	National	Environmental Safety Strategy (2020)	The concept aims to reduce the risk and serious impacts of crises (disasters) caused by the interaction of the environment and society (this mainly concerns disasters of anthropogenic and natural origin and terrorist acts), to reduce the impacts of crises if they could not be prevented, and thus to increase environmental safety.	https://files.fao.org/docs/pdf/csa202024.pdf	
PR NA.22	National	National River Basin Plans (2022)	The National River Basin Plans, in accordance with the Water Directive (EU), replaced the conceptual Document Plan of the Main River Basins of the Czech Republic used in the first planning period. National River Basin Plans sets the goals to reduce the adverse effects of floods and droughts. The Plans are specified by the 10 sub-basin plans. The plans update the definition of areas with potentially significant flood risk. For this area the flood hazard and flood risk maps were prepared. In areas with significant flood risk, the following were proposed: General measures are applied in all municipalities and serve primarily to prevent risk and improve flood management preparedness (creation or updating of flood plans of territorial units, use of flood mapping outputs in territorial planning, establishment and modernisation of rain gauge and water gauge stations, local warning systems, etc.) Specific measures usually include the construction of protective dikes including mobile elements, dry reservoirs and natural flood control measures.	oblige the Ministry of Environment, the Ministry of Agriculture, the regional councils, and the river basin managers to fulfill the goals set	national/regional/local
PR NA.23 PR LO.01	Local	Adaptation strategy of the City of Prague	The plan sets a vision for Prague in 2030 First pillar - Comprehensive and Health City sets those goals: - city of short distances - stop the decline in the number of green areas - health city - create a hierarchical structure of green spaces, support its connectivity, prioritize the nature-based water management activities, pooling the technical infrastructure to support the greening of the city, set the index of green spaces per inhabitant - tree species suitable for city conditions, implement agro-technological measures on the agroecological areas - air quality - support renewable energy sources, low and zero-emission heat sources - sustainable mobility - support public transport, electromobility, bicycle transport, walking, park-ride zones, rail transport etc.	Strategy and concept of green infrastructure for the city Prague Sustainable Drainage Management Plan for Prague Regional Energy Concept Prague's Climate Change Adaptation and Resilience Program of Clean Energy Prague 1st Implementation program of the Strategic Plan of the city of Prague for 2018-2024 Project Wild Vltava River, Project Suburban Park, Southok	city wide
PR LO.02	Local	Climate Plan for the City of Prague 2030 - Prague on the way to carbon neutrality (2021)	The document specifies the default state of the city's carbon footprint and indicates the carbon budget for 2030 - 2050 and how to reach it. The main goals of the document: - Sustainable Energy and Buildings - new heat producers using renewable energy, renovation of buildings owned by the city, community energy, modern street lighting - Sustainable Mobility - support effectiveness and capacity of public transport, increase attractiveness and prepare sustainable air transport - Circular Economy - separation, recycling, transformation - Adaptation Measures - improvement of microclimatic conditions in the city (increase of greenery, decrease of impervious surface, sustainable drainage system, adaptation of buildings and public spaces, improvements of the risk management	Created by the Commission for Sustainable Energy and Climate which was established as an advisory body of the city council of Prague. The document specifies 79 projects with financial sources that might help reach the goal of a significant decrease in the city's carbon footprint by 2030. Preparation of methodical documents i.e.: Stormwater management standards, Urban development standards, Preparation of the City Climate Fund, Climate partnerships (Covenant of Mayors, C40 Cities, Race to Zero, CNCA etc.)	city council, local administration
PR LO.03	Local				

				The strategy focuses on reducing the negative impacts of climate change using nature-based solutions, preservation of water, soil and biological components of nature and landscape, and preserving and restoring ecosystems resistant to climate change and contributing to disaster prevention. Where inappropriate, technical (so-called grey) and soft measures (e.g. early warning systems, information campaigns, etc.) are proposed. The main adaptation measures related to the impacts of climate changes in the city are: - heat waves, heat island and temperatures increase - flash floods, river floods, long-term drought - energy consumption and building adaptation - climate protection and protection of population - sustainable mobility - environmental education The document is also an Action Plan for Sustainable Energy and Climate	The Strategy is followed by the Implementation Plan of the Climate Change Adaptation Strategy 2020 – 2024 (https://www.obchodan.info/mg_uprosel7/bp0896n.pdf), https://www.obchodan.info/mg_uprosel7/bp0896n.pdf, https://www.obchodan.info/mg_uprosel7/bp0896n.pdf, in which individual measures and their implementation are elaborated in more detail, including the division of competencies and the determination of responsibility for individual activities and their time frames. This strategy and Implementation Plan are developed into the Climate Plan (see above).	
Local	Climate Change Adaptation Strategy of the Capital City of Prague (2017)	Digital Flood Management Plan for Prague (2019)		The digital plan integrates local flood management plans for all areas of Prague. It provides a summary of data needed for a brief overview and allows easier orientation to the management plans. The plan consists from the substantive part - water levels of rivers, actual situation on water constructions, level of flood risk, the organizational part - responsibilities of various parties, personal list of responsibilities facing flood events, tasks specific to each party, and the methodical part - information about flood development, flood risk, etc. The document contains a method for ensuring active communication about a flood development, the possibility of influencing the drainage regime, the organization and preparation of security works, how to activate flood authorities, ensuring the reporting and patrol service and the protection of objects in potential flood risk. The document helps prepare and organize rescue works, how to ensure basic functions in objects and territory affected by floods, and the established standard limits for flood activity levels.	The document is activated during the flood events	city wide / regional
				The Concept provides an overview of the energy consumption/production and proportion of different energy sources used in the city of Prague. The concept includes projections for the year 2033 based on the current trends. The analysis counts the contribution of Prague to climate change as the total amount of GHG production during the year. The documents sets a prognosis in the consumption development and provide energy-saving potential for the development of alternative resources. Priorities of the concept: - energy savings in the property of the city of Prague - increase the effectiveness of the energy usage - support the use of renewable energy sources - increasing the security and reliability of energy supplies	Prepares data for the strategy of low-carbon economy for Prague. It is implemented by the Action plan for low carbon economy (P.L implementaci LEK_zarovsky_2013_2022.pdf_2013(50)) It is completed by the other strategies of the city of Prague: - sustainable mobility strategy - strategy for the transition to a low-carbon economy - transport policy of Prague - principles of the development of urban infrastructure https://obchodanby.cz/wp-content/uploads/2024/07/P-Aktualizace-lek-n-plan.pdf	regional
Local	Sustainable Mobility Plan for Prague (2019) and its Action Plan (2024–2036)			It is a document directing the development of the transportation system in the metropolitan area of Prague. The aim of the document is to ensure long-term growth in the quality of life while not unnecessarily burdening the environment or public resources. Describes the current state of the environment and proposes the goals and measures for the support of ecosystems and biodiversity. Climate change, green infrastructure or flood management is not directly connected with the proposed measures, even if these can be perceived as adaptation measures. Priority for landscape protection: - landscape connectivity - landscape character - protected species of plants and animals - urban system of greenery - water ecosystems - forest ecosystems - agricultural ecosystems The document provides technical details of different solutions for water drainage in urban areas proposing green-blue infrastructure measures. It is a practical tool for practice, including information for project specifications. The document provides standards for new buildings or complete renovation in the unburied area or the new construction. The document aims to restore the natural water regime in existing development areas and preserve it.	The document is not accessible on the main page of the city	regional/national/international
Local	Prognosis concept and strategy of nature and landscape protection in Prague (2003)					
Local	Rainwater management standards in the territory of the capital city of Prague				The standards are intended for both the public and commercial sectors. The Standards are not used for extreme flash floods or the case of river floods.	

The work of the Meteomatics partner (Switzerland) has received funding from the Swiss State Secretariat for Education (SERI).

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
IN-LE-01	International	Paris Agreement	Commit to reduce greenhouse gas emissions 65% by 2030 as part of Germany's contribution	Integration of climate goals into urban planning and development Participation in international climate networks and knowledge exchange	national, regional, local
IN-LE-02	International	UN Sendai Framework for Disaster Risk Reduction (2015-2030)	Disaster risk reduction and enhanced resilience	Implementation of disaster risk management plans Early warning systems	national, regional, local
IN-LE-03	International	European Climate Law (2021)	Legally binds EU to climate neutrality by 2050	Annual emissions monitoring and reporting Climate policies reviewed for compliance with goals	national
IN-LE-04	International	EU Green Deal	Reach climate neutrality by 2050	"Fit for 55" package LIFE Climate funding for innovative projects	national, regional, local
LE-NA-01	National	Climate Action Plan 2050	Set long-term strategy for Germany to reduce emissions 80-95% by 2050 compared to 1990 levels	Target of reducing GHG emissions by 80-95% compared to 1990 levels by 2050 Defines benchmarks for decarbonizing the economy while maintaining competitiveness Promotes a "just transition" for regions and industries dependent on fossil fuels	national, regional, local
LE-NA-02	National	Climate Action Programme 2030	Aim to reduce emissions 55% by 2030 through measures like carbon pricing and incentives for energy efficiency	National emissions trading for heating and transport sectors Funding of research and development for climate technologies EV incentive and charging infrastructure	national, regional, local
LE-NA-03	National	Federal Climate Change Act	Establish binding sector-specific emission reduction targets and monitoring mechanisms	Binding sector-specific emission reduction targets Regular monitoring and reporting	national, regional, local
LE-NA-04	National	Federal Climate Change Act (Klimaschutzgesetz)	Legal framework for climate action	Binding sector-specific emission reduction targets Annual review of CO2 balances	national
LE-NA-05	National	Coal Phase-out Act (Kohleausstiegsgesetz)	Phasing out coal-based electricity	Gradual phase-out of coal power by 2038 New program to promote greenhouse-gas-neutral heat generation	national, regional, local
LE-NA-06	National	Hydrogen Strategy for Germany	Promoting sustainable power alternatives	Development of green hydrogen technology Support for industries like steel and aviation to adopt hydrogen	national, regional
LE-NA-07	National	Energieeffizient Construction and Restoration	Improving building energy efficiency	Payments for replacing old oil central heating Increased redemption allowance for energy-efficient restoration Tax breaks for energy efficiency measures in owner-occupied properties	national, regional, local
LE-NA-08	National	Structural Development Act (Strukturförderungsgesetz)	Support for regions affected by coal phase-out	Up to 40 billion euros earmarked for affected regions 14 billion euros for significant investments 3 billion euros for structurally weak locations	national, regional, local
LE-NA-09	National	Master Plan for Charging Infrastructure	Electric mobility promotion	Legal framework for developing privately owned charging structures Solar thermal plant integration into district heating system;	national, regional, local
LE-LO-01 = LE-LO-08	Local	German Strategy for Adaptation to Climate Change Energy and Climate Protection Programme (ESKP) 2014-2020	Focus on local energy and climate protection with over 1,000 measures in urban development, buildings, mobility, and communication	Bidirectional EV charging stations; Renewable energy production Organic lunchbox in schools and day-care centers	regional, local

LE LO 02	Local	Water Security Climate Adaptation Strategy https://static.leipzig.de/fileadmin/mediendatenbank/konzepte/INSEK-2030/INSEK-2030/Broschuere_eng_Fassung_Teil_1.pdf	Address regional climate adaptation through vulnerability plans ; Stakeholder networks, and forest management	Vulnerability analysis for agriculture, forestry, and water management; stakeholder networks for knowledge sharing; Forest management plans to increase resilience	regional, local
LE LO 03	Local	Green Ring Leipzig https://static.leipzig.de/fileadmin/mediendatenbank/konzepte/INSEK-2030/INSEK-2030/GrueRingLeipzig.pdf	Development of green-blue infrastructure promotes climate protection and adaptation	Vulnerability analysis for agriculture, forestry, and water management; Forest management plans to increase resilience	regional, local
LE LO 04	Local	Masterplan Grün-Blau Leipzig 2030	Expansion of urban green spaces	Expansion of urban green spaces Integrated watershed management Preservation of ecological corridors	local
LE LO 05	Local	Strassenbaumkonzept Leipzig 2030	Expansion and maintenance of street trees	Target of planting 1.000 street trees per year Use of climate-resilient tree species Reducing deforestation and green space preservation	local
LE LO 06	Local	Fachkonzept Freiraum und Umwelt (INSEK 2030)	Freiraum preservation and climate adaptation	Enhancement of inner-city biodiversity Urbanization of Leipzig's green corridors Improved public access to urban water bodies	local
LE LO 07	Local	Freiraumstrategie Leipzig	Preservation and enhancement of public green spaces	Promotion of biodiversity	local
LE LO 08	Local	KoopStadt Leipzig Climate Strategy	Climate-resilient urban development https://www.klimatelligence.org/fileadmin/user_upload/Initiativen/Climate_innovations/Launaplan/managementstandards/StandardsClimateStrategyLeipzig2030.pdf	Energy-efficient building retrofits Promotion of public transport and cycling Integration of climate adaptation into urban planning	local

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
IN.FU.01	International	European Floods Directive from 2007	establish a framework for the assessment and management of flood risks to reduce the negative consequences of flooding on human health, economic activities, the environment and cultural heritage in the European Union.	a conduit for local planning on adaptation	
FU.NA.01	National	2008 National Adaptation Strategy (NAS)	First national strategy on climate change adaptation. Outlines how the government, local authorities, and businesses can work together to achieve the national goals for climate adaptation.	National adaptation portal "Klimatilpasning.dk" was established under the Danish Environmental Protection Agency	
FU.NA.02	National	2012 National Action Plan (NAP) https://climate-adapt.eea.europa.eu/en/infobase/publications/denmark - "teat-the2020action2020focuse2020on2020transitions2020international2020climate2020change2020adaptation"	First action plan on how to "climate proof" Denmark. Focused on flooding.	All 98 Danish municipalities had finished their plans in 2014.	
FU.NA.03	National	2018 and 2017 Flood Protection Act	Update of the Flood Protection Act from 2009/2010, based on the EU Floods Directive. The updated Act requires assessment and management of flood risks from streams and lakes. Partly overlaps adaptation in Denmark.	Over the following three years, the Danish Housing and Planning Authority have introduced and gradually updated official guidelines to ensure fulfilling the guidelines on how to plan and adapt to flood risks. The updated guidelines include measures to accommodate the emergence of improved data, with the latest version introduced in 2022 (Danish Housing and Planning Authority, 2022)	
FU.NA.04	National	2018/2022 Revision of the Planning Act - https://jls.dk/Headline/User_upload/Kulturav/engelsk/dokumenter/Planning_Act_2007.pdf https://www.retsinformation.dk/eli/ta/2020/1157	The revised Planning Act requires municipalities to consider climate change when making decisions regarding land use and physical planning. Coastal erosion is now part of municipal adaptation plans.		
FU.NA.05	National	2018 Climate Act	Denmark's first "climate law", which specifies the reduction of greenhouse gas emissions by 70% by 2030 and the binding target of becoming a net-zero society by 2050		
FU.NA.06	National	2020 Service Level Act - https://www.retsinformation.dk/eli/ta/2020/2276	The Service Level Act, which came into effect in 2021, obligates wastewater utilities to develop the necessary adaptation measures for mitigating the flood risks due to heavy rains, defined as roof and surface water runoff.		
FU.NA.07	National	2022 Government Platform	The task of developing a National Climate Adaptation Plan is written into the new government platform after the General Election in 2022.		
FU.NA.08	National	Evaluation of flood and erosion prevention rules in the Planning Act	Aligns with 2016 and 2017 Flood Protection Act		
FU.NA.09	National	Coastal Protection Act	Danish Housing and Planning Authority have introduced and gradually updated official guidelines to ensure fulfilling the guidelines on how to plan and adapt against flood and erosion risk in accordance with the Planning Act	The Climate Act establishes an independent Climate Council to provide expert advice and monitor progress towards these targets and requires the Danish government to develop regular climate action plans. Neither the Climate Act nor the Climate Council concerns adaptation.	
FU.NA.10	National	Flood Risk Management Plans - Cloudburst management plan 2022 - City of Copenhagen	Regulates coastal development and land use to reduce flood risks and protect coastal ecosystems.		
			Requires municipalities to develop and implement plans to assess and manage flood risks, including measures for prevention, protection, and preparedness. https://www.klima-og-erhverv.klima/klima/klimaaftalen-2020/klimaaftalen-for-hjelle-danmark 27 municipalities were subsequently required by law to develop flood risk management plans, so there are multiple such plans. I am sharing the one for Copenhagen: https://international.kk.dk/sites/default/files/2021-09/CloudburstRiskManagementPlan2020.pdf		

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
INAT 01	International	Paris Agreement on Climate Change	Substantially reduce greenhouse gas emissions, mitigate climate change, adapt and strengthen resilience.	In 2018, Greece ratified a National Climate Change Adaptation Strategy (Ministry of Environment & Energy) based on a 2011 study by the Bank of Greece (see below). This strategy mandated 23 regional plans, and established a National Centre for the Adaptation to Climate Change (NACC) in 2017 to coordinate, monitor and evaluate the plans. The NACC also supports the government's implementation of the national adaptation strategy, and the 13 regional adaptation action plans through 2025.	National, regional
INAT 02	International	UN Global Framework for Disaster Risk Reduction (2015-2030)	Reduce disaster risk through a life-cycle approach. Empower youth, local communities and local authorities to be part of an all-hazards approach (guiding principles "1", "4" and "7").	In 2019, Greece completed the first National Risk Assessment (NRA). • It is underpinned by the concept of "Active Resilience" in cooperation with General Secretariat for Civil Protection (GSCP) in the Ministry of Climate Crisis and Civil Protection. • It is a disaster risk assessment that includes the process to create this and what agencies were involved besides the GSCP. • This NRA focuses on nine (9) types of natural and man-made hazards: earthquakes, floods, landslides, fires, extreme weather events, tsunamis, wildfires, volcanic hazards, cyber hazards, industrial accidents, and radiological/nuclear hazards. Extreme weather events are included as a hazard, but under what Ministry? Play a role in extreme heat risk. • The NRA does not use a standardised approach to data for each hazard, does not address much hazard risk and cascading risks, and it does not provide future scenarios or estimates taking into account climate projections, development patterns and other risk drivers. In 2020, Greece began developing a National Disaster Risk Management Plan (NDRMP). There is no sign of process or output other than an input document published by World Bank.	National
INAT 03	International	Post-2020 Global Biodiversity Framework	Minimise the impact of climate change on biodiversity and increase its resilience through nature-based solutions and other ecosystem-based approaches (Target 3). • Restore and enhance nature's contributions to people, including ecosystem functions and services, as well as protection from natural hazards and disasters, through nature-based solutions and ecosystem-based approaches (Target 1).	Implementation examples of NDCs can only be specific (from regional - but usually to local scale).	National
INAT 04	International	Decade on Ecosystem Restoration	The UN Decade on Ecosystem Restoration is a rallying call for the protection and restoration of ecosystems and the services they provide to people and nature. It aims to halt the degradation of ecosystems, and restore them to achieve global goals. Only with healthy ecosystems can we enhance people's resilience and well-being, and secure the livelihoods and food security of all. The UN Decade runs from 2021 through 2030, which is also the deadline for the Sustainable Development Goals, and the timeline scientists have identified as the last chance to prevent catastrophic climate change.	Implementation examples of NDCs can only be specific (from regional - but usually to local scale).	National, regional, local
INAT 05	International	European Green Deal (2020)	Greece and other EU member states have obligations to transform their economies to be climate-resilient and resource-efficient, and have climate adaptation as a key objective of the European Green Deal. • EU greenhouse gas emissions and transform EU country economies to be sustainable, inclusive and resource-efficient.	Greece developed a National Climate Law (2022)	National
INAT 06	International	European Climate Law (2021)	Endorse the binding target to cut emissions by at least 55% by 2030, compared to 1990 levels.	Greece developed a National Climate Law (2022)	National and local
INAT 07	International	EU Mission Adaptation			
INAT 08	International	EU Mission for Climate Resilience and Smart Cities	As part of this Mission, cities make commitments and co-create Climate City Contracts with local stakeholders that include climate action plans and adaptation strategies, and are supported by the Mission through financing and funding. EU Mission run by the Knowledge Cities Programme.	Athens and 5 other Greek cities are part of this EU Mission. Athens Climate City Contract was approved and will be signed September 12, 2024.	Local, city-wide
INAT 09	International	EU Biodiversity Strategy (2020)	Propose ambitious EU actions and commitments to halt biodiversity loss in Europe and worldwide.	NDCs to reduce urban heat island effect and mitigate extreme heat can also contribute to biodiversity goals.	
INAT 10	International	EU Water Framework Directive (WFD, 2000)	Greece and all member states required to implement River Basin Management Plans (RBMPs) to include drought management plans.	Greece is currently working on the third revised version of RBMPs, including Athens RBMP. 2nd revised version of Athens RBMP (2024) (draft) https://water.gk.gr/management-plan-g7/transition-approved-new-agreement-phase-g7-approved-transition-406-g7/	National and regional
INAT 11	International	EU Floods Directive	Required Greece and all member states to have Flood Risk Management Plans (FRMPs).	FRMPs must take into account the effects of climate change, flood risk, and flood management. Some City of Athens projects have this as a specific objective. Greece working on 2nd Flood Risk Management Plans (FRMPs). European Commission referred Greece to the Court of Justice of the European Union in 2023 for failing to provide updated flood risk and flood hazard maps as required by Floods Directive (update every 6 years) is required, 2nd plans were due by the end of 2021, covering the period 2022-2027.)	National

IN AT 12	International	EU Regulation on Nature Restoration (Nature Restoration Law, 2024)	This law is a key element of the European Green Deal and EU Biodiversity Strategy. Water related requirements include restoring the natural connectivity of rivers, and this should be considered as MSs are developed and prioritized for implementation. This is provided as an overarching initiative to address climate adaptation, drought, water scarcity and flood mitigation and adaptation goals and EU description summary. For member states to access funds to address the inequitable impacts of climate change and emission reduction efforts, including housing, clean heating and cooling, and zero or low-emission mobility solutions.	Just recently approved for implementation		national, regional, local
IN AT 13	International	PROPOSED: EU WATER RESILIENCE INITIATIVE	This is proposed as an overarching initiative to address climate adaptation, drought, water scarcity and flood mitigation and adaptation goals and EU description summary. For member states to access funds to address the inequitable impacts of climate change and emission reduction efforts, including housing, clean heating and cooling, and zero or low-emission mobility solutions.	https://climate.ec.europa.eu/eu-water-resilience-initiative_en		trans-national potentially, national, regional
IN AT 14	International	Social Climate Fund and national plans				
AT MA 01	National	Ministries responsible for heat risk and Extreme heat Emergency Management?		Relevant Ministry Roles: Heat waves are primarily managed by the Ministry of Health (considered primarily a health issue). Main issues a heat wave or cyclic to hospitals and health/medical institutions, civil protection services, all Ministries, all regional authorities, and other stakeholders following an alert given by the Hellenic National Meteorological Service. Ministry of the Environment and Energy – no role in heat wave management. Active role responsible for developing and implementing environmental policy, and climate change mitigation (in connection with the carbon footprint and greenhouse gas emissions). Only intervenes related to heat and fire risk. Ministry of Civil Protection and Disaster Crisis (created Sept 2021) – no role in heat wave management. It is responsible for climate adaptation and change. Ministry of Labour and Social Security – worker safety framework (see below). Ministry of Interior issues a circular during extreme heat about worker safety for public sector employees, in communication with Hellenic National Meteorological Service and Ministry of Climate Crisis and Civil Protection. Ministry of Education and Religious Affairs – Ministry of Civil Protection for Emergency provides directions and trainings to Ministry employees related to disaster risks, and coordinates action during emergencies and disasters.		National
AT MA 02	National	National Climate Law (2022) https://www.biodid.org/normedia/document/793411/norm-a939-2022	Transition to climate-resilient and adaptation by climate change, urgent provisions to deal with the energy crisis and environmental protection. Aim to reduce greenhouse gas emissions by 55% by 2030 compared to 1990 levels and achieve net zero emissions by 2050. Municipalities are highly required to reduce emissions and report how they are reducing energy and fuel use. All municipalities must submit an action plan to the Ministry of the Environment and Energy by 1 January 2025. Submission of the Action Plan is a prerequisite for securing funds from the EU Cohesion Fund, Recovery & Resilience Fund (RRF) and other EU funds. The Action Plans should include a GHG emissions reduction plan and a climate adaptation plan. Climate Change Adaptation for Civil Protection (CCAP) in the Ministry of Climate Crisis and Civil Protection the responsibility to issue national plans for hazard-specific disasters. (Unclear whether this includes Extreme Heat, or if Ministry of Health leads on this. National Resilience is included. National Water Agency has the role in low stream priority protection.)	As of September 2024, no municipality had submitted an Action Plan.		national and local
AT MA 03	National	National Civil Protection Plan "New edition" (Ministerial Decision No. 13486/2008)		https://www.ath.gov.gr/jspes/default.asp?2018-07/2429_03.17948900327.pdf		National
AT MA 04	National	National Climate Change Adaptation Strategy (Ministry of Environment & Energy, ratified 2024) https://pam.gov.gr/real-estate/imagetags/protektio-stin-klimatikis-alegi/ https://climate-law.org/globe/comment-the-national-strategy-for-climate-change-adaptation_1692?tag=ec-cs-climate-change-adaptation	This strategy mandated the 13 Regional Authorities to have regional plans (7 for the islands) and a National Council for the Adaptation to Climate Change in 2021 to coordinate, monitor and evaluate the plans.	See Region of Attica regional plan below.		national and regional
AT MA 05	National	Adaptation Strategy for Climate Change and Urban Planning (Ministry of Environment and Energy, ratified 2024) https://climate.ec.europa.eu/eu-water-resilience-initiative_en	Urban greening and green roofs: https://climate.ec.europa.eu/eu-water-resilience-initiative_en Other provisions: https://climate.ec.europa.eu/eu-water-resilience-initiative_en			local and regional
AT MA 06	National	National Biodiversity Strategy and Action Plan	Plan following the plan policy in Greece. In the context of a green transition, all municipalities must prepare a Local Urban Plan (LUP) by 2025 and Special Urban Plans (SUP) will be prepared for strategic development that span multiple municipalities. The plan must include a chapter on climate adaptation (including measures to reduce greenhouse gas emissions, increase resilience levels, and sustainable mobility) and a chapter that includes a local plan for civil protection or emergency management (Bassi et al., 2020). The plan must include a chapter on climate adaptation (including measures to reduce greenhouse gas emissions, increase resilience levels, and sustainable mobility) and a chapter that includes a local plan for civil protection or emergency management (Bassi et al., 2020). The plan must include a chapter on climate adaptation (including measures to reduce greenhouse gas emissions, increase resilience levels, and sustainable mobility) and a chapter that includes a local plan for civil protection or emergency management (Bassi et al., 2020).	Action Plan for specific habitat types or species	national and regional	
AT MA 07	National	Sustainable Development Goals (SDGs)	Research has focused on national policy with the United Nations Sustainable Development Goals (SDGs), particularly SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land), which emphasize the role of forests in achieving climate resilience and protecting biodiversity.	SDG 11.3 (Ratio of land consumption rate to population growth rate) and SDG 15.1 (Forest area as a proportion of total land area) using EO within the JUSRA4 project frame at national level, n.a.t.c (regions, n.a.t.s (municipalities) (2020-2015, 2015-2020 and 1992-2020, respectively)		national and regional
	National	National Energy and Climate Plan (NECP)	https://commission.europa.eu/press-summaries/press-summaries-2023_en			

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BA.01	International	Paris Agreement 2015 https://unfccc.int/sites/default/files/english_paris_agreement.pdf	The Paris Agreement is a global framework that addresses both climate mitigation and adaptation. While its primary goal is to limit global temperature rise, it also emphasises enhancing adaptive capacities, including wildfire risk management, by encouraging resilient ecosystems and sustainable forest management. (Article 6)	Barcelona's green infrastructure projects, such as creating green corridors between forested areas and urban spaces, are aligned with the climate adaptation goals of the Paris Agreement.	
BA.02	International	United Nations Framework Convention on Climate Change (UNFCCC)	The UNFCCC provides a global platform for international cooperation on managing wildfire risks. Through guidelines and funding mechanisms such as the Green Climate Fund, it supports countries in developing wildfire risk reduction strategies.	https://www.gridclimate.fund/	
BA.03	International	Senda Framework for Disaster Risk Reduction (2015-2030) https://www.undrp.org/implementing-senda-framework-on/ohhri-senda-framework	This framework focuses on reducing disaster risks, including wildfires, by enhancing resilience and adaptive capacities at local and national levels. It promotes integrating disaster risk reduction into climate policies, including wildfire preparedness, early warning systems, and recovery.		
BA.04	International (EU)	EU Strategy on Adaptation to Climate Change (2021)	The strategy provides a comprehensive approach to enhancing Europe's resilience to climate change, including wildfires. It encourages Member States to adopt nature-based solutions for wildfire risk management, including forest fire prevention and recovery.	Barcelona Climate Plan (PMU), which includes planting fire-resistant vegetation in public parks and along urban borders to prevent wildfires from spreading.	
BA.05	International (EU)	Forest Strategy for 2030 (2021)	This strategy aims to enhance sustainable forest management and resilience to climate risks, including wildfires. The strategy highlights fire prevention measures, fire suppression technology, and forest restoration as key elements for Member States.	Cataluña Natural Park has adopted sustainable forest management practices as outlined in the EU Forest Strategy. These include regular forest thinning, selective logging, and the creation of firebreaks to prevent the rapid spread of wildfires. This ensures that forests are not only more resilient to climate impacts but also better managed for fire prevention.	
BA.06	International (EU)	EU Green Deal (2020)	The EU Green Deal promotes climate mitigation and adaptation strategies that also impact wildfire management. It encourages sustainable land management, ecosystem restoration, and resilient landscapes, which are essential in mitigating wildfire risks.		
BA.07	International (EU)	European Civil Protection Mechanism (ec.europa.eu/civil-protection)	This mechanism strengthens Europe's ability to respond to natural disasters, including wildfires. It facilitates cross-border cooperation, resource sharing, and the rapid deployment of fire suppression teams and equipment. There is this mechanism for international collaboration among Member and Participatory States both at emergency response and risk planning. So the important part here is the collaborative framework of the Mechanism.		
BA.08	International (EU)	EU Commission: EU's Biodiversity Strategy for 2030	The new 2030 Biodiversity Strategy is a comprehensive, systemic and ambitious long-term plan for protecting nature and reversing the degradation of ecosystems. It is a key pillar of the European Green Deal and of EU leadership on international action for global public goods and sustainable development goals.	National Protected Area Networks: Spain has expanded their national parks, nature reserves, and marine protected areas. For example, Spain has added several marine reserves, enhancing protection in the Mediterranean Sea. Nature 2000: The existing Natura 2000 network has been expanded in countries like Germany and Italy, incorporating more ecologically significant areas to protect species and habitats under threat.	
BA.09	International (EU)	Nature Restoration Law	The Nature Restoration Law is the first continent-wide, comprehensive law of its kind. It is a key element of the EU Biodiversity Strategy, which sets binding targets to restore degraded ecosystems, in particular those with the most potential to capture and store carbon and to prevent and reduce the impact of natural disasters.	Agricultural ecosystems are critical for biodiversity, especially when managed sustainably with biodiversity restoration in mind.	
BA.10	International (EU)	Guidelines on Biodiversity-Friendly Afforestation, Reforestation and Tree Planting		Agroforestry Project in Spain: Spain has been promoting agroforestry—integrating trees into agricultural landscapes—as a means of restoring degraded soils, increasing biodiversity, and enhancing ecosystem resilience. For example, the 'Maderamen' project in southern Spain is a notable example, where oak trees and grazing livestock coexist in a restored ecosystem.	
BA.11	International (EU)	European Commission: Guidelines for Defining, Managing, Monitoring, and Strictly Protecting EU Primary and Old-Growth Forests			
MA.01	National	Catalan Strategy for Adaptation to Climate Change (ESACCC 2013-2020 and ESACCC 2021-2050) https://canicmmit.cerast.cat/canibmit/definiciondelaspoliticadecataluna-adaptacion-climatica-2013-2030/	Catalonia's adaptation strategy outlines specific actions for addressing climate risks, including wildfires. It includes forest management practices to enhance resilience, wildfire prevention, and preparedness measures.		
MA.02	National	Catalan Forest Law 6/1988	This law provides a framework for managing forest resources in Catalonia, focusing on wildfire prevention, forest restoration, and fire management strategies. It also promotes collaboration with local authorities in fire-prone areas.	Under this law, the Collserola Park and other forested areas in the BMA are managed with regular maintenance practices to prevent the buildup of flammable material, such as dry leaves and dead trees. Local governments work with forestry experts to clear brush and reduce vegetation density, minimizing fire hazards.	
MA.03	National	Wildfire prevention plans	Catalonia has developed specific wildfire prevention plans for its regions, including in the Barcelona Metropolitan Area. These plans outline local actions for fire prevention, such as fuel management, controlled burns, and firebreak creation.	https://seccm.mai.gub.es.com/decree/6645529f52364332449610c724662	
MA.04	National	Pla Informatiu	Pla Informatiu is Catalonia's wildfire emergency plan and is activated annually during the fire season. In the BMA, this plan includes coordinated emergency drills, public awareness programs, and the deployment of rapid response units to		

BA LO 01	Local	Metropolitan Climate Plan https://www.amb.cat/web/medi-ambient/actualitat/publicacions/detal/-/publicacio/pla-clima-i-energia-2030/71551511818	The Barcelona Metropolitan Area has developed a Climate Plan that integrates climate adaptation and mitigation strategies. The plan includes measures for managing wildfire risks, such as reforestation, green infrastructure development, and enhancing urban and peri-urban forest resilience.		
BA LO 02	Local	Local wildfire prevention plans Local wildfire prevention plans	Municipalities have developed specific wildfire prevention and management plans that include fuel reduction in peri-urban areas. In Barcelona metropolitan area, since it is a high wildfire risk area, all municipalities must have a local wildfire prevention plan. These local plans are not public, and only public authorities have access to them. From these plans I would highlight that they identify risk scenarios, vulnerable elements (wildland-urban interface, parking lots...), wildfire infrastructure (water points, roads...) and strategic management areas (i.e. forest areas that should be managed in order to get prepared for a potential wildfire). So, the wildfire prevention plans are reference documents to help public authorities (such as local councils, fire services or civil protection) manage wildfire emergencies.		
BA LO 03	Local	Colòria Wildfire Prevention Plan	The Colòria Natural Park, a key forest area in the BMA, has a specific management plan that focuses on preventing and managing wildfires. It includes adaptive management strategies to reduce the risk through sustainable forest management practices.		
BA LO 04	Local	Special Plan for the Protection of the Natural Environment and Landscape of the Serra de Colòria Natural Park https://parcnaturalcoloria.cat/pla-spcial-ds-proteccio-del-medi-natural-i-de-salut-de-l-parc-natural-de-la-serra-de-coloria-2021-2026	It is a comprehensive management and protection plan specifically designed for the Colòria mountain range, located near Barcelona. The plan focuses on preserving the natural ecosystem and landscape of the park while balancing human activities like recreation and urban expansion.	https://data.gencat.cat/opusportal/consultar/detal/Expedient/221041/Document	13

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
IN BO 01	International	Green deal (https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en)	Microclimate → Health protection. It sets out an action plan to make the European Union's economy sustainable, turning climate and environmental challenges into opportunities in all policy areas in a fair and inclusive way. The European Green Deal is the new growth strategy for a sustainable, cleaner, safer and healthier European economy.		
IN BO 02	International	Agenda 2030 ONU (https://www.agendacione.gov.it/comunicazione/agenda-2030-per-lo-sviluppo-sostenibile/7lang-en)	Microclimate → Health protection. This Agenda is an Action programme for people, the planet and prosperity. The 17 objectives set for sustainable development have a global validity, concern and involve all countries and components of society, from private companies to the public sector, from civil society to information and culture operators.	Outdoor microclimate and health issues of fragile population including socialization opportunities	
IN BO 03	International	One Health strategy (https://www.eea.europa.eu/en/topics/one-health/health/cross-agency-knowledge-for-one-health-action)	Microclimate → Health protection. Applying a One Health approach means that all actions to prevent, predict, detect and respond to health threats should take into account the interlinkages between human, animal, plant and ecosystem health. The One Health approach must now be translated into action at different levels of governance, supported by a strong interface between science, policy and society which responds to key principles of collaboration, coordination, communication and capacity-building.		
IN BO 04	International	Forging a climate-resilient Europe – the new EU Strategy on Adaptation to Climate Change (https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:2021000082)	Microclimate → Health protection. The European Climate Law proposal provides the foundation for increased ambition and policy coherence on adaptation. It sets both the framework for achieving climate neutrality and the ambition on adaptation by 2050 by integrating the internationally-shared vision for action into EU law.		
IN BO 05	International	Delivering on EU Food Safety and Nutrition in 2050 - Future challenges and policy preparations (https://publications.jrc.ec.europa.eu/repository/handle/JRC101971)	Microclimate → Health protection. Access to safe and nutritious food to meet individual citizens' choices is a key element of health and well-being, but striking the balance between facilitating the widest possible choice of foodstuffs and guaranteeing the safety of an ever-growing variety of origins, ingredients and production methods is a delicate task. Looking into the major drivers of future developments should help identify the areas of highest future risks and provide the basis to analyze the existing legal and policy framework within the context of future vulnerabilities and foreseeable challenges.	Implementation to avoid food deserts for elderly and disabled	
IN BO 06	International	United Nations Convention on the Rights of Persons with Disabilities (https://ec.europa.eu/social/main.jsp?langId=en&catId=1138)	definition of the condition of disability, basic assessment, reasonable accommodation, multidimensional assessment for the development and implementation of the personalised and participatory individual life project. (G.U. 14.05.2024, n. 11)	Implementation of risk assessment for disabled and elderly (determination of specific coefficient for the risk equation)	
IN BO 07	International	EUROPE 2020 A strategy for smart, sustainable and inclusive growth (https://eur-lex.europa.eu/lexUriServ/lexUriServ.do?uri=COM:2010.2020:FIN:EN:PDF)	Fragiles and other diversities → Progetto di Vita. Europe 2020 is the EU's growth strategy for the new decade. The Union has set five ambitious objectives - on employment, innovation, education, social inclusion and climate/energy - to be reached by 2020. Each Member State will adopt its own national targets in each of these areas. Concrete actions at EU and national levels will underpin the strategy.		
IN BO 08	International	Strategy for the rights of person with disabilities 2021-2030 (https://ec.europa.eu/social/main.jsp?catId=1488&langId=en)	The Strategy for the Rights of Persons with Disabilities 2021-2030 intends to tackle the diverse challenges that persons with disabilities face. The goal is to ensure that persons with disabilities in Europe, regardless of their sex, racial or ethnic origin, religion or belief, age or sexual orientation, enjoy their human rights, have equal opportunities, have equal access to participate in society and economy, are able to decide where, how and with whom they live, can move freely in the EU regardless of their support needs, no longer experience discrimination.		
IN BO 09	International	Small business act for EU	Food desert neighborhood. To recognise the central role of SMEs in the European economy and to activate a comprehensive policy framework, at EU and Member State level, through 10 principles to guide policy formulation and implementation at both EU and Member State level. These principles are essential to enhance initiatives at EU level, create a level playing field for SMEs and improve the legal and administrative environment across the EU.	Implementation at local level of the small business policies, linkage to the regional level policies.	
IN BO 10	International	Transit Oriented Development strategy	the Bank's Community of Practice on Transit Oriented Development has developed a methodology called the 3 Value (3V) Framework, which considers the node, place, and market potential value of each station. The 3V Framework outlines a typology to facilitate TOD implementation at the metropolitan and urban scale in various contexts as part of a methodology that aims to: • identify the economic development potential of different transit corridors and different areas around mass transit stations in terms of type, scale, and timing, considering the level of connectivity and market demand through quantified indicators • develop planning and implementation measures and prioritize limited public resources to create such value through coordinated interagency measures • develop and communicate with residents, government agencies, and private developers a vision for the city that articulates development around its mass transit network.		
IN BO 11	International	Pathway to a Healthy planet for all			
IN BO 12	International	Farm to fork strategy			

30 NA.01	National	NAS (https://www.mase.gov.it/sites/default/files/archivio/allegati/cima/strategia_adattamentoCC.pdf)	General objective: to develop a national vision on the common points to be taken to face climate change, counteracting and mitigating its impacts. Five strategic lines of action: -improve knowledge on climate change and its impacts; -describe the vulnerability of the territory, the adaptation options for all natural systems and relevant socio-economic sectors, and any associated opportunities; -promote participation and increase stakeholder awareness in the definition of sectoral adaptation strategies and plans -support awareness-raising and information on adaptation through widespread communication activities; https://www.mase.gov.it/sites/default/files/archivio/allegati/cima/strategia_adattamentoCC.pdf		
30 NA.02	National	Report on the state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy (https://www.mase.gov.it/sites/default/files/archivio/allegati/cima/znacc_2014_rapporto_stato_conoscenza.pdf)	Report on the state of scientific knowledge on impacts, vulnerability and adaptation to climate change in Italy		
30 NA.03	National	Analysis of EU and national legislation relevant to impacts, vulnerability and adaptation to climate change (https://www.mase.gov.it/sites/default/files/archivio/allegati/cima/znacc_2014_rapporto_analisi_normativa.pdf)	Analysis of EU and national legislation relevant to impacts, vulnerability and adaptation to climate change		
30 NA.04	National	Elements for a National Strategy for Adaptation to Climate Change (https://www.mase.gov.it/sites/default/files/archivio/allegati/cima/znacc_2014_elementi.pdf)	Elements for a National Strategy for Adaptation to Climate Change		
30 NA.05	National	National Plan for Adaptation to Climate Change (https://va.mite.gov.it/it-IT/Oggetti/Documents/7726/11206)	The information and data of the National Adaptation Plan will be made available following its approval.		
30 NA.06	National	Legislative Decree No. 62 of 03.05.2024 - Articles 17 and 18 (https://www.gazzettaufficiale.it/eli/id/2024/05/14/24G00079/Sg)	Definition of the condition of disability, basic assessment, reasonable accommodation, multidimensional assessment for the development and implementation of the personalised and participatory individual life project. (G.U. 14-05-2024, n. 111)		
30 NA.07	National	Department for the Government programme - Focus Disability policies (Legislative Decree 62/2024) (https://www.programmagoverno.gov.it/media/du/pulep/focus-disabilita-dlgs-n-62-2024.pdf)			
30 NA.08	National	LEGISLATIVE DECREE No. 62 of 3 May 2024 'Definition of the condition of disability, basic assessment, reasonable accommodation, multidimensional assessment for the development and implementation of the personalised and participatory individual life project'. READING NOTE ON THE MAIN RULES OF INTEREST TO MUNICIPALITIES (https://www.anc.it/wp-content/uploads/Nota-lettura-dlgs-62-disabilita.pdf)	READING NOTE ON THE MAIN RULES OF INTEREST TO MUNICIPALITIES		Full implementation and monitoring at the metropolitan level of the legislative decree.
30 RE.01	Regional	The Pact for Jobs and Climate (https://www.regione.emilia-romagna.it/patto-lavoro-e-per-il-clima)	The new Pact is not a new planning tool but – using the existing ones as a reference starting from the Metropolitan Strategic Plan – it contributes on the one hand to providing a timely response with actions for the emergency and on the other hand it selects some strategic projects divided into priority areas (clusters) for sustainable development and growth. The new Pact is also intended to be the Metropolitan City's contribution to the new Regional Pact for Work and the Climate.		Attention to caregivers
30 RE.02	Regional	The Region for the climate: the mitigation and adaptation strategy for climate change (https://ambiente.regione.emilia-romagna.it/it/cambiamenti-climatici/strategia-mitigazione-adattamento/) la regione per il clima la strategia di mitigazione e adattamento per i cambiamenti climatici	In the page there are also all the sectorial risks matrix, in Italian		
30 LO.01	Local	The Metropolitan Area Development Plan (MADP) (https://www.pmbologna.it/Sinres_didattiva) (https://www.pmbologna.it/pm_approvato)	is the new general development planning instrument for the Metropolitan City that sets out the choices for the sustainable development of the entire catchment area. The aim of the MADP is to promote and foster a sustainable, resilient and attractive area, in which the protection of health and the environment, the beauty of urban and natural places, geographical equity, employment and innovation come together as a single driving force for the economic development of the area.		Focus on exposure to HW of elderly and disables

BO LO 02	Local	SECAP Bologna Municipality (https://www.comune.bologna.it/portal/C_A944/api/content/download?d=632&cid=7266400994e4c1c1 or (https://www.comune.bologna.it/portal/C_A944/api/content/download?d=6348764b04a350998d007)	In April 2019, the Municipality of Bologna joined the Covenant of Mayors for Energy and Climate and in April 2021 it approved the Energy and Climate Action Plan (Paec).	.NBS measures to specifically protect fragiles	
BO LO 03	Local	SECAP monitoring plan (https://www.comune.bologna.it/portal/C_A944/api/content/download?d=6348764b04a350998d007)	update of the 2023 qualitative monitoring plan	.NBS measures to specifically protect fragiles	
BO LO 04	Local	The Bologna Charter for the Environment (2017) (https://www.cittametropolitana.bo.it/portale/Engine/RAServeFile.php/P/2438210010100) (https://www.cittametropolitana.bo.it/portale/Engine/RAServeFile.php/P/comuni_cali_stamp/carra_d_bologna_per_l_ambiente.pdf)	On the occasion of the G7 Environment Summit, hosted in Bologna on 11 and 12 June, metropolitan cities become the real protagonists of environmental protection and the promotion of sustainable development with the signing of the Bologna Charter for the Environment: the first protocol of its kind, at national level, in the environmental field. From waste to air and water quality, from energy transition to sustainable mobility, there are eight macro objectives identified by the Bologna Charter for the Environment to be included in metropolitan agendas for sustainable development.	.Slow mobility for elderly and disables	
BO LO 05	Local	Pact for Work and Sustainable Development (https://www.cittametropolitana.bo.it/portale/Patto_metropolitano_lavoro_viluppato_sostenibile) (https://www.cittametropolitana.bo.it/portale/Engine/RAServeFile.php/P/news/PATTO_metropolitano_per_il_lavoro_e_lo_sviluppo_sostenibile.pdf) (https://www.cittametropolitana.bo.it/portale/Engine/RAServeFile.php/P/news/PATTO_metropolitano_per_il_lavoro_e_lo_sviluppo_sostenibile_1_Cluster.pdf)	a project born in the Metropolitan City that aims to attract businesses and talents, and support supply chains and the territory in the green and digital transition in order to support the growth and innovation process of the entrepreneurial fabric and increase quality employment. more documents → 6.6.2025 : https://www.cittametropolitana.bo.it/agenzia_sviluppo_sostenibile/Engine/RAServeFile.php/ACCORDO_MASE_OM_BOLOGNA_avviso_n253_2023_signed.pdf	Related impacts to caregivers	
BO LO 06	Local	The Metropolitan City of Bologna participated in the LIFE VEG-GAP project (2018-2022) https://www.lifeveggap.eu/ . At this link the two final reports: https://www.lifeveggap.eu/files/rapporti/documenti/	the carrying capacity must remain within the metropolitan area development plan (scenario) is the result of a medium-term action that began in 2019, i.e. the establishment of a database of support for the plan in synergy with all the Municipalities of the Metropolitan City, in particular with the Municipality of Bologna. Among the medium-term actions of adaptation to Climate Change started in 2019 there is the promotion of the climate risk assessment tool developed by the Derris Project also on all the industrial areas of the Metropolitan area. The Metropolitan City of Bologna participated in the LIFE VEG-GAP project (2018-2022), which stems from the awareness that the use of a natural resource, such as urban greenery, represents a great opportunity to improve the quality of life in the city in its many social, economic and cultural aspects.		
BO LO 07	Local	urban planning sustainable mobility-Metropolitan city of Bologna - https://pumsbologna.it/Documenti ; https://pumsbologna.it/Engine/RAServeFile.php/documenti/approvazione/REL_AZIONE/Relazione.pdf ; https://pumsbologna.it/Logistica	there is a section dedicated to Logistic	plan to optimise the delivery to markets to reduce the urban pollution	citizens
BO LO 08	Local	Urban health (https://salute.regione.emilia-romagna.it/prp/aree-tematiche/ambiente-clima-e-salute/urban-health)	Within the scope of the 'Environment, Climate and Health' programme, the Urban Health strategic objective (promotion and support of intersectoral interventions to make cities healthier and more inclusive) has been implemented through an action aimed at preparing, adopting and disseminating technical and methodological guidance documents, as well as collecting 'recommended practices' and/or 'good practices' in the field of 'livability, health and urban well-being' of local facilities. For this purpose, a multidisciplinary working group was set up, with expertise in public health and urban planning, made up of regional and university staff and personnel from the Local Health Authority and ARPAE (Regional Agency for the Protection of the Environment).	improving the health protection for elderly with cognitive impairments during heatwaves	elderly and chronics
BO LO 09	Local	PSM - Development Strategic: Metropolitan Plan		Creation of hubs for food delivery to convert the distribution from fossil to electric vehicles.	
BO LO 10	Local	AGENDA 2.0 sustainable development: metropolitan city area			
BO LO 11	Local	Bologna metropolitan plan for the social economy			

CODE	Scale	Policy	Focus	Implement examples	Beneficiaries
BR 01	International	Covenant of Mayors	Signature of the Covenant of Mayors 2008 aim: reduce greenhouse emissions by 14% before 2020 2021 aim: reduce the CO2 emission by 15% before 2030 and to reach climate neutrality by 2050 https://www.bravacity.eu/files/https://www.bravacity.eu/files/BravacityStrategicAgreementAndNon-DisputeResolutionMechanism.pdf	1. A city's signatory of the Covenant of Mayors, Brason Municipality implemented the Sustainable Energy Action Plan, focused on the following areas of intervention: - Buildings and related installations; - Public transportation; - Local energy production; - Green waste heating systems; - Urban planning; - Public purchase; - Communication; - Waste management. All these measures led to achieving the aimed reduction in greenhouse emissions by 2020. 2. Brason Municipality developed a Sustainable Energy Action Plan (SEAP) with a target of 12% CO2 reduction and developed a Sustainable Energy Action Plan (SEAP) for the time frame 2010-2020. The SEAP is extended to commitments by signing the new Covenant of Mayors for Climate and Energy pledge, aiming for a 40% CO2 emissions reduction by 2050. By signing commitments with the Green Deal, renewing the Covenant of Mayors pledge, and adopting a Sustainable Energy and Climate Action Plan (SECAP) the Municipality's aim was that of reducing CO2 by 15% by 2030 and achieve climate neutrality by 2050. 3. The Energy Transition Team of the Municipality of Brason was created in 2020 and covers strategic areas, being forwarded by the City Hall of the Municipality of Brason, the local public transport company, the local electricity distribution company, the local natural gas company, the company that manages public lighting (local, the local high-efficiency cogeneration company, the regional operator of public water supply and sewerage services, the local sanitation company), the local authority for environmental protection, Transilvania University and local initiative group made up of professionals in architecture, communication, technology, sociology and economics, with the aim of redesigning public services through strategic design around the needs of citizens, by involving them in the process. Brason Municipality has obtained and implemented EU funding projects that integrate solutions in regard to: purchase of hybrid and electrical means of public transport, sustainable food policy measures, public bike lanes, sustainable building refurbishment and others. Present measures under implementation in order to reach the above-mentioned targets: - Initiate & support information campaign on Brason's aim to reach climate neutrality by 2050; - Continue the process of public lighting system modernization: LED equipment, tele-management; - Adopt measures to increase the use of public transport on a regular basis by least 60% of the population; - Encourage the use of alternative means of transportation, by enlarging the cycling infrastructure with a minimum of 100 km routes at maximum safety standards; - Develop campaigns to promote rational and sustainable consumption habits among the citizens; - Ensure selective waste collection within the whole city; - Adapt the urban policies to the assumed objective of reaching climate neutrality. Future measures to be implemented in order to reach the above-mentioned targets: - Increase the use of public transport on a regular basis by at least 75% of the population; - Reach 100% electric local public transportation; - Increase the use of public transport on a regular basis by at least 75% of the population; - Eliminate the use of personal vehicles in the historical centre (excepting residents living in the area); - Interconnect all neighbourhoods in the city through a minimum of 200 km cycling routes; - Ensure a minimum of 30% electricity and heat supply necessary for public buildings from "green" solution – solar panels, wind power plants, thermal pumps, biogas; - Reach the threshold of 12-20 km green spaces/inhabitant, equivalent of 50% of the green spaces as regulated by EU; Brason collaborates with the Energy Cities network (https://energy-cities.eu/members/members-map), partnering with Embassies like Ireland, France, UK and also being engaged in multiple EU networks (such as those supported by the Interreg and the Growing Urban Transitions programmes). Moreover, Brason has been represented by AMEE in multiple climate migration projects, many of them being funded under Horizon 2020 (e.g., Towards Multi-stakeholders transition roadmap with citizens at centre (TMOACROV), progressSMART, V-act, and Hub-act). Additionally, Brason is also part of the Energy Cities network, through the support provided under the national areas in the EU project, which is funded by the European Commission. The city works in all five Green City Accord areas: it closely monitors the air quality in 29 areas, and implemented measures to reduce air pollution levels. It increased efficiency of urban sanitation; and improved its wastewater management and treatment, while connecting 78% of its population to a centralised sewage system. Brason implemented forest management plans, established protected natural areas, and regenerated former industrial sites into green space. Now, Brason works towards developing green infrastructure, engaging the community in nature conservation, improving the quality of existing green spaces. After expanding its infrastructure and enhancing selective waste collection efforts, the city has the long-term objectives of achieving zero waste to landfill and implementing and eliminating food waste by 2050. The UAFU partnership on food policy relevant stakeholders from all parts of the food chain in order to build a shared vision together with the necessary means for its sustainable implementation. It will bring added value by creating a major one-stop shop platform of exchange enabling better visibility on and synergies between the ongoing initiatives. Its role will be to coordinate and support the implementation of the food policy, as well as to provide a platform for the exchange of experiences and best practices. Brason is also part of the Urban Food Policy Pact, an international protocol aimed at addressing food related issues at the urban level which is signed by more than 100 cities. The framework for action includes measures related to Governance, Sustainable diets and nutrition, Social and economic equity, food production, food supply and distribution, by more than 100 cities. The framework for action includes measures related to Governance, Sustainable diets and nutrition, Social and economic equity, food production, food supply and distribution, as well as food waste.	Municipal scale
BR 02	International	European Green Deal	European Green Deal - ensure the sustainability of the economy by turning climate and environmental challenges into opportunities in all policy areas and ensuring a fair and inclusive transition for all. The European Green Deal contains actions to encourage the efficient use of resources by moving to a clean circular economy and to end climate change.	Future measures to be implemented in order to reach the above-mentioned targets: - Increase the use of public transport on a regular basis by at least 75% of the population; - Reach 100% electric local public transportation; - Increase the use of public transport on a regular basis by at least 75% of the population; - Eliminate the use of personal vehicles in the historical centre (excepting residents living in the area); - Interconnect all neighbourhoods in the city through a minimum of 200 km cycling routes; - Ensure a minimum of 30% electricity and heat supply necessary for public buildings from "green" solution – solar panels, wind power plants, thermal pumps, biogas; - Reach the threshold of 12-20 km green spaces/inhabitant, equivalent of 50% of the green spaces as regulated by EU; Brason collaborates with the Energy Cities network (https://energy-cities.eu/members/members-map), partnering with Embassies like Ireland, France, UK and also being engaged in multiple EU networks (such as those supported by the Interreg and the Growing Urban Transitions programmes). Moreover, Brason has been represented by AMEE in multiple climate migration projects, many of them being funded under Horizon 2020 (e.g., Towards Multi-stakeholders transition roadmap with citizens at centre (TMOACROV), progressSMART, V-act, and Hub-act). Additionally, Brason is also part of the Energy Cities network, through the support provided under the national areas in the EU project, which is funded by the European Commission. The city works in all five Green City Accord areas: it closely monitors the air quality in 29 areas, and implemented measures to reduce air pollution levels. It increased efficiency of urban sanitation; and improved its wastewater management and treatment, while connecting 78% of its population to a centralised sewage system. Brason implemented forest management plans, established protected natural areas, and regenerated former industrial sites into green space. Now, Brason works towards developing green infrastructure, engaging the community in nature conservation, improving the quality of existing green spaces. After expanding its infrastructure and enhancing selective waste collection efforts, the city has the long-term objectives of achieving zero waste to landfill and implementing and eliminating food waste by 2050. The UAFU partnership on food	Municipal scale
BR 03	International	Green City Accord	Movement of European mayors committed to making cities cleaner and healthier. It aims to improve the quality of life for all Europeans and accelerate the implementation of relevant EU environmental laws.	Future measures to be implemented in order to reach the above-mentioned targets: - Increase the use of public transport on a regular basis by at least 75% of the population; - Reach 100% electric local public transportation; - Increase the use of public transport on a regular basis by at least 75% of the population; - Eliminate the use of personal vehicles in the historical centre (excepting residents living in the area); - Interconnect all neighbourhoods in the city through a minimum of 200 km cycling routes; - Ensure a minimum of 30% electricity and heat supply necessary for public buildings from "green" solution – solar panels, wind power plants, thermal pumps, biogas; - Reach the threshold of 12-20 km green spaces/inhabitant, equivalent of 50% of the green spaces as regulated by EU; Brason collaborates with the Energy Cities network (https://energy-cities.eu/members/members-map), partnering with Embassies like Ireland, France, UK and also being engaged in multiple EU networks (such as those supported by the Interreg and the Growing Urban Transitions programmes). Moreover, Brason has been represented by AMEE in multiple climate migration projects, many of them being funded under Horizon 2020 (e.g., Towards Multi-stakeholders transition roadmap with citizens at centre (TMOACROV), progressSMART, V-act, and Hub-act). Additionally, Brason is also part of the Energy Cities network, through the support provided under the national areas in the EU project, which is funded by the European Commission. The city works in all five Green City Accord areas: it closely monitors the air quality in 29 areas, and implemented measures to reduce air pollution levels. It increased efficiency of urban sanitation; and improved its wastewater management and treatment, while connecting 78% of its population to a centralised sewage system. Brason implemented forest management plans, established protected natural areas, and regenerated former industrial sites into green space. Now, Brason works towards developing green infrastructure, engaging the community in nature conservation, improving the quality of existing green spaces. After expanding its infrastructure and enhancing selective waste collection efforts, the city has the long-term objectives of achieving zero waste to landfill and implementing and eliminating food waste by 2050. The UAFU partnership on food	Municipal scale
BR 04	International	Urban Agenda for the EU Thematic Partnership on Food and Nutrition Urban Urban Food Policy Pact	The Urban Agenda for the EU (UAFU) addresses urban challenges by setting up Partnerships between cities, the European Commission, other EU institutions and bodies, national governments and other stakeholders such as non-governmental organisations. These partnerships develop action plans that contribute to the three UAFU pillars: better regulation, better funding and better knowledge.	Future measures to be implemented in order to reach the above-mentioned targets: - Increase the use of public transport on a regular basis by at least 75% of the population; - Reach 100% electric local public transportation; - Increase the use of public transport on a regular basis by at least 75% of the population; - Eliminate the use of personal vehicles in the historical centre (excepting residents living in the area); - Interconnect all neighbourhoods in the city through a minimum of 200 km cycling routes; - Ensure a minimum of 30% electricity and heat supply necessary for public buildings from "green" solution – solar panels, wind power plants, thermal pumps, biogas; - Reach the threshold of 12-20 km green spaces/inhabitant, equivalent of 50% of the green spaces as regulated by EU; Brason collaborates with the Energy Cities network (https://energy-cities.eu/members/members-map), partnering with Embassies like Ireland, France, UK and also being engaged in multiple EU networks (such as those supported by the Interreg and the Growing Urban Transitions programmes). Moreover, Brason has been represented by AMEE in multiple climate migration projects, many of them being funded under Horizon 2020 (e.g., Towards Multi-stakeholders transition roadmap with citizens at centre (TMOACROV), progressSMART, V-act, and Hub-act). Additionally, Brason is also part of the Energy Cities network, through the support provided under the national areas in the EU project, which is funded by the European Commission. The city works in all five Green City Accord areas: it closely monitors the air quality in 29 areas, and implemented measures to reduce air pollution levels. It increased efficiency of urban sanitation; and improved its wastewater management and treatment, while connecting 78% of its population to a centralised sewage system. Brason implemented forest management plans, established protected natural areas, and regenerated former industrial sites into green space. Now, Brason works towards developing green infrastructure, engaging the community in nature conservation, improving the quality of existing green spaces. After expanding its infrastructure and enhancing selective waste collection efforts, the city has the long-term objectives of achieving zero waste to landfill and implementing and eliminating food waste by 2050. The UAFU partnership on food	Municipal scale

BR.VA.06	National	Romania's general transport master plan, which aims to develop a sustainable transport system, which will contribute to increasing the productivity of the economy.	Romania's general transport master plan, which aims to develop a sustainable transport system, which will contribute to increasing the productivity of the economy.	National scale
BR.VA.07	National	Romania's long-term strategy to reduce greenhouse gas emissions aims to establish the strategic framework for implementing the climate change mitigation targets assumed by Romania. This strategy defines the directions for a green transition at the national level and for achieving climate neutrality by 2050.	Romania's long-term strategy to reduce greenhouse gas emissions aims to establish the strategic framework for implementing the climate change mitigation targets assumed by Romania. This strategy defines the directions for a green transition at the national level and for achieving climate neutrality by 2050.	National scale
BR.VA.08	National	National Strategy on Adaptation to Climate Change aims for sectoral development according to the principles of the New EU Adaptation Strategy, formulating the directions for enhancing adaptive capacity and resilience of socio-economic and natural systems.	National Strategy on Adaptation to Climate Change aims for sectoral development according to the principles of the New EU Adaptation Strategy, formulating the directions for enhancing adaptive capacity and resilience of socio-economic and natural systems.	National scale
BR.VA.09.1 e 2	National	The national plan for the development of hydrographic basins in Romania, which aims to identify the future socio-economic and environmental requirements regarding water resources, the identification of feasible options for achieving the balance between water demand and available water resources, the identification of the primary assessment of the potential risk to water-related flooding, identifying the actions, measures, solutions and works necessary to achieve the accepted degree of flood protection of human settlements and goods, reducing the effects of droughts, excess moisture and soil erosion, using the potential of water, meeting environmental requirements on water resources (requirements hydrological, hydraulic and ecological), identifying constraints, conflict of interest and solutions, impact analysis and assessment of the risks induced by the actions, measures, solutions and works proposed in the water shed management plan.	The national plan for the development of hydrographic basins in Romania, which aims to identify the future socio-economic and environmental requirements regarding water resources, the identification of feasible options for achieving the balance between water demand and available water resources, the identification of the primary assessment of the potential risk to water-related flooding, identifying the actions, measures, solutions and works necessary to achieve the accepted degree of flood protection of human settlements and goods, reducing the effects of droughts, excess moisture and soil erosion, using the potential of water, meeting environmental requirements on water resources (requirements hydrological, hydraulic and ecological), identifying constraints, conflict of interest and solutions, impact analysis and assessment of the risks induced by the actions, measures, solutions and works proposed in the water shed management plan.	National scale
BR.VA.10	National	The national flood risk management strategy, which aims to increase the quality of life by reducing the damage caused as a result of floods, reducing the impact of risk management measures (on a temporal and spatial scale) on ecological systems, appropriate use of land for construction, planning and operation of infrastructure, and the reduction of flood risk for the maintenance of socio-economic activities (agricultural, industrial, commercial, residential and recreational) in flood zones.	The national flood risk management strategy, which aims to increase the quality of life by reducing the damage caused as a result of floods, reducing the impact of risk management measures (on a temporal and spatial scale) on ecological systems, appropriate use of land for construction, planning and operation of infrastructure, and the reduction of flood risk for the maintenance of socio-economic activities (agricultural, industrial, commercial, residential and recreational) in flood zones.	National scale
BR.VA.11	National	The National Waste Management Strategy, which aims to identify the objectives and action policies that Romania must follow in the field of waste management in order to achieve the status of a recycling society.	The National Waste Management Strategy, which aims to identify the objectives and action policies that Romania must follow in the field of waste management in order to achieve the status of a recycling society.	National scale
BR.VA.12	National	The National Strategy and Action Plan for Contaminated Sites, which aims to reduce the area occupied by contaminated sites and their number, improve the quality of environmental conditions in the local area and implement a unified management at national level for contaminated sites.	The National Strategy and Action Plan for Contaminated Sites, which aims to reduce the area occupied by contaminated sites and their number, improve the quality of environmental conditions in the local area and implement a unified management at national level for contaminated sites.	National scale
BR.VA.13	National	The national forestry strategy, which aims to make the institutional and regulatory framework of forestry activities more efficient and the sustainable management of the national forestry fund.	The national forestry strategy, which aims to make the institutional and regulatory framework of forestry activities more efficient and the sustainable management of the national forestry fund.	National scale
BR.VA.14	Regional	The Regional Operational Program aims to establish the framework for European funding for 2021-2027. The document includes the key priority area which will receive funding at regional level, and include Braşov metropolitan area.	The Regional Operational Program aims to establish the framework for European funding for 2021-2027. The document includes the key priority area which will receive funding at regional level, and include Braşov metropolitan area.	National scale

IR LO 01	Local	INTEGRATED URBAN DEVELOPMENT STRATEGY OF THE BRASOV METROPOLITAN AREA (U0091-2024-2030) The Integrated Urban Development Strategy (IUDS) guides the city and its metropolitan area's development towards 2030. Its vision for 2030 is to become a dynamic, strong community in economic partnerships, with a high capacity to adapt to global changes, offering an attractive lifestyle, and development and innovation opportunities.	The IUDS highlights the necessity for prioritising emission reductions and climate change adaptation in the Brasov Metropolitan Area, prompted by the forecasted temperature increase (between 0.5-2.5 in 2021-2050, compared to 1880-1980) and their potential impacts. The main strategic objectives that focus on reducing GHG emissions are Connectivity and mobility, as well as Quality and lifestyle including measures for access to utility services, increasing the quality of residential buildings). Specific objective 1.1. Improving mobility within the ZMB Measure 1.2.3. Public transport - Actions: 1.2.3.32 Metropolitan network of charging stations for electric cars; 1.2.3.34 Greenway of Brasov Municipality; UAT Brasov; 1.2.3.35 Intelligent systems for traffic management. Measure 1.2.4. Cycling infrastructure - Actions: 1.2.4.23 Extension of Busparking system; 1.2.4.24 Extension of bicycle lanes in Brasov Municipality and UAT Brasov Metropolitan Area; 1.2.4.25 Extension of bicycle lanes in the city of Brasov. Specific objective 1.3. Improving the provision of the territory with public services and utilities Measure 3.1.5. Building infrastructure and sanitation - Actions: 3.1.5.98 Urban fountains planting in the UAT Brasov landfill area; 3.1.5.99 Development of UAT Brasov Ecological Waste Landfill; 3.1.5.100 Extension of separate waste collection system; 3.1.5.101 Installation of above-ground and underground platforms for selective waste collection (eco-islands); 3.1.5.108 Rehabilitation of the thermal transport and distribution network - Florilor area; 3.1.5.109 Purchase of circulation pumps with converter; 3.1.5.110 Flood risk monitoring and prevention. Measure 3.1.6. Public lighting - Actions: 3.1.6.21 Increasing the energy efficiency of the public lighting system in the Muir BV; 3.1.6.22 Energy efficiency of Brasov street lighting system. Measure 3.1.7. Smart city and digital communities - Actions: 3.1.7.21 Development of buildings owned by UAT - public utility with high efficiency systems energy; 3.1.7.22 Extension, rehabilitation and modernisation of public lighting; LED technology; 3.1.7.23 Adaptive public lighting with sensors for pedestrians and vehicles with intensity modification; 3.1.7.24 Extension of the public lighting system in the city of Brasov. Measure 3.2.3. Energy efficiency for public buildings - Actions: 3.2.3.27 EBD - Energy efficiency - Brasov City Hall; 3.2.3.28 EBD - Headquarters energy efficiency - SCBAF SA Brasov; 3.2.3.29 EBD - Building energy efficiency Inspectorate for Emergency Situations; etc. Measure 3.2.4. Public spaces and urban regeneration - Action: 3.2.4.20 Purchase and installation of panels for air purification (City Tree); 3.2.4.21 Final closure of the non-hazardous waste repository Timis Tringe and establishment green space for leisure; 3.2.4.22 Reconstruction of abandoned areas into green areas - Bulimental Brasov; 3.2.4.23 Radu Quarry Reconversion (Bădăla-Dealul Măcelor); 3.2.4.25 Installation of sound-absorbing panels on congested arteries. Specific objective 4.1. Development of tourism, cultural and recreational infrastructure Measure 4.1.1. Development of tourism and recreational infrastructure - Actions: 4.1.1.10 Development of walking paths, public gardens, urban courtyard for environmental protection; 4.1.1.38 Arrangement of green spaces between blocks - Promenade areas in UAT Brasov neighbourhoods; 4.1.1.40 Planting trees along the arteries of Brasov; UAT; 4.1.1.41 Urban heat islands; 4.1.1.42 Development of urban micro-forests.	Metropolitan scale
IR LO 02	Local	SUSTAINABLE DEVELOPMENT STRATEGY OF THE BRASOV METROPOLITAN AREA (U0091-2024-2030) The Sustainable Development Strategy of Brasov Municipality 2010-2030 serves as a framework and tool for the local public administration to implement the development vision and strategic development goals, formulated based on a comprehensive consultation process. The strategy outlines a detailed vision for 2030 for several development domains (e.g. structure, housing, environment, economy) and formulates 20 specific objectives.	The strategy action domains are: Compact City, Mobile City, Cosmopolitan City, I am home here, and Innovative City. These domains represent an integrated approach towards future urban development, encompassing traditional sectoral areas of action. The strategy envisions Brasov as a modern, attractive European city with clear urban limits, where residential neighbourhoods within city limits are preferred; locations for living, while former business/industrial areas are transformed into green spaces; Beside improvement in spatial planning, the built environment and urban mobility, the plan specifies cross-levelled measures under its ambition to realise the European Green Capital Award. Sector-specific vision and key measures: Field of Action B - a mobile City 8.1. Mobility in Brasov 2030 8.2. Road traffic 8.2.2 Speed limitations 8.2.3. Road traffic in the city of Brasov 8.2.3.1 Making of cycling tracks on the main streets 8.2.3.2 Making of cycling tracks on the main streets 8.2.3.3 Making of cycling tracks on the main streets 8.2.3.4 Making of cycling tracks on the main streets 8.2.3.5 Making of cycling tracks on the main streets 8.2.3.6 Making of cycling tracks on the main streets 8.2.3.7 Park & pedal" system 8.2.3.8 Bicycle parking spaces 8.2.3.9 Bicycle parking spaces Strategic objective 1 - Connectivity and mobility: Consolidation of the strategic geographical position of ZMB by developing the intermodal transport hub connected to regional functional areas and unique natural landscapes Measure 1.2. Improving mobility inside ZMB (reducing mobility on certain roads and the exceeding traffic pollution levels)	Municipal scale
IR LO 03	Local	URBAN MASTER PLAN BRASOV Brasov City has no master plan. Some initial studies exist, but no final and essential documents have been established. I can provide different documents because I have read them. They are concerned with environmental quality evaluation, climate resilience, and natural and anthropic risks. Please let me know if you think these documents will be helpful. I attached the synthesis of the Master Plan and the Regulation, which is in consultation - Project de consultare PUD Brasov and the Synthesis PUD. https://drive.google.com/file/d/1q-5u0uH0H5Cp3dPmW2-1M45tYpY/view?usp=sharing	The goal of Brasov includes urban indicators such as the permitted functions of constructions, the land occupancy percentage, the land use coefficient, the maximum and minimum height of constructions, their appearance, the minimum area and green space.	Municipal scale

[illegible]

BR LO 10	Local	VELO MASTERPLAN FOR THE MUNICIPALITY OF BRASOV	The Velo Masterplan for the Municipality of Brasov is a strategic document with an aim to improve the mobility of citizens and reduce the environmental impact of the cycling component.	The Velo Masterplan for the Municipality of Brasov is a strategic document with an aim to improve the mobility of citizens and reduce the environmental impact of the cycling component.	Municipal scale
BR LO 11	Local	LOCAL STRATEGY FOR DISTRICT HEATING SERVICE FOR THE POPULATION IN THE HISTORIC CENTRE OF BRASOV MUNICIPALITY 2023	The purpose of the Local Strategy for District Heating is to provide a set of short, medium, and long-term objectives and actions in the management of the public heating service in the Municipality of Brasov.	The objectives of the strategy are to ensure the continuity, quality, and safety of thermal energy supply to the population, increase efficiency in thermal energy (supply), modernise and expand the District Heating System (SACET), decentralise the heating/cooling system to reduce greenhouse gas emissions in the Municipality of Brasov, promote the use of renewable energy resources, and encourage investments in the District Heating System.	Municipal scale
BR LO 12	Local	LIGHTING MASTERPLAN FOR THE HISTORIC CENTRE OF BRASOV	The lighting master plan for the historic centre of the city aims to develop an attractive urban environment during nighttime. It ensures that lighting interventions are coordinated and cohesive across the public and private sectors.	The key objectives contributing to climate neutrality included in the masterplan are promoting the principles of circular economy and sustainability, as well as reducing light pollution. Other objectives of the master plan for public lighting include economic development and branding (developing nighttime economy and promoting the city identity), valourising built heritage, promoting collaboration between institutions, with the private sectors and other stakeholders.	Municipal scale
BR LO 13	Local	NOISE ACTION PLAN 2027	The Noise Action Plan includes a list of streets where the noise levels exceed the maximum limits and the number of persons exposed to noise pollution. The main source of noise identified is road traffic. The plan also includes a prognosis for 2027, as a result of its implementation.	The plan highlights ongoing measures to reduce noise pollution and identifies additional ones. These measures refer to increasing the use of electric and hybrid means of transport, increasing the use of public transport, as well as the installation of sound-absorbing panels.	Municipal scale
BR LO 14	Local	LEGAL AND TECHNICAL REGULATIONS REGARDING THE DEVELOPMENT OF PLANNING DOCUMENTS FOR BUILDINGS ON SLOPING LANDS	The aim of the regulations is to halt the irreversible consumption of existing landscape resources by proposing a control mechanism for local landscape transformation.	The regulations have a positive impact on preventing chaotic urban development which contributes to increased GHG emissions. The document states minimum requirements and rules regarding construction regulations on sloping lands.	Municipal scale
BR LO 15	Local	INTEGRATED WASTE MANAGEMENT PLAN FOR BRASOV COUNTY 2020-2035	The Integrated Waste Management Plan covers the period 2020-2035, with 2019 as the reference year. All municipalities in Brasov County are part of the Intercommunity Development Association "GO Environment", established in 2011 in the field of waste management, ensuring an integrated approach.	The plan analyses data on non-hazardous and hazardous municipal waste (household and similar waste from commerce, industry, and institutions), including used cooking oils and packaging waste, electrical and electronic equipment waste, as well as construction and demolition waste and sludge from wastewater treatment. It also includes a prognosis for waste generation for municipal waste and packaging waste. - Objective 1: Reducing the amount of household and similar waste generated per inhabitant in 2035 by at least 3% compared to 2017 respectively reducing the amount generated per inhabitant by at least 5 kg/year. - Measure 1: Implementation of the "pay for what you throw" economic tool - Measure 2: Separating and developing existing actions on individual composting of bio-waste - Measure 3: Reducing the amount of wasted food by 2025 compared to 2017 - Measure 4: Preventing the generation of printed paper waste - Measure 5: Introducing topics in the school program regarding the provision of waste generation - Objective 2: Reducing the amount of packaging waste from economic growth, i.e. the increase in the amount of packaging waste in 2035 compared to 2017 by at least 10% lower than the GDP increase for this period. - Objective 3: Promoting the prevention of waste generation from food processing and from the chemical, metallurgical and steel industry.	County scale
BR LO 16	Local	REGIONAL MASTERPLAN FOR WATER AND WASTEWATER	The purpose of the Water and Wastewater masterplan is to identify investment priorities necessary for compliance with EU directives in the water and wastewater sectors, during the period 2013 – 2042. All municipalities in Brasov county are part of the Intercommunity Development Association in the Water Sector. The Association was established in 2007 and aims to implement joint regional development projects in the field of drinking water and wastewater.	The Water and Wastewater masterplan analyses the rates of connection of households to water and wastewater services and environmental risks, and includes necessary measures to achieve full compliance.	Regional scale
BR LO 17	Local	CLIMATE NEUTRALITY ACTION PLAN	It details the key interventions to bridge the gap between current conditions and achieving climate neutrality, with a 2038 time horizon.	These plan's fields of action are Sustainable mobility, Green infrastructure and nature-based solutions, Waste and circular economy, Built environment (energy renovation of public and residential buildings), Energy systems (rehabilitation of district heating system, RES generation, fast charging stations for electric vehicles, public lighting), Governance innovation (policies, incentives and punitive measures), and Social innovation (citizen involvement). By addressing these areas, the Action Plan leverages the city's current advancements, aligning with local, national and EU strategies to accelerate the transition to climate neutrality.	Metropolitan scale
BR LO 18	Local	SUSTAINABLE DEVELOPMENT STRATEGY OF BRASOV COUNTY, 2021-2030	The general objective assumed at the county level consists of: efficient and balanced use of material and human resources with respect to the principles of sustainable development, in order to increase the quality of life of the inhabitants of Brasov county in a sustainable and intelligent way.	Sector-specific vision and key measures: - Objective 1: Improve energy efficiency and reduce pollution - Measure 1.1: Improve energy efficiency in the buildings - Measure 1.6: Promotion of green city investment (green roofs, walls vertical greens etc.) - Measure 2: Promotion of adaptation to climate change, risk prevention and resilience to disaster - Measure 2.4: Reduction of environmental impact - Objective 3: Transition towards circular economy - Measure 3.1: Integrated management of waste in the county Brasov - Measure 3.2: Sustainable management of water resources - Strategic direction 2: Sustainable connectivity, integrated and intelligent development of urban & rural communities - Objective 2: Ensuring easy access for citizens at durable and safe, public transport and fair prices - Measure 2.3: Encouraging the use of alternative means of transport - Measure 2.5: Development county bike infrastructure (bike net)	County scale

Birmingham, UK

CODE	Scale	Policy	Focus	Implementation Examples	Beneficiaries
IN.BI.01	International	Carbon Disclosure Project (not policy, but International Initiative)	Global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.	Route to Zero Action Plan (mitigation)	city wide
IN.BI.02	International	Carbon Disclosure Project (not policy, but International Initiative)	Global disclosure system for investors, companies, cities, states and regions to manage their environmental impacts.	Climate Risk and Vulnerability Map. https://maps.birmingham.gov.uk/webapps/CRVA/	city wide
BI.NA.01	National	2008 Climate Change Act	Mitigation, but no net zero statutory targets for local authorities.		-
BI.NA.02	National	National Adaptation Programme - England	This report sets out the actions that government and others will take to adapt to the impacts of climate change from 2023 to 2028.		-
BI.NA.03	National	2008 Climate Change Act Adaptation Reporting Power	Reporting climate impacts, opportunities, and what the organisation is doing to address this, but local authorities are not required to report	ARPA for the West Midlands (see row 11)	-
BI.NA.04	National	2010 Water Management Act	Measures to prevent flooding, therefore providing adaptation. Creates Local Lead Flood Authorities who must manage a flood risk management strategy, and maintain a register of flood risk assets.	Bham are a Lead Local Flood Authorities and lead co-operation within the area to respond to flood risk. Flood risk zones are mapped within the city, and flood risk assessments are required when developments take place in flood risk areas. Policy (that priorities spending) is currently being updated in this area. Recent flood risk reduction measures across the city include removing weirs, engineering structures, channel reprofiling to remove meanders.	city wide, flood measures focused in flood risk areas
BI.NA.05	National	2010 Water Management Act	Schedule 3 - mandates Sustainable Urban Drainage on new developments. Implementation delayed since 2010 (except in Wales) therefore no action as yet.	Should Schedule 3 be mandated, BCC plans to include SUDS alongside BNG as a pre-requisite on developments. There may be a SUDS approval board.	city wide, flood measures focused in flood risk areas, protect homes and businesses
BI.NA.06	National	2021 Environment Act	Biodiversity Net Gain and Local Nature Recovery Networks link into adaptation agenda	BNG is a prerequisite for development, and will link to SUDS when this becomes mandatory.	residents and users on new developments
BI.NA.07	National	2012 NPPE (National Planning Policy Framework - 2023 update)	This is national planning policy that local plans must adhere to. Section 14 describes how local authorities should meet the challenge of climate change	N/A	-
BI.NA.09	National	Innovation review - Strategies to address Climate change risk in low and moderate Income Communities			
BI.RE.01	Regional	West Midlands Adaptation Reporting Power (ARP4)	In 2024 (through the fourth round of adaptation reporting (ARP4)) local and combined authorities were invited to report on their respective climate risks and adaptation action plans on a voluntary, pilot basis. WMCA volunteered to participate in this pilot round to demonstrate our commitment to and leadership role in climate adaptation, and to use the process to help colleagues across disciplines identify the climate risks and possible solutions facing their remit.		
BI.RE.02	Regional	West Midlands Climate Change Adaptation Plan 2021-2026	This plan sets out the climate change adaptation actions that should be considered for implementation by decision makers in the West Midlands, to ensure that our natural environment, people, infrastructure, buildings and businesses are prepared for the impacts of climate change, including greater incidence and severity of flooding, a higher likelihood of water scarcity and more intense and prolonged heatwaves.		

BI.LO.01	Local	Birmingham Development Plan 2031	The framework that determines planning within the city of Birmingham. We have opportunity to feed into the next local plan (which is currently being drafted). It includes targets and text on how the city should be mitigating and adapting to climate change as part of the development process		The next iteration of this is currently being written, but has a chapter on climate change, that features the CRVA developed by UoB.	city wide
BI.LO.02	Local	2019 climate emergency declaration	Route to Zero Action Plan (mitigation)		Birmingham District Energy Company (BDEC) supplies low carbon, low-cost energy to major energy consumers across the city centre	businesses
BI.LO.03	Local	2020 climate emergency declaration	Route to Zero Action Plan (mitigation)		3 Cities Retrofit Programme - housing retrofit programme across Birmingham, Wolverhampton, and Coventry.	home owners
BI.LO.04	Local	2021 climate emergency declaration	Route to Zero Action Plan (mitigation)		Birmingham Municipal Housing Trust (BMHT) - new building specifications which include energy and water saving measures for new developments and options for using more sustainable construction methods	social housing residents, housing organisations
BI.LO.05	Local	2022 climate emergency declaration	Route to Zero Action Plan (mitigation)		Hydrogen Bus Scheme - expanding the hydrogen bus fleet from 20 to 142 buses which will operate on the low carbon fuel source, making it the largest hydrogen bus fleet in Europe.	city wide
BI.LO.06	Local	2023 climate emergency declaration	Route to Zero Action Plan (mitigation)		Electric Bin Lorry Trial - an electric bin lorry trial.	city wide
BI.LO.07	Local	2024 climate emergency declaration	Route to Zero Action Plan (mitigation)		Birmingham Transport Plan 2031 - sets out how to radically transition the city towards sustainable forms of transport.	city wide
BI.LO.08	Local	2025 climate emergency declaration	Route to Zero Action Plan (mitigation)		Electric Vehicle Charging Strategy - a strategy to deliver a comprehensive public electric vehicle charging network across Birmingham.	electric vehicle owners
BI.LO.09	Local	2026 climate emergency declaration	Route to Zero Action Plan (mitigation)		Birmingham Clean Air Strategy	city wide
BI.LO.10	Local	2027 climate emergency declaration	Route to Zero Action Plan (mitigation)		Birmingham Food Systems Strategy - an ambitious eight-year approach to creating a food system and economy where food choices are affordable, nutritious and desirable for all citizens, reducing the environmental impact of our food system in Birmingham.	city wide
BI.LO.11	Local	Birmingham Transport Plan 2031	https://www.wmca.org.uk/media/1372/2016-06-01-mfg-full-document_wmca.pdf			
BI.LO.12	Local	TfWM strategic transport plan				
BI.LO.13	Local	West Midlands Local Nature Recovery Strategy				
BI.LO.14	Local	Birmingham City of Nature Plan	The plan looks at the next 25 years to ensure that this current young generation inherit a much improved, fairer, and greener city. A city that puts nature, people, and the planet at the heart of its decision-making and inclusive growth agenda. Actions will be delivered across 5 city themes: Fair, Healthy, Green, Valued and Involved, that embrace the circular economy and introduce new ways of working right across the council and its partners.			City wide

Climate policies: From the Climate-ADAPT platform (table)

Information collected from Climate-ADAPT platform.

NAS = National Adaptation Strategy
NAP = National Adaptation Plan
CRA = climate risk assessment
Climate Law (including adaptation)
Sectoral Adaptation plan
Regional Adaptation Plan - any country involved in CARMINE where documents had been uploaded

Czech Republic

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.PR.NA.01	National	NAS		https://www.mzp.cz/cz/zmena_klimatu_adaptacni_strategie ; https://climate-adapt.eea.europa.eu/en/countries-regions/countries/czechia
CA.PR.NA.02		NAP		https://mzp.gov.cz/cz/narodni_akcni_plan_zmena_klimatu
CA.PR.NA.CRA.01		CRA 2019 - 2 documents present: Complex study on impacts, vulnerability and Sources of Risk related to CC in the Czech Republic - and - Vulnerability Assessment of the Czech Republic related to CC		
	SECAP-covenant	/		

Germany

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.LE.NA.01	National	NAS 2008		https://www.bmu.de/fileadmin/Date_n_BMU/Download_PDF/Klimaanpassung/das_gesamt_bf.pdf
CA.LE.NA.02		NAP 2011		https://www.bmu.de/download/aktionsplan-anpassung-zur-deutschen-anpassungsstrategie-an-den-klimawandel
	SECAP-covenant	/		

Denmark

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.FU.NA.01	National	NAS 2008		https://edit.mst.dk/media/veuouwr/klimatilpasningsstrategi_03032008.pdf
CA.FU.NA.02		NAP 2012		https://www.regeringen.dk/aktuelt/tidligere-publikationer/saadan-ha-andterer-vi-skybrud-og-regnvand-handlingsplan-for-klimasikring-af-danmark/
CA.FU.CRA.01		CRA 2012		https://climate.ec.europa.eu/document/download/95a48620-8889-4c0f-995d-447a441d4889_en?filename=summary_fiche_dk_en.pdf
CA.SE.FU.02	SECAP-covenant	SEAP - strategic energy plan - 2013		
CA.SE.FU.01		SECAP 2024		

Greece

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.AT.NA.01	National	NAS 2016		https://ypen.gov.gr/wp-content/uploads/legacy/Files/Klimatiki%20Allagi/Prosarmogi/20160406_ESPK_A_teliko.pdf
CA.AT.NA.02		summary for NAS		https://climate.ec.europa.eu/document/download/e36bd121-f221-4dce-bfc8-947949ef8d97_en?filename=summary_fiche_gr_en.pdf
CA.AT.NA.03		summary of NAS		https://www.bankofgreece.gr/RelatedDocuments/National_Adaptation_Strategy_Excerpts.pdf
CA.SE.AT.01	SECAP-covenant	/		https://mycovenant.eumayors.eu/storage/web/mc_covenant/documents/27/R9BkatthOioTKHGkqHL-RgRabDo5_cGu.pdf

Spain

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.BA.NA.01	National	Climate Law -		https://www.boe.es/buscar/pdf/2021/BOE-A-2021-8447-consolidado.pdf
CA.BA.NA.02		sectoral adaptation plan - Adaptation strategy for the Spain coast - 2017		https://www.miteco.gob.es/content/dam/mitesco/es/costas/temas/proteccion-costa/estrategiaadaptacionccaprobada_tcm30-420088.pdf
CA.BA.NA.03		climate change plan 2018-2030 (administrator of railway infrastructures) - 2018		https://www.adif.es/documents/2012/4/1809001/PLCCC_publicacion.pdf/972137a7-0407-2f05-4164-3934fe12c0a0?t=1620648275372
CA.BA.NA.04		strategic guidelines on water and climate change - 2022		
CA.BA.NA.05		NAS - 2021		https://www.miteco.gob.es/content/dam/mitesco/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pnacc-2021-2030-en_tcm30-530300.pdf
CA.BA.NA.06		NAP		https://www.miteco.gob.es/content/dam/mitesco/es/cambio-climatico/temas/impactos-vulnerabilidad-y-adaptacion/pt1-pnacc_tcm30-535273.pdf
CA.BA.CRA.01		CRA - 2005 - A preliminary General Assessment of the Impacts in Spain due to the Effects of Climate change		
CA.BA.CRA.02		CRA - 2021 - impacts and risks delivered from climate change in Spain		
CA.SE.BA.01	SECAP-covenant	Barcelona - monitoring report 2017		https://mycovenant.eumayors.eu/docs/seap/381_1331047596.pdf
		Barcelona Metropolitana area		no documents

Italy

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.BO.NA.01	National	National Adaptation Strategy		https://www.mase.gov.it/sites/default/files/archivio/allegati/clima/documento_SNAC.pdf
CA.BO.NA.02		National adaptation plan		https://www.mase.gov.it/notizie/clima/approvato-il-piano-nazionale-di-adattamento-ai-cambiamenti-climatici
	SECAP-covenant			
CA.SE.BO.01		PAESC		https://mycovenant.eumayors.eu/storage/web/mc_covenant/documents/31/hnQZXld6IISSo2xoQYAvaPlfnyDgxqVn.pdf

Romania

CODE	Scale	Policy	Focus	Implementation Examples
	International			
CA.BR.NA.01	National	NAS and NAP		https://www.mmediu.ro/categorie/ca-drul-national/408
CA.SE.BR.01	SECAP-covenant	SEAP		https://mycovenant.eumayors.eu/docs/seap/305_1328701734.pdf
CA.SE.BR.02		monitoring 2014		https://mycovenant.eumayors.eu/storage/web/mc_covenant/documents/10/9CA5af1U9Do303slgQg3tGBgRCo9zfR.pdf

United Kingdom

CODE	Scale	Policy	Focus	Implementation Examples
	SECAP-covenant			
CA.SE.BI.01		adhesion form 2030	https://mycovenant.eumayors.eu/docs/adhesion/330_1486564011.pdf	
CA.SE.BI.02		sustainable energy plan	https://mycovenant.eumayors.eu/docs/seap/330_507_1304007118.pdf	
CA.SE.BI.03		strategic issue and options	https://mycovenant.eumayors.eu/docs/seap/330_507_1304007458.pdf	

Climate Policies: International Reports (table)

CODE	International	specific document	link
IPC.01	IPCC sixth report		https://www.ipcc.ch/report/sixth-assessment-report-cycle/
IPC.02		AR6 Synthesis Report	https://www.ipcc.ch/report/ar6/syr/
IPC.03		summary for policy maker	https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf
IPC.04		longer report	https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf
IPC.05		climate change 2023 synthesis report	https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf
IPC.06		annexes index	https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_AnnexesIndex.pdf
	WMO		
WMO.01		Guidance on Measuring, Modelling and Monitoring the Canopy Layer Urban Heat Island (CL-UHI)	
WMO.02		2023 STATE OF CLIMATE SERVICES HEALTH	
WMO.03		LONG-TERM SG-ENE CAPACITY DEVELOPMENT PLAN ON SERVICES FOR ENERGY - SERCOM-3/INF. 4.8	
WMO.04		IMPLEMENTING MECHANISMS FOR HEALTH - SERCOM-3/INF. 4.9	
WMO.05		Guidance on Integrated Urban Hydrometeorological, Climate and Environmental Services - Concept and methodology - WMO n.1234	
WMO.06		State of the Global Climate 2023 - WMO-No. 1347	https://library.wmo.int/records/item/68835-state-of-the-global-climate-2023
	WEF		
WEF.01		Future-Proofing the Longevity Economy: Innovations and Key Trends WHITE PAPER - MARCH 2025	https://www.weforum.org/publications/future-proofing-the-longevity-economy-innovations-and-key-trends/