

# Climateurope2

## Assessment Report on Municipal Knowledge Needs and Narratives of Climate Change for Maintaining Trust in Standardised Climate Services

### *Deliverable 5.1*

Authors: Krauß, W., Martinez, G., Beck, S., Bräuer, J., Taddeo, S., Calderaro, C., Finello, F., Hobeika, M. and C. Gonzalez Romero



Climateurope2

## Document Information

<b>GRANT AGREEMENT</b>	101056933
<b>PROJECT TITLE</b>	Supporting and standardising climate services in Europe and beyond
<b>PROJECT ACRONYM</b>	Climateurope2
<b>PROJECT START DATE</b>	01/09/2022
<b>RELATED WORK PACKAGE</b>	WP5
<b>RELATED TASK(S)</b>	T5.2
<b>LEAD ORGANIZATION</b>	UBREMEN
<b>AUTHORS</b>	Krau, W. (UBremen), Martinez, G. (ECO), Beck, S. (TUM), Bruer, J. (TUM), Taddeo, S. (CMCC), Calderaro, C. (CMCC), Finello, F. (RMC), Hobeika, M. (RMC) and C. Gonzalez Romero (BSC)
<b>SUBMISSION DATE</b>	29.08.2024
<b>DISSEMINATION LEVEL</b>	Public

## History

DATE	SUBMITTED BY	REVIEWED BY	VISION (NOTES)
06.08.24	Werner Krau (UBremen)	Valerie Wischott, Anna Klose (Fraunhofer)	First draft review
22.08.24	Valerie Wischott, Anna Klose (Fraunhofer)		Review received
29.08.24	Werner Krau (UBremen)		submitted

Please cite this report as: Krau, W., Martinez, G., Beck, S., Bruer, J., Taddeo, S., Calderaro, C., Finello, F., Hobeika, M. and C. Gonzalez Romero (2024) Assessment Report on Municipal Knowledge Needs and Narratives of Climate Change for Maintaining Trust in Standardized Climate Services. Deliverable 5.1 of the Climateurope2 project.

*Disclaimer: Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate,*

*Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.*

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## About Climateurope2

Timely delivery and effective use of climate information is fundamental for a green recovery and a resilient, climate neutral Europe, in response to climate change and variability. Climate services address this through the provision of climate information for use in decision-making to manage risks and realise opportunities.

The market and needs for climate information has seen impressive progress in recent years and is expected to grow in the foreseeable future. However, the communities involved in the development and provision of climate services are often unaware of each other and lack interdisciplinary and transdisciplinary knowledge. In addition, quality assurance, relevant standards, and other forms of assurance (such as guidelines, and good practices) for climate services are lagging behind. These are needed to ensure the saliency, credibility, legitimacy, and authoritativeness of climate services, and build two-way trust between supply and demand.

Climateurope2 aims to develop future equitable and quality-assured climate services to all sectors of society by:

- Developing standardisation procedures for climate services
- Supporting an equitable European climate services community
- Enhancing the uptake of quality-assured climate services to support adaptation and mitigation to climate change and variability

The project will identify the support and standardisation needs of climate services, including criteria for certification and labelling, as well as the user-driven criteria needed to support climate action. This information will be used to propose a taxonomy of climate services, suggest community-based good practices and guidelines, and propose standards where possible. A large variety of activities to support the communities involved in European climate services will also be organised.

## Executive Summary

The report examines the critical gap at the interface between science-based climate adaptation plans and their implementation. Since climate change impacts vary significantly across regions, climate services must extend beyond merely providing climate data and information. Integrating place-based knowledge and contextual narratives is essential for ensuring that climate services are relevant, credible and trusted by communities. Using several case studies as examples, the report makes recommendations for incorporating these elements into climate services, discusses the limits of standardisation, and identifies key factors that influence the success of adaptation to the local impacts of a changing climate.

## Keywords

*Adaptation, municipal climate services, narratives, local knowledge, place-based, needs, limits of standardisation.*

# 1. Introduction

Climate adaptation has become one of the primary objectives of climate politics in the EU, alongside mitigation and protection. The impacts of climate change and natural variability are predominantly felt at the regional or municipal level, increasingly drawing the focus of European legislation and initiatives. Many municipalities already have adaptation plans in various strategic sectors, such as water management, health, mobility, or spatial planning, due to the vulnerability of the European society to changing climate (IPCC, 2021). In this report, we discuss how municipalities and other regional entities address the challenge of implementing climate adaptation plans based on European legislation and initiatives.

In climate service literature, there is a strong emphasis on the design and implementation process of climate services, particularly on the science-policy interface and the need for co-production. In this deliverable, we explore the implementation of municipal adaptation plans primarily from a social science and humanities perspective, using various case studies drawn from literature or fieldwork. These cases exemplify both general and context-specific problems in the implementation process. Climate services literature identifies existing gaps or missing knowledge that must be addressed to implement adaptation plans successfully, such as limited forecast skill, prioritisation of multidecadal prediction for shorter-term risks, limited use of climate data, and user selection (Baulenas, 2023; Nissan, 2019). However, this technical perspective on climate governance often clashes with local definitions of risk, place-based understandings of climate extremes, and responses based on local knowledge, municipal governance, and skills (Krauß & Bremer, 2020; Martinez, 2022). Therefore, addressing place-based knowledge needs and the corresponding narratives of climate change presents a challenge for climate services and the quest for standardisation.

In a working definition elaborated by Climateurope2, **“climate services involve the provision of climate information in such a way as to assist decision-making. The service includes appropriate engagement from users and providers, is based on scientifically credible information and expertise, has an effective access mechanism and responds to user needs”**. This definition goes beyond a merely technical understanding of climate services. Climate adaptation is more than a technical problem solvable through the translation of scientific data and information. The development of climate services at a local scale requires incorporating local knowledge, acknowledging tacit knowledge and common law, knowledge about senses of belonging, material life conditions, perceptions of changes in weather and climate, and place-specific practices, networks and political constellations. This includes non-climatic information and the involvement of citizens’ initiatives, of citizen science, of NGOs and other civic activities through participatory approaches.

Certification and standardisation help ensure procedural consistency, create new business opportunities and have the potential to increase trust in climate services. However, given the nature of climate services and its demand-driven approach, standardisation is not always straightforward or maybe even possible. One of the key objectives of Climateurope2 is to critically focus on the interface of science and policy, discussing the limits of standardisation and questioning what aspects can and cannot be standardised. Recent studies suggest that climate services face complex situations at the local level and have to integrate social and qualitative knowledge to support the relevance and effectiveness of adaptation strategies (Schmidt et al. 2024; Krauß & Bremer 2020). Place-based narratives of change provide insight into the past, present and future of local communities and into the dynamic of local policies, land use and other place-based practices. The resulting tensions between technical aspects of climate adaptation and the relevance of social factors challenges a narrow understanding of climate services and of standardisation. However, as the anthropologist Anna Tsing (2005) demonstrated in her ethnography of global connections, friction between different groups,

actors and world views can be productive, too. The inclusion of local knowledge and narratives of change can enhance trust in climate services and drive the climate adaptation and mitigation processes.

In this deliverable, we examine the role of place-based knowledge needs and narratives of change in the context of implementing climate services, and we do so at the example of case studies in Belgium, France, Germany, Italy, Latin America and the French West Indies. The examples show that both adaptation and mitigation interventions and standardisation have limits, and that without place-specific knowledge they may be ineffective or even misguided. A main message from these case studies is that each case must develop its own forms of adaptation, by incorporating place-specific knowledge and narratives of change to enhance trust in decision-making and provide policy support. Thus, local knowledge becomes a key criterion for any standardisation effort. The deliverable seeks best practices and effective standards for emerging climate services on adaptation to facilitate the integration of place-based needs.

## 1.1 Background and objectives of the Report

The deliverable “Assessment report on place-based knowledge and narratives of climate change for maintaining trust in standardised climate services” is part of Work Package 5 (WP5), titled “Policy Support for Climate Services.” The objective of WP5 is to assess the coherence between Climate Services (CS) standardisation activities to illustrate how the coordination between regional, national and European activities and their implementation can be improved; identify place-based knowledge needs of local communities as well as nested forms of local adaptation in order to understand how trust into standardised CS can be maintained; support the robust co-production between CS providers and users by developing coherent, policy-relevant good practices and guidelines for the use of CS.

WP5 is divided into three interrelated tasks. Task 5.1 is about multi-dimensional in-depth analysis of decision-making requirements for standardised climate services; task 5.2 is about adding CS support and value to local policy and decision-making, while task 5.3 develops a roadmap for policy support to realise the value of standardised CS in action.

These interrelated three tasks add social science and humanities perspectives and insights to Climateurope2. Surveys, in-depth analyses and ethnographic case studies provide the basis for a roadmap for policy support and for the other Work Packages in Climateurope2.

Deliverable 5.1 is closely linked to task 5.2 (“Adding Climate Service Support and Value to Local Decision-Making”), which provides in-depth accounts of encounters between users and providers of CS. We explore the role of trust and respect, document (un-)intended consequences of action and address gender issues, subsidiarity, jurisdiction and nested forms of local adaptation.

The primary objective of WP5, particularly task 5.2, is to identify place-based knowledge needs and nested forms of local adaptation to understand how trust in standardised climate services can be maintained. This work package and the deliverable, offer insights into the limits of standardisation of climate services and provide recommendations on how to further improve the decision-making process.

## 1.2 Structure of the Report

In the first part, we introduce the background, the objectives and the structure of the report (section 1.1 and 1.2). We further provide an overview of EU legislation and initiatives on climate adaptation at

the national and municipal levels (section 1.3). Section 1.4 addresses the complex interface between science, policymakers, stakeholders and concerned citizens from the perspective of postnormal science (Funtowicz & Ravetz 1993) and Bruno Latour's (2004) distinction between "matters of fact" and "matters of concern". In this context, the report highlights the importance of local knowledge and narratives of change (Krauß & Bremer 2020) in the adaptation process and discusses more integrated and inclusive approaches to implementing adaptation plans on the ground.

In the second part, this document presents an overview of case studies conducted to illustrate these processes, and we describe our approach and methodology (section 2.1). In the following sections, this report discusses the role of local knowledge needs and explores the various ways communities address the challenges of implementation (section 2.2.1). In section 2.2.2, this document exhibits the findings of the case studies, emphasising the role of non-climate information and the value of local knowledge and narratives of change in adaptation. We also consider how these elements contribute to building trust in standardised climate services.

In the third part, the report identifies the key findings (section 3.1) and provides recommendations (section 3.2).

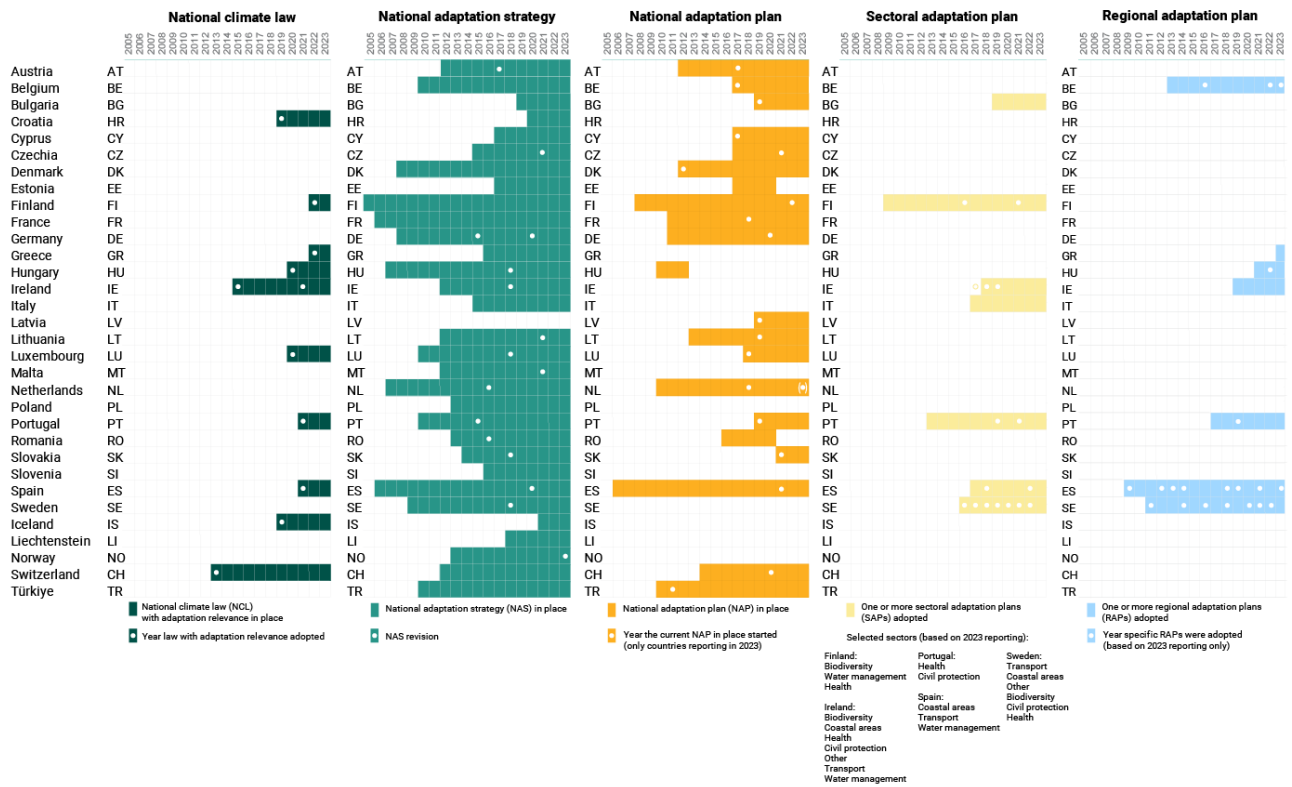
The report on EU legislation on adaptation and the seven individual case studies are presented in the Annex.

### **1.3 EU legislation on adaptation in the EU on the national and the municipal level<sup>1</sup>**

The need to adapt to the effects of a changing climate gains increasing significance in European legislation. The European Climate Law (2021), the EU Adaptation Strategy (2021), the Mission on Adaptation to Climate Change (2023), and the Communication on managing risks in Europe (2024) express this concern. Every two years since 2021, Member States are reporting on the implementation of national adaptation actions. Currently, 26 of 27 Member States have developed a National Adaptation Strategy (NAS), while 16 have established a National Adaptation Plan (NAP), and 15 have implemented both NAS and NAP (see Figure 1: Overview of adaptation policies in the EU Figure 1).

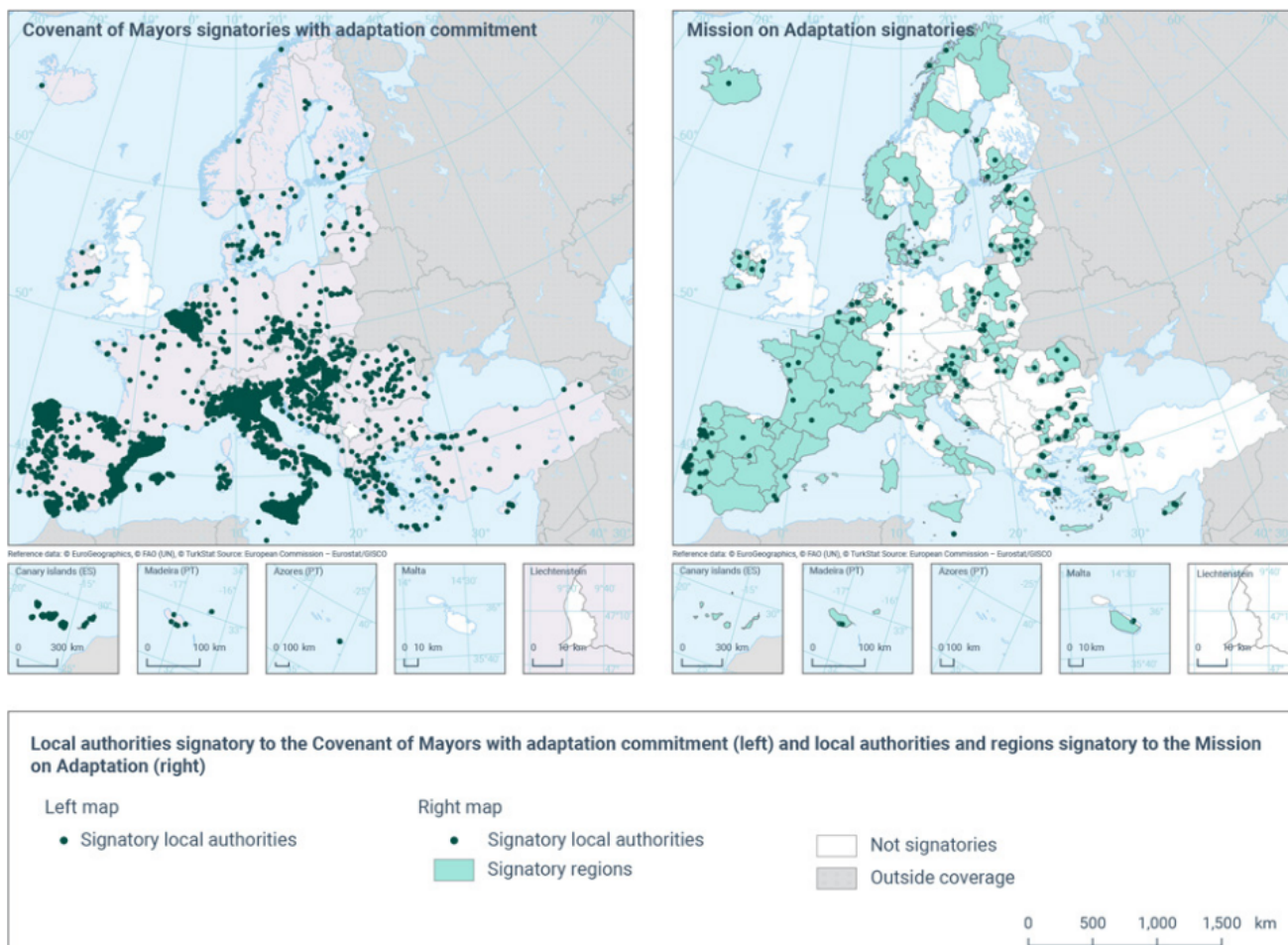
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<sup>1</sup> Francesca Finello (Ramboll) provided this part, for more detail see Appendix 1.



**Figure 1: Overview of adaptation policies in the EU**

The European Union recognized that municipal and regional authorities play a crucial role in the adaptation process and enhanced the capacity of public administrations in EU Member States. National climate laws and international climate networks help European municipalities to make progress in adopting local adaptation plans. Approximately 51% of European cities (municipalities with more than 50,000 inhabitants) have now established specific adaptation plans. However, in many EU Member States, sub-national adaptation planning remains primarily voluntary and non-binding, relying heavily on bottom-up initiatives. Figure 2 visualises the cities' engagement in European initiatives on adaptation to climate change such as the Covenant of Mayors and the Mission on Adaptation.



**Figure 2: City engagement in European initiatives on adaptation to climate change (EEA, 2024 based on the EU Covenant of Mayors for Energy and Climate, Mission on Adaptation Secretariat)**

Only 7 of 27 EU Member States reported adopting Regional Adaptation Plans (RAPs) under national climate laws between 2021 and 2023. Most municipal adaptation actions reported under the Covenant of Mayors<sup>2</sup> target the following sectors: water (17%), buildings (13,6%), the environment (11,7%), land (10,8%), agriculture (9,3%), and health (7,6%) (Figure 1).

There is a growing trend towards standardising Climate Risk Assessments (CRAs) to ensure they can be performed consistently and allow for comparisons over time. Countries such as Germany and the Netherlands have specifically used the **ISO 14091:2021 standard**<sup>3</sup> for their national CRAs. This move towards standardisation allows for the assessment of changes in risk, vulnerability, and preparedness in a consistent, clear, and comparable manner. While the application of these standardised frameworks is still in its early stages, their potential importance suggests they warrant further attention and exploration in the future.

<sup>2</sup> The Covenant of Mayors is an initiative that provides vital assistance to local authorities through capacity building, technical support, networking opportunities, and participation in European projects focused on the local level.

<sup>3</sup> ISO 14091:2021 Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment Available at: [ISO 14091:2021 - Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment](https://www.iso.org/standard/75421.html)

The ISO 14091:2021 standard is focused on adaptation to climate change through guidelines on vulnerability, impacts, and risk assessment. It is utilised by organisations globally, as it provides a systematic approach to understanding and managing climate risks. This standard has a broad international scope and is used in over 130 countries (Porst et al. 2022). It was developed jointly by international contributors and is aligned with other global sustainability initiatives. **At the municipal level**, ISO 14091:2021 provides a structured approach for cities and regions to conduct climate risk assessments. This standard helps local governments identify and prioritise their vulnerabilities to climate phenomena like droughts and floods. By assessing which areas and populations are most at risk, municipalities can tailor their adaptation strategies effectively. The guidelines support local authorities in integrating climate risk considerations into urban planning and infrastructure design, fostering resilience against future climate challenges. This enables efficient resource allocation and strategic policy development, facilitating both immediate and long-term climate adaptation planning.

A recent analysis (Reckien et al., 2022) evaluated local climate action plans based on several criteria: assessing impacts and risks, setting adaptation objectives, pinpointing adaptation actions, detailing implementation methods, conducting monitoring and evaluations, and engaging the community. **Although the overall quality of these plans has improved over time, the average quality rating still only reaches about one-third of the potential maximum.** This underscores the necessity for improved public engagement, more precise alignment of risks with objectives, and a focus on the unique adaptation needs of vulnerable populations.

## 1.4 The science-policy interface and the role of local knowledge and narratives of change

In our case studies, we examine the role of climate services in implementing science-based adaptation plans at the municipal level. Ideally, climate services follow the stages of the policy cycle – planning, policy development, implementation, monitoring and evaluation (Gancheva et al. 2022). However, in practice, climate services often encounter complex situations in municipalities where sectoral adaptation measures are already established, where local networks and policy routines have to be acknowledged and where often-conflicting interests have to be considered - these and other factors impede the routine procedure along the policy cycle. While in some cases, climate services can co-produce effective measures together with local stakeholders, in other cases climate services encounter complex situations where other forms of knowledge, values and interests come into play. Other than many climate service applications like dashboards for viticulture (Terrado et al. 2023), municipal contexts more often than not afford the inclusion of a diverse community of actors and different forms of knowledge, including non-climatic information. The focus shifts from the provision of data and co-production with stakeholders to specific assemblages or collectives which have to decide over adaptation as a matter of collective interest.

In the philosophy of science and Science and Technology Studies, the role of scientific expertise in the context of complex situations is widely discussed. For the purpose of this deliverable, two concepts provide useful insights into the role of science in the decision-making process: “post-normal science” as suggested by Funtowicz and Ravetz (1993) and Bruno Latour’s (2004) differentiation between “matters of fact” and “matters of concern”.<sup>4</sup>

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<sup>4</sup> see also Krauß & von Storch (2012) and Krauß (2023).

Post-normal science (PNS) explicitly addresses situations where scientific expertise alone is insufficient. Funtowicz and Ravetz argue that while many problems and knowledge needs can be addressed by conventional science, PNS focuses on cases where knowledge is uncertain, stakes are high, values are contested, and decisions must be taken regardless. In the following Example 1, we provide a climate service case which easily counts as an example for normal science.

**Example 1:** In an interview with the public transport officials in a major German city, for new climate indicators such as the development of peak temperatures over the next decades was expressed. This information is necessary for the procurement of infrastructure such as air-conditioning systems in public transport. Science-based climate services can deliver these scenarios, including uncertainties, thereby aiding the decision-making process.<sup>5</sup>

Example 2 is different and serves as an illustration of a post-normal situation:

**Example 2:** A recent study on the implementation of climate adaptation plans in São Paulo and Hamburg presents a contrasting scenario. Schmidt et al. (2024) state that “even though data and expertise is available, its use remains unsystematic, while climate action is mostly hampered by missing political capacity, silo mentalities, and a structural lack of resources.” To facilitate co-production, the authors examine “the entanglements of rules and norms, interests and visions, knowledge and capacities in a particular local context in order to identify aspects that may encourage meaningful knowledge co-production.” This situation exemplifies PNS, where science alone cannot resolve the issues.

This differentiation between normal and post-normal situations helps to highlight the limitations of technical approaches to climate adaptation. While in example 1, the various steps of the knowledge co-production can be standardised to ensure the quality of the climate service, example 2 additionally requires flexibility and the inclusion of place-based knowledge needs and narratives of change. Climate services need to find their place among other interests and forms of knowledge which have to be accounted for, too. This necessitates other forms of evaluation and shifts the focus on the process of decision-making in democratic contexts.

In climate service literature, these post-normal situations are often referred to as “gaps” or “valleys of death”. For example, Schmidt et al. (2024) argue that “urban governance, the interplay of governmental bodies with other actors shaping decision-making and its implementation, plays a key role for mitigation and adaptation measures in cities. While knowledge co-production is advanced as an instrumental approach to support climate action, a gap between knowledge and implementation exists”. Krauß and Bremer (2020) contend “that many places experience a persistent mismatch between predominantly science-based and technical framings of climate risk on the one hand, and the place-based understandings of climate extremes and responses of the people living in these places on the other”. Martinez et al. (2022) stressed “that user needs, desires and actions hinge on value prepositions formed by specific socio-cultural, climatic, spatial and bio-ecological contexts”, and Swart et al. (2021) note that “not only differences in knowledge and skills, but also in framing of climate risks and information needs, pose a serious gap between suppliers and users of climate information”. Orlove et al. (2023) describe an even wider gap between scientific expertise and local and indigenous knowledge systems.

But how can we avoid “the valley of death” and bridge these gaps if not by providing more data and assessments? Bruno Latour (2004) proposed translating “matters of fact”, which scientifically prove

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<sup>5</sup> Personal Information

the existence of anthropogenic climate change, into “matters of concern”. In the context of climate services for municipal adaptation, this approach is relevant because it encourages municipalities to consider climate data not just as objective information but as part of a broader dialogue involving stakeholders, local knowledge, and ethical considerations. This shift fosters more inclusive, context-sensitive decision-making, which is crucial for effective and sustainable climate adaptation strategies at the municipal level. Translating matters of fact into matters of concern involves providing context and focusing on the collectives that form around climate-induced risks. Each of those collectives, whether human or non-human, brings its own interests and knowledge to the table, and each deserves the opportunity to be heard.

Recent climate service literature increasingly emphasises the diversity of actors, their knowledge, and the stories they have to tell. Krauß and Bremer (2020) assert that “narratives of change” are a “missing link in climate governance”, arguing that “attention to local narratives expands the scope of issues covered by climate information and improves its integration into social and cultural life”. “Narratives of change” refer to the stories and discourses that people, communities, and institutions create to make sense of and respond to changes in weather and seasons and the resulting impacts on their environment, economy and daily life. These narratives shape how climate change is understood, communicated, and acted upon, reflecting cultural, social, and political contexts. They help guide perceptions, behaviours, and decisions related to climate action and adaptation. Clifford et al. (2020) suggests that the “design of climate services can be improved by a wide variety of user input and understanding of needs based on perceptions” and “experienced climate knowledge”. Martinez et al. (2022) explain that “(i)t is therefore necessary to identify and analyse risk perceptions and their origins, vulnerability and adaptive capacity of stakeholders before starting with the development of any given climate service”, and Köppel et al. (2016) emphasise the importance of landscape narratives, particularly in recognizing individual place constructions and their implications for landscape management.

However, there are also limits to this approach, especially when science-based climate adaptation meets populations and areas which are not fully integrated into the nation states. Indigenous groups often assert their cultural autonomy and may resist conforming to Western concepts (Orlove et al. 2023). Ethnographic studies from Bangladesh (Dewan 2021) show that climate adaptation often builds upon established practices of development policies, even when they have, according to Dewan’s case study, misinterpreted landscapes and consistently overlooked local knowledge and practices. There is a need to decolonise climate services, understood as a global science-policy complex that tends to colonise other forms of knowledge, world views and ways to understand vernacular landscapes. The view from outside of Europe, in our case from Latin America or the French West-Indies, sharpens the view on the power effects of centralised adaptation measures and raises awareness for the questions of equity, gender relations, and environmental justice.

The increasing focus on local knowledge needs and narratives of change add context to science-based data and information, they add flesh and blood to the bones of quantitative research. Narratives of change and place-based knowledge needs are often expressed by civic actors, by citizens’ initiatives, environmental groups, citizen scientists or other concerned citizens. They voice their concerns, rub with established forms of climate governance and provide a link between climate governance and local needs and perceptions of a changing climate (Martinez et al. 2024). In doing so, they contribute to enhancing trust in standardised climate services and, at the same time, show the limits of standardisation.

## 2. Case Studies and Methodology

At the beginning of Climateurope2, WP5 was tasked with suggesting exemplary case studies as a reality check for all WPs in the project. These case studies were chosen to exemplify the processes and products associated with climate services and to illustrate the role of standardisation. For this deliverable 5.1., we chose other case studies or modified their perspective, and we drew the focus on the science-policy interface. The goal in analysing the case studies was to understand if and how climate services were used in the implementation of adaptation plans, with a special focus on the role of local knowledge needs and narratives of change. We chose five case studies from the European Union (Italy, France, Belgium and two from Germany), and two from outside of Europe. The latter are cases from the French West Indies and Latin America that help shedding light on processes which are easily hidden behind the cultural bias of researchers who write about their own cultures. Table 1 shows the locations, the levels of administrations, the climate impacts and sectors involved.

**Table 1: Case studies - Summary of the context of the case studies**

Case Study	Geography	Level	Climate Impact	Sector(s) involved
Paris	France	Municipality	Heatwaves, droughts, extreme temperature, environmental health disparities, air pollution, energy	Energy, adaptation, mitigation, infrastructures & urban areas, human health, social services, migration
Ghent	Belgium	Municipality	Heatwaves, droughts, heavy rain, floods	Adaptation, mitigation, infrastructures & urban areas, energy, housing, mobility, agriculture, water resources, human health, ecosystems & biodiversity
Milan	Italy	Municipality	Heatwaves, heavy rain, floods	Public sector
Ammerland	Northern Germany	Municipality	Heatwaves, drought, heavy rain, flooding; energy, heating.	Energy, mobility, adaptation, mitigation, water management, spatial planning
Landshut	Southern Germany	Municipality	Heatwaves, heavy rain, floods	Water resources, ecosystems & biodiversity, human health, infrastructures & urban areas
French West Indies	Outermost Regions of the EU (Martinique and Guadeloupe)	Regional	Heatwaves, droughts, cyclones, new diseases and epidemics	Agriculture, environmental, health
Latin America	Guatemala, Colombia, Honduras, Nicaragua, Chile, Panama, El Salvador, Peru, Paraguay and Mexico.	Regional (subnational)	Droughts, hails, heavy rains, floodings, extreme winds, extreme temperatures,	Agriculture, environmental, meteorological and health

## 2.1 Research Approach and Methods

The case studies presented in this assessment report cover different forms of climate plans and initiatives, including adaptation, climate mitigation and climate protection. They also shed light on governance structures embedded in postcolonial structures through the inclusion of a case from two EU Outermost Regions in France. The research for this report involved a comprehensive review of existing literature, exemplary case studies, and interviews with stakeholders. We adopted a mixed-methods approach to gather qualitative and quantitative data, tailored to the disciplinary and institutional backgrounds of the researchers and dependent on the data available. To establish common ground, the authors chose a selective and ethnographically informed approach to studying municipal activities concerning adaptation, shedding light on the day-to-day operations and cultural context of the municipalities and climate services involved. This method seeks to understand how local practices, values, and interactions shape and influence the implementation of climate adaptation strategies. The goal is to gain deep, context-rich insights into how policies are experienced, interpreted, and applied on the ground by those directly involved. Given the limited research timeframe, we concentrated on specific situations relevant to the objectives of WP5 and the overall goal of Climateurope2.

From the outset, the authors decided that each case study should have its own focus and narrative. This report documents the stories shared by administrators, engaged citizens, climate managers or platforms.

As a guideline and starting point for analysing the case studies with regard to climate services, we used the following questionnaire developed collectively during the first phase of Climateurope2.

**1. Clarity:** Select cases with a clear use of a service, not just climate information provision, and a clear identification of the need (or not) for standardisation, or that contain elements that show potential for standardisation. *Questions:*

- What climate services components does this use case illustrate more clearly? What is the concrete need that the services must meet?
- What aspects of the climate services in this use case have potential for standardisation?
- What types of benefits would emerge from their standardisation?
- If there are aspects where standardisation may be non-desirable, what other types of governance could be considered?

**2. Complementarity:** Case studies should offer or show potential for a multi-faceted analysis that is more useful to the project than the independent analysis of each WP. *Questions:*

- What perspectives does this use case offer for the types of tasks and deliverables in your WP?
- To what extent is it possible to analyse the climate services in this use case for generalising requirements for quality, usability and saliency to other aspects of the project?

**3. Usability in Climateurope2:** Common case studies should showcase lessons learned, success or room for improvement regarding standardisation processes. *Questions:*

- What lessons do we learn from this use case?
- In regard to which component of climate services are these lessons?
- Lessons for whom?
- What exactly can be improved?

**4. Knowledge holders:** The selection should ensure that the use case involves users and stakeholder and knowledge holders. *Questions:*

- What are the main stakeholders and knowledge holders in this use case? Are there some missing in the use cases that would be relevant?
- What methods are used to engage with them?
- How would you evaluate the quality of the co-design and co-production processes? What would be the lesson from a standardisation perspective?
- Who amongst those stakeholders and knowledge holders are best and least served by the climate services in this use case?

As we will see in the following sections, the questionnaire's focus on standards did not always elicit adequate responses; many of the interviewees were not aware of any standards. Instead, the responses from the interviewees highlighted the role of local knowledge in implementing adaptation plans. Their narratives emphasised how plans could be made effective in specific contexts, such as a particular neighbourhood, or in rural and urban regions. The quest for standards was counterbalanced by the search for new and flexible approaches to implement adaptation practices on the ground. This tension underscores the need for adaptable methods that cater to the unique needs of each local context.

## 2.2 Discussion of the Case Studies

Our case studies cover five municipalities in the European Union – Milan, Paris, Ghent, Landshut and Ammerland – and include one example from the EU's Outermost Region of France (a non-sovereign country that is governed with the same laws and regulations as mainland France itself) and one regional example from Latin America. As listed in section 1.3, the European Union develops various climate plans and initiatives targeting nation states, regions and municipalities. Many European cities have already initiated adaptation measures in strategic sectors like housing, water management, health, urban planning, mobility and so on. With the European Green Deal, climate adaptation and mitigation has become a primary objective of European politics, considered essential for maintaining municipal infrastructure and safeguarding the well-being of its residents. This shift in focus and narrative is reshaping governance structures in cities and municipalities. To ensure best practice, Climateurope2 is developing guidelines and criteria for the standardisation and certification of climate services and the creation of new business opportunities.

### 2.2.1 Addressing local knowledge needs

How is local knowledge integrated in the implementation of adaptation plans and other climate related measures? And which role do climate services play in this process? These are the guiding questions for the seven case studies presented here (see Table 2).

Many municipalities or regions had already developed their own climate adaptation strategies, specifically designed to meet local needs and integrated into various sectors of municipal governance. Climate concepts implemented through national adaptation strategies, such as the German Climate Initiative (DKI), often face greater challenges in gaining traction in local politics compared to those in situ, as seen in Milan or Paris.

Organisations and institutions such as IPCC, Copernicus, research institutes, EU projects, public or private consultancies and regional administrations provide municipalities with data and analysis on vulnerability and climate risks. In some cases, citizen science, citizen intelligence and local universities are involved and used as additional knowledge sources. However, most of our interviewees in the various municipalities were unfamiliar with the term "climate services". While administrators, climate

managers or other local technicians might be more familiar with the processes and products related to climate services, the term itself seems to hold little relevance for the implementation of climate adaptation or protection policies.

Anyway, in the process of implementation of adaptation plans, municipalities are not only climate service users, but also providers. They create local data, monitor activities in their communities and sometimes develop strategies which can serve as a model for other communities. Furthermore, municipalities serve as intermediaries or knowledge brokers when they actively engage in translating and disseminating climate information to various stakeholders within their jurisdiction. For example, a municipality might translate complex climate data into actionable strategies for local businesses or communicate risks and adaptation options to residents in a way that is accessible and relevant. As knowledge brokers, municipalities help bridge the gap between scientific data and practical application, ensuring that climate services are effectively used to inform local adaptation efforts. These efforts are also widely reflected and encouraged in the EU Mission on Adaptation to Climate Change, or the EU ADAPT platform.

There is also a political dimension to integrating local knowledge needs. Without these approaches, the implementation of adaptation plans, or other measures risks being perceived as bureaucratic, top-down and prescriptive. Protest against climate politics was already a significant concern in recent farmer protests and right-wing populism in Italy, France, Belgium and Germany – exactly where some of our case studies are located. Additionally, the lack of assimilation of local needs into the co-development of climate services prompt a dissociation between the local demand and the fit-for-purpose of the climate service itself. It can also threaten the collective trust in climate services and increase the risk of public backlash against climate change and climate adaptation policies. Thus, we consider climate adaptation on regional or local level not only as a technical, but also as a political problem and a challenge for democratic decision-making. All of the case studies presented here highlight this aspect in one way or another.

The examples from Latin America and the French West Indies illustrate a more user-centric approach to climate adaptation. In the case of Latin America, smallholder farmers, agribusinesses, research institutes, meteorological organisations, local government and international institutions form a flexible network focused on supporting farmers and agribusiness to become more resilient to a changing climate by providing tailored agroclimatic information that supports their decision-making process. This “grassroots” aspect ensures the assimilation of local needs into the climate service and promotes the inclusion of non-climate information, such as gender issues or indigenous knowledge. In the case of the French West Indies local narratives of farmers influence local policies and enhance interactions between farmers and public policy offices at territorial level. A significant challenge for the trust in standardized climate services is to avoid imposing measures and criteria that disregard local heritage, geography, demography, senses of place and social structures. These examples highlight the importance of respecting and integrating local knowledge and values into adaptation strategies.

**Table 2: Case studies - Summary of Adaptation plans**

	<b>Adaptation or other climate plans</b>	<b>Link to EU / national climate plans &amp; initiatives</b>	<b>Climate Services</b>	<b>Ecosystem of actors</b>	<b>Local Knowledge integration</b>

<b>Paris</b>	Municipal Climate Plan “Plan Climat-Air-Énergie Territorial” (PAET)	no	Urban vulnerability assessment, external consultants, IPCC, GREC,	Paris City Council, municipal councillors, technical department, public	International Organization for Migrants (IOM),
<b>Ghent</b>	Climate Plan 2020-2025 (adaptation / mitigation)	Covenant of Mayors for Climate & Energy	Flemish Climate Portal, vulnerability analyses, Citizen Intelligence, universities, citizen science	City of Ghent, national and regional government, citizen intelligence	Citizen engagement, “citizen intelligence”, citizen science, NGOs and civil society org.
<b>Milan</b>	Air and Climate Plan	Resilient Cities Network	Services co-developed by REACHOUT and other projects	Milan municipality, EU projects, Permanent Citizens Assembly	Permanent Citizens’ Assembly on Climate
<b>Ammerland</b>	Integrated climate protection plan	National Climate Protection Initiative;	Climate managers, Regional Statistical office, private consultancies, citizens’ initiatives	Municipal climate managers, stakeholders, public, citizens’ initiative, National Climate Initiative (NKI)	Interactive website, workshops, citizens’ initiative “climate markets”
<b>Landshut</b>	Climate Adaptation concept	National Climate Protection Initiative	FITNAH meteorological non-hydrostatic mesoscale model, Urban climate modelling, City climate analysis	Bavarian state ministry, municipal politics, City administration, climate manager, Citizens, external climate/environmental consultancies	Public participation events, “real-life experiments”, Internal workshops with other departments within city administration

<b>French West Indies</b>	Climate policy is integrated within existing structures and programs, e.g. MAEC (measures to prepare for agro-environmental/climate changes)	National Adaptation Plans	Geographic Data and Knowledge Platform for Supporting Climate Service Design	State plays a leadership role in coordinating climate policy efforts and integrating CC into institutional structures;  Smallholder farmers and ministries for agricultural development	Initiative by ministry of agriculture and Citizens; “creole gardening” initiatives
<b>Latin America</b>	MTAs are part of the Colombian NDCs (2015) and are also part of the NFCS in Colombia and Guatemala.	Not applicable	Agroclimatic round tables and bulletins	Smallholder farmers, agribusinesses, research institutions, national meteorological services, NGOs, ministries of agriculture and environment.	Round table sessions are held on a regular basis (either monthly or every 3 months depending on the location).

### 2.2.2 Implementation of local knowledge needs

The case studies offer a great variety of strategies in integrating knowledge needs (see Table 2). In Paris, local migrants are considered as an important source of climate knowledge, and consequently, the International Organization for Migrants is part of the adaptation strategy. Ghent has adopted the concept of “Citizen Intelligence” which seeks to integrate citizen engagement, citizen science, the activities of NGOs and others in civil society. Milan has institutionalised a “Permanent Citizens’ Assembly on Climate”; a concept which is becoming increasingly popular in Germany, too. In the German case study, citizen participation consists of public consultations and an interactive website, with additional input from citizens’ initiatives. Landshut is experimenting with “real life experiments” and public participation events. In Latin America, the implementation of the Round Tables is a common approach that has even developed its own step-by-step implementation guideline for other regions to follow, while in the West Indies “creole gardening” sustains new initiatives by the ministry of agriculture and citizens.

Like in the case of climate services, our questions concerning the standardisation of these services did not raise much interest. While many of our interviewees are indeed aware of the role that standardisation plays in the implementation of plans, there was little perceived need for standards regulating the interaction with local stakeholders or residents. The integration of local knowledge and needs is often seen as context-specific, requiring flexibility rather than rigid standards. This perspective suggests that a one-size-fits-all approach may not be effective in capturing the nuanced and diverse needs of local communities, which are essential for successful climate adaptation efforts.

Thus, the implementation of local knowledge needs looks like a huge field of societal experimentation. A recent study from climate research in Hamburg (Engels et al., 2023) highlighted the role of non-governmental organisations, citizen science and other activities as important drivers of societal transformation towards decarbonization and adaptation. Climate adaptation is more than a technical

process and challenges conventional forms of governance. The emergence of new forms of participation indicates that adaptation and mitigation strategies are as much a democracy issue as they are a technical problem.

It is not always easy to separate the activities of municipalities and the role of climate services in the implementation process of climate plans. Municipalities are users and sometimes also providers of climate services, and they serve as intermediaries and knowledge brokers. At a regional or local level, the municipal governance must link local policies with these new demands, reorganise the municipal sectors, accordingly, include citizens' initiatives and also non-climatic factors in the democratic process. However, this necessitates dialogue and the capacity to listen and to actively incorporate feedback instead of speaking or educating (Dudman and deWit 2021). This is also true for climate services and the delivery and dissemination of science-based climate information. Climate science increasingly needs to become aware of its role of a social actor in the collectives that decide over climate adaptation as a matter of concern.

The variety of examples presented here illustrates that there is no one-size-fits-all approach to the implementation of adaptation plans and initiatives. Instead, a wide range of governance strategies and democratic participation is occurring. Climate adaptation, as well as climate protection and mitigation, necessitate place-specific knowledge and narratives of change that provide context for these experiments.

### 3. Conclusion

In the realm of climate adaptation, the relationship between climate services, the implementation of adaptation plans, and the roles of various stakeholders, particularly municipalities, is crucial. Climate services, which are typically provided by scientific organisations, research institutions, and specialised agencies, offer essential data and tools to support decision-making in the face of a changing climate. The successful implementation of adaptation strategies at the regional and municipal levels requires more than just the provision of data; it demands a careful balance between the expertise of climate service providers and the on-the-ground realities faced by municipalities. In other words, the demand driven approach of climate services is essential for a successful implementation of adaptation plans.

Municipalities, often the frontline actors in climate adaptation, are both the users and implementers of these services, and sometimes they are providers of climate knowledge, too. As intermediaries and knowledge brokers, they translate scientific insights into practical measures that protect communities, infrastructure, and ecosystems. The challenge lies in ensuring that the climate services provided are not only scientifically sound but also tailored to the specific needs and contexts of these local governments. This report explores this delicate balance, focusing on the interaction between climate services and their practical application in different regions, while emphasising the importance of local knowledge and stakeholder engagement in shaping effective and context-sensitive adaptation strategies.

By examining case studies from the European Union, Latin America, and the Caribbean, the report highlights that the success of climate adaptation efforts depends on integrating place-based knowledge and contextual narratives, which are essential for developing tailored climate services. These services should go beyond merely providing data; they must embrace a more inclusive approach that incorporates local knowledge and addresses the specific needs of communities.

The distinction between scientific facts and broader societal concerns is particularly relevant for climate adaptation. While scientific data often reduces complex situations to technical problems, it is crucial to consider the social, political, and ethical implications of adaptation, including non-climatic factors such as gender, environmental justice, and decolonisation.

Finally, ethnographic research is vital for understanding the local contexts and narratives essential for developing fit-for-purpose and effective climate services. Through qualitative methods, ethnography provides deep insights into the lived experiences, cultural practices, and social dynamics of communities. This knowledge is crucial for tailoring adaptation strategies to local needs and fostering trust and collaboration between climate service providers and local stakeholders. Ethnographic research uncovers the nuanced ways in which climate change and risks are perceived and experienced, enabling more responsive and contextually appropriate adaptation measures.

Standardisation is not a primary concern for the municipalities in this study; rather, they emphasise the importance of flexibility, situatedness, and open communication in their processes. Municipalities recognize that each community has unique needs and contexts, making rigid standards less effective in addressing local challenges. Instead, they value adaptable approaches that allow for tailored solutions and responsive interactions with stakeholders. However, there is potential for procedural standardisation in the future, particularly in establishing common frameworks or guidelines that ensure consistency in process management while still allowing room for customization. Such procedural standards could help streamline operations and facilitate collaboration across different municipalities, without undermining the essential need for localised and context-specific interventions.

### 3.1 Key findings

1. **Importance of local knowledge:** The case studies underscore the critical role of place-based knowledge when developing climate services. Various approaches to incorporating local knowledge and concerns were observed, such as *MTAs (Mesas Técnicas Agroclimáticas or agroclimatic roundtables)* in Latin America, citizens' parliaments in Milan, holistic approaches led by citizens' initiatives in Ammerland and the West Indies, real-life experiments in Landshut, citizen science projects in Ghent, and the inclusion of migrant knowledge in Paris. These diverse methods highlight that without integrating local knowledge and narratives, climate services risk being perceived as top-down initiatives, disconnected from the lived realities and specific needs of the municipalities and communities most affected by a changing climate.
2. **Role of local actors and narratives:** Local actors, including NGOs, citizen scientists, and other civic organisations, play a pivotal role in climate adaptation by ensuring that strategies are grounded in local realities and are more likely to gain community trust and support. Their engagement helps align adaptation plans with the specific needs and conditions of the communities they serve. Exploring local narratives of change, as discussed by Krauß and Bremer (2020), adds depth to place-based knowledge and provides critical context for linking adaptation plans and climate services with local experiences. These narratives not only enrich the understanding of local vulnerabilities and strengths, but also facilitate more effective and culturally relevant adaptation measures by connecting broader strategies with the lived experiences and values of the community.
3. **Need for integrated approaches:** Effective and fit-for-purpose climate services necessitates integrated approaches that combine scientific data with local narratives and place-based knowledge. This integration not only enhances the relevance and credibility of climate services

but also ensures they are both scientifically robust and contextually appropriate. By merging quantitative data with qualitative insights from local communities, climate services and adaptation plans can be tailored to address specific local needs, risks, and opportunities. For example, cities like Paris and Ghent, which face challenges such as heat waves, heavy rains, and flooding, benefit significantly from this approach. Integrating local experiences and scientific data allows these cities to develop more effective and responsive adaptation plans. This holistic method fosters more nuanced and actionable strategies, promotes community engagement and ownership, and ultimately improves the effectiveness and resilience of climate adaptation efforts. Additionally, it helps bridge gaps between different stakeholders, leading to more coordinated and comprehensive responses to climate challenges.

4. **Democratising and decolonising climate adaptation:** Climate adaptation extends beyond technical processes and challenges traditional forms of governance. Non-governmental organisations, citizen science, and other civic activities play pivotal roles in driving adaptation efforts. The rise of new participatory models underscores that climate services are as much a matter of democratic engagement as they are technical challenges. This is particularly evident in non-European contexts, such as Latin America and the West Indies, where participation, self-empowerment, and decolonisation are integral to the adaptation process. However, these issues are also pertinent in cities and rural areas across the European Union, where there is often a dynamic interplay between government initiatives and local citizens' initiatives. The case studies presented here illustrate in various constellations how this tension can lead to productive co-production and outcomes, but there is also the urge from citizens' initiatives to remain independent, as the Ammerland case illustrates. Ultimately, climate service for adaptation is a highly political issue that continuously challenges the routines of democratic decision-making.
5. **Opportunities and Limits of Standardization:** Standardization offers several benefits, including ensuring procedural consistency and facilitating the generation of comparable data. It can support the development of an equitable climate services ecosystem and enhance the uptake of quality-assured services to aid adaptation and mitigation efforts. However, its effectiveness is limited by the diverse and complex nature of local climates, socio-economic conditions, and cultural contexts. A one-size-fits-all approach often falls short of addressing these varied needs. For instance, interviewees from the Ghent case study emphasise the necessity of flexibility in adaptation strategies, noting that standards like ISO 14091:2021 may not adequately accommodate the specific needs and adaptive capacity required by local municipalities. Furthermore, such standards can add layers of complexity and administrative burden.

Despite these limitations, standardisation can still play a valuable role. In some cases, standardising processes within climate service development can facilitate the effective integration of local knowledge, address local needs, and support the scaling up and equitable development of climate services. The Latin American case study illustrates how the standardisation of agroclimatic round tables (MTAs) can achieve comparability, inclusivity, saliency, legitimacy, robustness, and fit-for-purpose outcomes, demonstrating the potential benefits of a balanced approach.

Thus, while standardised climate services can provide consistent data and information beneficial for specific adaptation measures and foster trust in climate services, standardisation must be approached with care. It requires a thorough analysis to determine which processes

can be standardised without undermining local climate needs and knowledge, ensuring that local contexts are always respected and accommodated.

## 3.2 Recommendations

1. **Enhance Engagement with Local Communities:** Climate services should prioritise continuous engagement with local communities to understand their specific needs, senses of place, knowledge, and narratives. This engagement should extend beyond the duration of individual projects, ensuring that adaptation strategies evolve in response to ongoing local feedback. While the methods of engagement should remain flexible to cater to local contexts, establishing a standardised framework for how this feedback is collected and integrated could enhance the consistency and effectiveness of community interactions.
2. **Promote Flexibility in Standardization and Guidelines:** Standards and guidelines should be designed to allow for flexibility and adaptation to local contexts. Developing adaptable procedural guidelines can help bridge the gap between the need for standardisation and the importance of local relevance. Such guidelines could provide a consistent foundation for municipalities while allowing for necessary customization based on specific local conditions.
3. **Situating Climate Services:** Despite many European cities having established or planning to establish adaptation plans, the term "climate services" remains unfamiliar to many local authorities, often being linked primarily to climate managers, administrators, or technicians. In practice, climate services are commonly seen as climate data providers and evaluators of outcomes, but they rarely play a central role in the implementation of adaptation plans. To improve their effectiveness, climate services should focus less on data provision and more on meeting local needs for adaptation and mitigation purposes. This means integrating climate services into local decision-making frameworks in a way that amplifies public engagement and incorporates diverse community perspectives. Rather than positioning climate services as an isolated solution, they should be part of the democratisation of adaptation plans. To facilitate and enhance public participation, ensuring that local knowledge and democratic input drive the development of climate services and adaptation strategies. This shift would help climate services become more relevant and impactful by respecting and elevating the role of the community in shaping effective and context-sensitive adaptation efforts.
4. **Establish Systematic Feedback:** Systematic feedback loops between users, purveyors, and providers of climate services are necessary to develop climate services that are truly fit for purpose. While the specific approaches to gathering feedback (e.g., round tables, citizens' initiatives, or assemblies) should not be standardised to allow for the necessary flexibility, the process of establishing these feedback systems and the continuous monitoring and evaluation strategies of climate services should be standardised. The evaluation process needs to be based on the goals set by the communities and not alone by technical standards. This would ensure a consistent and reliable process across municipalities, facilitating shared learning and improving the responsiveness of climate services.
5. **Encourage Interdisciplinary Approaches:** Combining insights from social sciences, humanities, and natural sciences can lead to more holistic and effective adaptation strategies. To support this, interdisciplinary research and practice should be encouraged and supported. While the specific interdisciplinary methods should remain flexible, establishing standard guidelines for

fostering interdisciplinary collaboration could help ensure that such approaches are consistently integrated into climate service development and implementation. There is an urgent need for a “cultural turn” (Krauß 2023) in climate services.

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# ANNEX

## EU legislation and initiatives

Francesca Finello, Ramboll

### 1. EU legislation on adaptation at the national level and current status in Member States

#### *Key messages*

- The key EU legislative documents about adaptation are the European Climate Law (2021), the EU Adaptation Strategy (2021), the Mission on Adaptation to Climate Change (2023), and the Communication on managing climate risks in Europe (2024).
- Under the Regulation on the Governance of the Energy Union and Climate Action (EU, 2018/1999), every two years since 2021, Member States are reporting on the implementation of national adaptation actions in their National Adaptation Strategies and National Adaptation Plans.
- At present, 26 of the 27 EU Member States have developed a National Adaptation Strategy (NAS), while 16 have established a National Adaptation Plan (NAP), and 15 have implemented both NAS and NAP.
- 12 out of the 26 national adaptation strategies are based on climate risk assessments.

In March 2024, the European Commission adopted and published a **Communication on managing climate risks in Europe**<sup>6</sup> In response to the first-ever **European Climate Risk Assessment (EUCRA)**<sup>7</sup>. The report pinpointed 36 significant climate risks across Europe, categorised into five main groups:

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<sup>6</sup> COM/2024/91 final

<sup>7</sup> EEA (2024), EEA Report No 1/2024, European Climate Risk Assessment, Available at: <https://www.eea.europa.eu/publications/european-climate-risk-assessment>

ecosystems, food security, public health, infrastructure, and the economy. Together, the two documents are a call to action for all levels of government, as well as the private sector and civil society. They set out how all major sectors and policy areas are exposed to climate-related risks, how severe and urgent the risks are, and how important it is to have clarity on who has the responsibility to address the risks.

The Communication outlines four key areas for action:

- **Improved Governance:** Enhance understanding and responsibility for climate risks, with closer cooperation between national, regional, and local levels.
- **Empowering Risk Owners:** Provide better tools and data access, including the Galileo Emergency Warning Satellite Service (EWSS) by 2025, and address data gaps through proposed legislation.
- **Harnessing Structural Policies:** Use Member States' structural policies to manage climate risks, integrating them into disaster risk management and future-proofing civil protection systems and assets.
- **Preconditions for Financing Climate Resilience:** Mobilise finance for climate resilience, support Member States in integrating climate-risk budgeting, and convene a Reflection Group on Climate Resilience Financing.

Additionally, concrete actions are suggested for six main impact areas: natural ecosystems, water, health, food, infrastructure, and the economy. International efforts are highlighted, with the EU actively supporting climate risk management globally.

## Policy Background

The **European Green Deal** prioritises addressing climate and environmental challenges<sup>8</sup>. Key to this initiative is the **European Climate Law** adopted in 2021, providing a legal framework for EU policies on climate change adaptation<sup>9</sup>. Article 5 of the law mandates continuous progress in enhancing adaptive capacity, resilience, and reducing vulnerability to climate change. Moreover, the Climate Law requires the Commission to develop a Union strategy on adaptation in line with the Paris Agreement and for Member States to adopt and implement national strategies.

In 2021, the Commission introduced a more ambitious **EU Adaptation Strategy**, incorporating advancements in climate science, technology, and understanding of adaptation measures since it was introduced in 2013<sup>10</sup>. It defines how the European Union can adapt to the unavoidable impacts of climate change and build climate resilience by 2050. The Strategy proposes 48 actions to enhance adaptation planning and risk assessments as a key step for smarter, swifter and more systematic adaptation across Europe. It entails crucial components such as the advancement of nature-based solutions, efforts to address knowledge deficiencies, and the provision of funding for climate adaptation measures.

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<sup>8</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: The European Green Deal (COM(2019) 640 final)

<sup>9</sup> Regulation (EU) 2021/1119 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ('European Climate Law')

<sup>10</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Forging a climate-resilient Europe – The new EU strategy on adaptation to climate change (COM(2021) 82 final)

To accelerate adaptation efforts, the European Commission launched the **2023 Mission on Adaptation to Climate Change**, rallying actions across EU regions, cities, and local authorities<sup>11</sup>. Moreover, the **Technical Support Instrument (TSI)** provides technical assistance to EU Member States for climate change adaptation strategies and resilience improvement<sup>12</sup>. For instance, it aids in managing rural wildfires, flood risks, and heatwaves.

EU Member States and EEA countries are actively adapting to climate change by implementing their National Adaptation Strategies and National Adaptation Plans. Every two years, Member States are reporting on national adaptation actions occurring under the Regulation on the Governance of the Energy Union and Climate Action (EU, 2018/1999)<sup>13</sup>. In line with Article 19, concerning national adaptation actions, they reported national adaptation action for the first time in 2021. The European Environment Agency (EEA) compiles reports<sup>14</sup> offering valuable insights for assessing national measures and progress at EU level<sup>15</sup>, as mandated by the European Climate Law<sup>16</sup>. Additionally, beginning in 2023 and recurring every five years thereafter, the Commission will evaluate the combined progress made by Member States. However, there are no stipulations for Member States to establish adaptation targets that are binding or quantifiable for adaptation.<sup>17</sup>

In March 2023, EU Member States reported their national adaptation actions for the second time and included adaptation aspects in their national energy and climate plans' progress reports for the first time. The Technical Paper "Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023" written by the **European Topic Centre on Climate change adaptation and LULUCF**<sup>18</sup> (ETCCA) presents the state of national adaptation efforts across Europe, focusing on recent advancements and insights gained since the 2021 EEA reporting period<sup>19</sup>. The reported information

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<sup>11</sup> EEA, 2023, Annual European Union greenhouse gas inventory 1990–2021 and inventory report 2023, No Submission to the UNFCCC Secretariat, EEA/PUBL/2023/044, European Environment Agency, Copenhagen. Available at: <https://www.eea.europa.eu/publications/annual-european-union-greenhouse-gas-2>

<sup>12</sup> Technical Support Instrument. Available at: [https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/technical-support-instrument\\_en](https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/technical-support-instrument_en)

<sup>13</sup> PE/55/2018/REV/1

<sup>14</sup> EC, 2023, Commission staff working document: Report on the implementation of the EU strategy on adaptation to climate change (2023 SWD/2023/338 final).

<sup>15</sup> Climate Action Progress Report 2023. Available at: [https://climate.ec.europa.eu/news-your-voice/news/climate-action-progress-report-2023-2023-10-24\\_en](https://climate.ec.europa.eu/news-your-voice/news/climate-action-progress-report-2023-2023-10-24_en)

<sup>16</sup> EC, 2023, Commission staff working document: Assessment of progress on climate adaptation in the individual Member States according to the European Climate Law (SWD(2023) 932 final).

<sup>17</sup> European Parliamentary Research Service (2023), Regional and local adaptation to climate change, Gaps, challenges and opportunities. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS\\_IDA\(2024\)757589\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS_IDA(2024)757589_EN.pdf)

<sup>18</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca-technical-paper-2-23-is-europe-on-track-with-climate-resilience-2013-status-of-reported-national-adaptation-actions-in-2023>

<sup>19</sup> EEA, 2021, EEA Report No 11/2022, Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021. Available at: <https://www.eea.europa.eu/publications/advancing-towards-climate-resilience-in-europe>

by countries in accordance with Article 19 of the **Regulation on the Governance of the Energy Union and Climate Action** (GovReg)<sup>20</sup> are accessible through the country profiles on *Climate-ADAPT*<sup>21</sup>. Likewise, information provided by EU Member States under Article 17 of the GovReg can be accessed via the *Climate and Energy in the EU* portal<sup>22</sup>. These country profiles offer the most recent information as provided and updated by each respective country.

## Complementary policies

Additional European measures and directives that share goals similar to those of enhancing societal resilience, as well as environmental and climate adaptation, are supporting the initiatives associated with the Green Deal and the Climate Change Adaptation Strategy. The following are some instances:

- **The 8th Environment Action Programme** is the unified agenda of the EU for environmental policy up until the year 2030, detailing priority objectives and the requisite steps to fulfil them. It aims to expedite the shift towards an economy that is both climate-neutral and resource-efficient, at the same time recognizing the significance of vibrant ecosystems. An array of indicators has been adopted to gauge advancements in reaching the EU's environmental and climate change objectives as stipulated in the 8th Environment Action Programme<sup>23</sup>.
- The **Regulation on the Governance of the Energy Union and Climate Action** necessitates regular reports from the EU Member States on their adaptations (EU, 2018). These nations are obligated to present bi-annual reports concerning their adaptive measures to the European Commission. An analysis of this reported data<sup>24</sup> offers insights into the strategies Member States employ for planning, executing, observing, and appraising policies and measures for adaptation, inclusive of actions taken at local levels.
- The **Zero Pollution Action Plan** which can bolster adaptation efforts in fields such as fair transition processes.

## Funding mechanisms

Two primary sources of funding are pivotal in supporting the implementation of the EU Adaptation Strategy:

- The **Next Generation EU Recovery Plan**<sup>25</sup> supplements the finances already designated in the EU's seven-year budget, allocating about one-third of its EUR 1.8 trillion budget to activities related to the EU Green Deal.

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<sup>20</sup> [Regulation on the Governance of the Energy Union and Climate Action](#)

<sup>21</sup> Climate-ADAPT, Country Profiles. Available at: <https://climate-adapt.eea.europa.eu/en/countries-regions/countries>

<sup>22</sup> EEA, Data. Available at: <https://climate-energy.eea.europa.eu/topics/climate-change-adaptation/adaptation-progress-to-targets/data>

<sup>23</sup> EEA, 2023, Monitoring report on progress towards the 8th EAP objectives 2023 edition, Available at: <https://climate-adapt.eea.europa.eu/en/metadata/publications/monitoring-report-on-progress-towards-the-8th-eap-objectives-2023-edition>

<sup>24</sup> EEA, 2023, Monitoring report on progress towards the 8th EAP objectives 2023 edition, Available at: <https://climate-adapt.eea.europa.eu/en/metadata/publications/monitoring-report-on-progress-towards-the-8th-eap-objectives-2023-edition>

<sup>25</sup> Next Generation EU. Available at: [https://next-generation-eu.europa.eu/index\\_en](https://next-generation-eu.europa.eu/index_en)

- The **European Regional Development Fund**<sup>26</sup> serves as a crucial financial tool of EU cohesion policy, which also includes the Cohesion Fund (CF), the European Social Fund Plus (ESF+), and the Just Transition Fund (JTF). Its objective is to strengthen economic, social, and territorial cohesion by correcting major regional disparities within the Union. Each Member State is required to spend at least 8% of its ERDF allocations on priorities and projects that are chosen by the cities based on their own strategies for sustainable urban development.

These funding streams are complemented by national, subnational, private, and philanthropic contributions. Additionally, the **LIFE program** has been crucial in funding climate adaptation and environmental goals<sup>27</sup>. The EU sustainable finance framework aims to mobilize private finance for climate mitigation and adaptation, reducing financial sector risks associated with climate change<sup>28</sup>.

## 2. Current status of implementation of adaptation actions in EU Member States

### NAS, NAP and national climate risk assessments

Over the past two years, countries have made progress in enhancing various aspects of their adaptation planning. Yet, given the nature of the adaptation policy cycle, resource-intensive climate risk assessments, and the complexities of long-term strategic planning and implementation of adaptation measures, along with challenges in monitoring, reporting, and evaluation (MRE), rapid and radical progress remains elusive.

The 2023 national reports indicate continued advancements in evaluating climate-related hazards, vulnerabilities, and risks, underscoring the ongoing efforts in many Member States to enhance, broaden, and deepen their understanding of climate risks. Between the two reporting periods 2021 and 2023, approximately half of EU Member States<sup>29</sup> reported significant progress in **updating or conducting new assessments of climate-related hazards, vulnerabilities, and risks**<sup>30</sup>. Additionally, notable efforts were made in related areas, such as the development of assessment methodologies and the enhancement of content in web-based databases at the national level.

There is a growing trend towards standardising Climate Risk Assessments (CRAs) to ensure they can be performed consistently and allow for comparisons over time. Countries such as Germany and the Netherlands have specifically used the **ISO 14091:2021 standard**<sup>31</sup> for their national CRAs. This move

<sup>26</sup> European Regional Development Fund. Available at: [https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/european-regional-development-fund-erdf\\_en](https://commission.europa.eu/funding-tenders/find-funding/eu-funding-programmes/european-regional-development-fund-erdf_en)

<sup>27</sup> LIFE Climate Change Mitigation and Adaptation. Available at: [https://climate.ec.europa.eu/euaction/eu-funding-climate-action/life-climate-change-mitigation-and-adaptation\\_en](https://climate.ec.europa.eu/euaction/eu-funding-climate-action/life-climate-change-mitigation-and-adaptation_en)

<sup>28</sup> Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – A sustainable finance framework that works on the ground (COM/2023/317 final).

<sup>29</sup> Including Austria, Belgium, Croatia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Poland, and Sweden.

<sup>30</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>

<sup>31</sup> ISO 14091:2021 Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment Available at: [ISO 14091:2021 - Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment](https://www.iso.org/standard/72441.html)

towards standardisation allows for the assessment of changes in risk, vulnerability, and preparedness in a consistent, clear, and comparable manner. While the application of these standardised frameworks is still in its early stages, their potential importance suggests they warrant further attention and exploration in the future.

The ISO 14091:2021 standard, focused on adaptation to climate change through guidelines on vulnerability, impacts, and risk assessment, is utilised by organisations globally, as it provides a systematic approach to understanding and managing climate risks. This standard has a broad international scope and is used in over 130 countries<sup>32</sup>. It was developed jointly by international contributors and is aligned with other global sustainability efforts. **At the municipal level**, ISO 14091:2021 provides a structured approach for cities and regions to conduct climate risk assessments. This standard helps local governments identify and prioritise their vulnerabilities to climate phenomena like droughts and floods. By assessing which areas and populations are most at risk, municipalities can tailor their adaptation strategies effectively. The guidelines support local authorities in integrating climate risk considerations into urban planning and infrastructure design, fostering resilience against future climate challenges. This enables efficient resource allocation and strategic policy development, facilitating both immediate and long-term climate adaptation planning.

**The number of Member States with legal mandates for conducting climate risk assessments has increased.** In many of the Member States where climate legislation has been recently introduced or revised, the requirement for preparing and regularly updating Climate Risk Assessments (CRAs) has been enshrined in national law, e.g. in France, Spain and Italy<sup>33</sup>. It is often linked to the revision cycles of national adaptation strategies (NAS), national adaptation plans (NAP), sectoral adaptation plans (SAPs), and/or regional adaptation plans (RAPs). Nonetheless, countries with such legal obligations remain in the minority.

The 2023 ETCCA Technical Paper indicates that **since 2019, all 27 EU Member States have a dedicated adaptation policy in place**. At present, 26 EU Member States have developed a National Adaptation Strategy (NAS), while 16 have established a National Adaptation Plan (NAP), and 15 have implemented both (see Figure 3). Additionally, several countries have started to enforce legal mandates aimed at addressing climate change, with several incorporating distinct requirements for adaptation measures. In 2023, eight<sup>34</sup> EU Member States reported having adopted a national climate law including adaptation aspects. Since 2015, a total of 14 EU Member States adopted a revised or new National Adaptation Strategy (NAS). Among them, nine have implemented both a NAS and a NAP<sup>35</sup> (see Figure 1). Figure 4 maps the EU Member States with a National Adaptation Strategy (in blue) and a Climate Risk Assessment (in green).

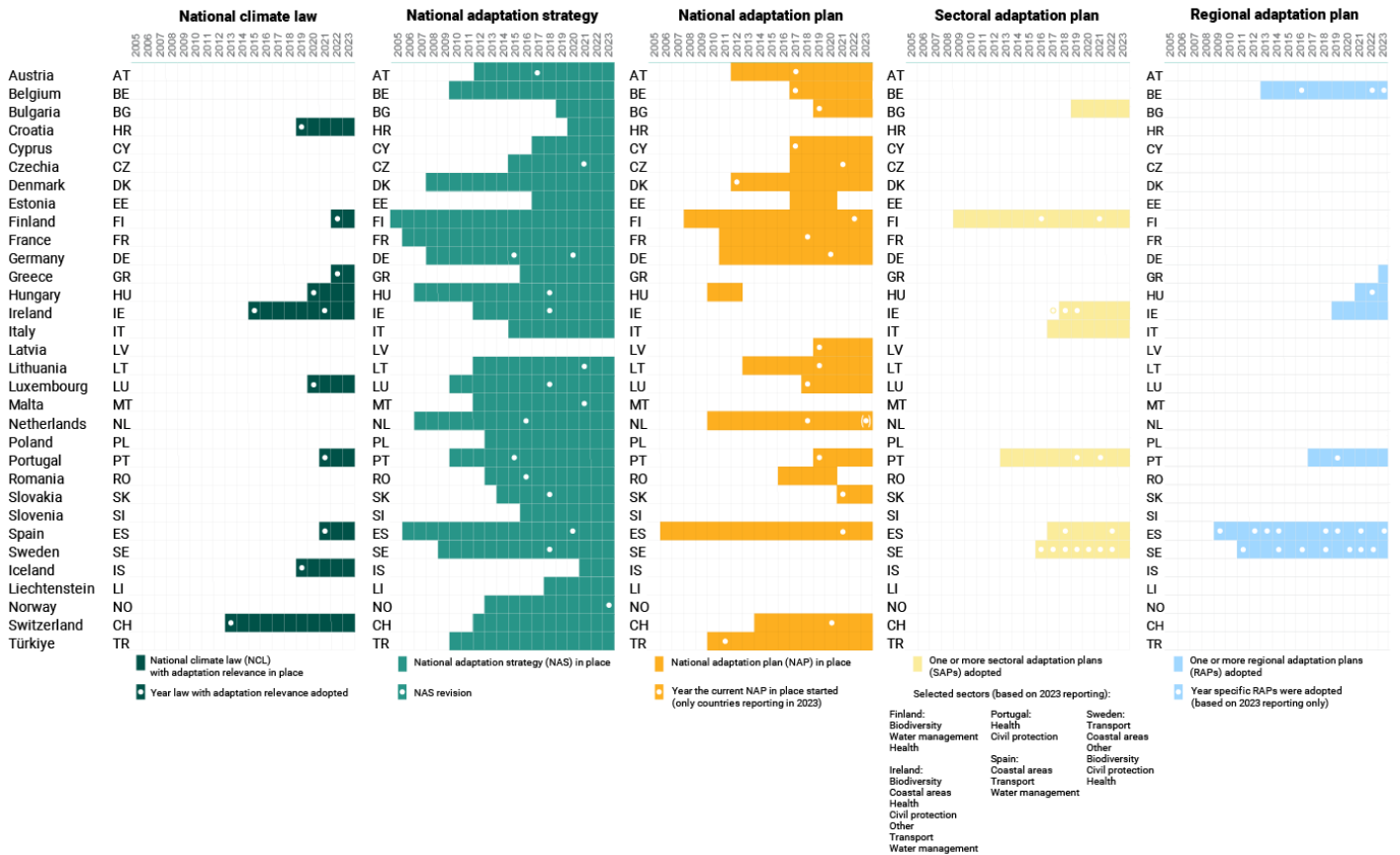
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<sup>32</sup> Porst et al. (2022), Climate Risk Assessments at the Municipal Level Recommendations for the Implementation of ISO 14091, Umweltbundesamt. Available at: <https://www.preventionweb.net/publication/climate-risk-assessments-municipal-level-recommendations-implementation-iso-14091>

<sup>33</sup> EEA, 2024, European Climate Risk Assessment, Executive Summary, EEA Report No 1/2024. Available at: <https://www.eea.europa.eu/publications/european-climate-risk-assessment>

<sup>34</sup> Croatia, Finland, Greece, Hungary, Iceland, Ireland, Luxembourg, Portugal and Spain.

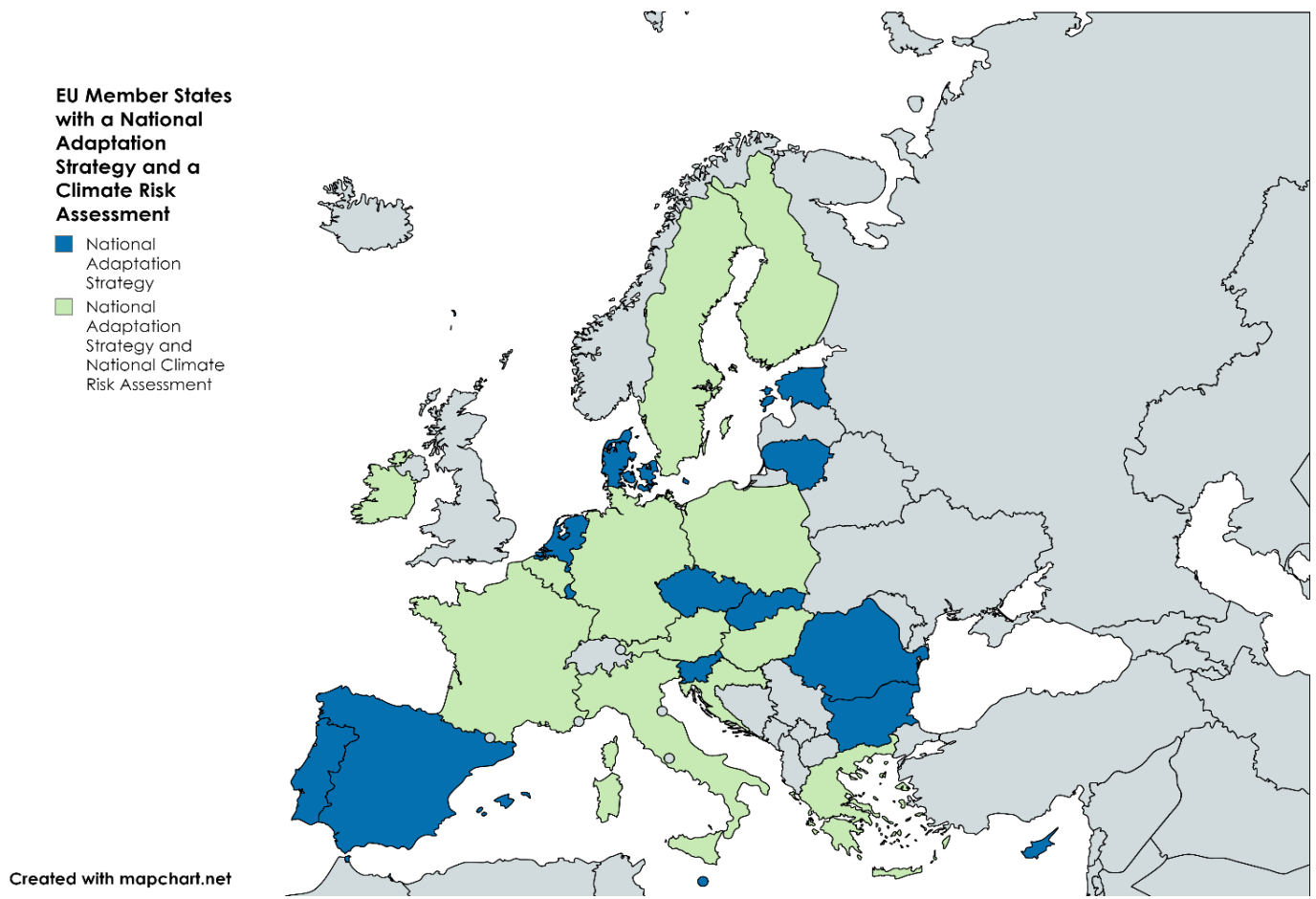
<sup>35</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>



Source: EEA, 2023<sup>36</sup> based on reporting under the [Monitoring Mechanism Regulation](#) ((EU) No 525/2013 Art. 15) in 2015, 2016 (voluntary) and 2019, the 2018 [country scoreboards](#) prepared for the evaluation of the 2013 EU adaptation strategy, and the reporting under [GovReg](#) Art. 19 in [2021](#) and in [2023](#).

Figure 3: Overview of adaptation policies

<sup>36</sup> EEA, 2023, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>



Source: Own compilation based on EEA, 2023<sup>37</sup> and ETCCA, 2023<sup>38</sup>.

**Figure 4: EU Member States with a National Adaptation Strategy and a National Climate Risk Assessment**

### Mainstreaming adaptation in sectoral policies

Mainstreaming adaptation across sectors is a key instrument for effective horizontal coordination of adaptation activities. Europe continues to make strides in integrating climate change adaptation at the national level. Various countries such as Belgium, Denmark, Estonia, Malta, Poland, Portugal, Romania, and Slovakia are progressively factoring climate change impacts into their national Disaster Risk Management (DRM) frameworks and sectoral policies<sup>39, 40</sup>. This comprehensive integration covers a range of areas including national civil protection plans, disaster risk management plans, national risk

<sup>37</sup> EEA, 2023, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>

<sup>38</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>

<sup>39</sup> Leitner, M., et al., 2023, 'Overview of reported national adaptation actions in Europe in 2023', (DOI: 10.25424/CMCC-5P8Y-VD45)

<sup>40</sup> EEA, 2022, Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021, EEA Report No 11/2021, Publications Office, Luxembourg (<https://data.europa.eu/doi/10.2800/517467>)

assessments, drought management plans, flood risk management plans, and river basin management plans. Additionally, EU Member States have expanded their integration of climate change adaptation into previously underexplored sectors like urban planning, buildings, and transport<sup>41</sup>. For instance, Latvia has incorporated climate change adaptation into its architectural strategy, while France has integrated adaptation measures into various documents and plans related to territorial coherence, urban planning, natural risk prevention, and marine environments. Furthermore, Portugal is actively incorporating climate change adaptation into coastal management, with plans to include the national Coastal Risk Assessment (CRA) in local master plans<sup>42</sup>.

Overall, the most frequently reported sectors in which adaptation is mainstreamed in 2023 included health, agriculture, forestry and biodiversity. These results are consistent with the ones from 2021. While each Member State is responsible for adaptation mainstreaming, only seven EU Member States adopted sectoral adaptation plans (SAPs), according to national reports from 2021 and 2023.

Various **national coordination bodies and mechanisms** facilitate multi-sectoral policy integration and coordination across different governance levels in nearly all countries. These mechanisms often include high-level inter-ministerial or cross-sectoral coordination bodies, as well as advisory boards. The technical and operational coordination tasks are typically assigned to specialised adaptation working groups. The ownership of policies related to the environment often resides within dedicated ministries, which is a consistent arrangement. Furthermore, since 2021, an increasing number of countries have established dedicated climate ministries, possibly indicating a heightened level of political commitment to addressing climate issues.

### Monitoring, reporting and evaluation frameworks for adaptation

In most EU Member States, frameworks for monitoring, reporting and evaluating (MRE) the progress of the implementation of adaptation activities are either being developed or have been recently put into action. If these frameworks are operational, they primarily revolve around the adaptation measures outlined in national adaptation strategies or plans, or they adopt an indicator-based approach. Many EU Member States encounter challenges in their MRE systems, especially in tracking financing for adaptation. While costs are difficult to assess comprehensively, sector costs for adaptation are rising across the board. Most countries lack dedicated budgets for adaptation implementation, but some provide quantitative finance information mainly from EU funds. In terms of MRE, half of the Member States are making progress on at least one of the three MRE activities being performed or planned (monitoring, reporting, evaluation), but engagement levels vary<sup>43</sup>. Connecting different levels of MRE is important for understanding and enhancing MRE activities. Many Member States emphasise the significant role of a coordinating actor, such as a ministry or governmental agency, in scaling adaptation actions and evaluating progress.

## 3. EU legislation and initiatives on adaptation at the municipal level and current status in Member States

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<sup>41</sup> EEA, 2022, Advancing towards climate resilience in Europe: status of reported national adaptation actions in 2021, EEA Report No 11/2021, Publications Office, Luxembourg (<https://data.europa.eu/doi/10.2800/517467>)

<sup>42</sup> Leitner, M., et al., 2023, 'Overview of reported national adaptation actions in Europe in 2023', (DOI: 10.25424/CMCC-5P8Y-VD45)

<sup>43</sup> EEA, National climate change adaptation planning and strategies, 2023, Article 19(1) Implementing Regulation 2020/1208, Annex I, Available at: <https://reportnet.europa.eu/public/dataflow/895>

### **Key messages**

- Recognising the role of municipal and regional authorities, in October 2023 the European Commission issued the Communication on Enhancing the European Administrative Space to enhance the capacity of public administrations in EU Member States.
- European municipalities have made progress in adopting local adaptation plans, mainly through national climate laws and international climate networks. Approximately 51% of European cities have now established specific adaptation plans, compared to 26% in 2018.
- However, in many EU Member States, sub-national adaptation planning remains primarily voluntary and non-binding, relying heavily on bottom-up initiatives. Only 7 of 27 EU Member States reported adopting Regional Adaptation Plans (RAPs) under national climate laws between 2021 and 2023.
- Most municipal adaptation actions reported under the Covenant of Mayors target the following sectors: water (17%), buildings (13.6%), the environment (11.7%), land (10.8%), agriculture (9.3%), and health (7.6%).

The updated **EU Adaptation Strategy**<sup>44</sup> from 2021 emphasises the importance of the regional and local level in adaptation efforts. Consequently, scaling up regional and local adaptation measures and ensuring seamless coordination of adaptation policies across all administrative levels are crucial requirements for effective adaptation. The Committee of the Regions estimates local and regional authorities to be responsible for 90% of climate change adaptation policies across Europe<sup>45</sup>. Recognising the role of municipal and regional authorities, in October 2023 the European Commission issued the **Communication on Enhancing the European Administrative Space**<sup>46</sup>. It aims to bolster the capacity of public administrations in EU Member States, particularly focusing on their role in leading the green transition and enhancing resilience.

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<sup>44</sup> COM/2021/82 final

<sup>45</sup> CoR, 2020, Resolution of the European Committee of the Regions - The Green Deal in partnership with local and regional authorities (Document 52019XR4351).

<sup>46</sup> EC, 2023, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Enhancing the European Administrative Space (ComPAct) (COM(2023) 667 final).

National adaptation reporting also offers insights into the impacts of climate change and adaptation strategies at both the subnational and urban levels. In 2023, ten EEA countries<sup>47</sup> specifically highlighted the urban sector as significantly affected by climate change and assessed the risk of future impacts as medium to high<sup>48</sup>. This suggests an expected increase in risk for the urban sector due to climate change. Nine EU Member States<sup>49</sup> specifically focused on urban areas within their national strategy summaries.

Additional European measures and directives are supporting climate adaptation measures at local level. The following are some examples:

- **The EU Cohesion Policy**<sup>50</sup> is designed to improve social, economic, and territorial unity within the regions of the EU. A number of themes that are funded by the cohesion policy budget for the period from 2021 to 2027 are directly related to the objectives of the Green Deal, climate change mitigation included. The **Sustainable Europe Investment Plan**<sup>51</sup>, also known as the European Green Deal Investment Plan, identifies the cohesion policy as a primary source of EU budget that can finance investment in climate and environmental initiatives. Past projects funded by the **Urban Innovative Actions (UIA)**<sup>52</sup> and **URBACT programs**<sup>53</sup> have now been included under the umbrella of the cohesion policy. This comprehensive tool offers a rich array of knowledge and support for research, practice, and eventually, policymaking, facilitating enhanced collaboration amongst EU cities and Member States
- **The New Leipzig Charter**<sup>54</sup> is an essential policy guidance document for sustainable urban development within Europe<sup>55</sup>. It underscores the requirement for cities to design holistic sustainable urban development strategies and ensure their comprehensive application throughout the entire urban area—that is, from functional zones to individual neighbourhoods. The Charter aligns closely with the cohesion policy and its support framework for sustainable urban development. The EU Member States have committed to encompassing the Charter within their respective national or regional urban policies.

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<sup>47</sup> Austria, Bulgaria, Czechia, Hungary, Italy, Portugal, Romania, Slovakia, and Spain.

<sup>48</sup> EEA, 2024, Urban adaptation in Europe: what works? Implementing climate action in European cities, EEA Report 14/2023, Available at: [Urban adaptation in Europe: what works? – European Environment Agency \(europa.eu\)](https://www.eea.europa.eu/en/urban-adaptation-in-europe-what-works)

<sup>49</sup> Austria, Bulgaria, Hungary, Italy, Luxembourg, Poland, Portugal, Slovenia, and Spain

<sup>50</sup> European Commission, EU Cohesion Policy, Available at: [https://ec.europa.eu/regional\\_policy/policy/what/investment-policy\\_en](https://ec.europa.eu/regional_policy/policy/what/investment-policy_en)

<sup>51</sup> COM/2020/21 final

<sup>52</sup> UIA, Urban Innovation Actions, Available at: <https://www.uia-initiative.eu/en>

<sup>53</sup> URBACT, Available at: <https://urbact.eu/>

<sup>54</sup> New Leipzig Charter, Available at: [https://ec.europa.eu/regional\\_policy/whats-new/newsroom/12-08-2020-new-leipzig-charter-the-transformative-power-of-cities-for-the-common-good\\_en](https://ec.europa.eu/regional_policy/whats-new/newsroom/12-08-2020-new-leipzig-charter-the-transformative-power-of-cities-for-the-common-good_en)

<sup>55</sup> EPRS, European Parliamentary Research Service, 2020, At a glance: The New Leipzig Charter, Available at: [https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/659384/EPRS\\_ATA\(2020\)659384\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2020/659384/EPRS_ATA(2020)659384_EN.pdf)

- The **EU Biodiversity Strategy**<sup>56</sup> for 2030 is focused on nurturing robust and dynamic ecosystems within urban settings. One goal is to halt the diminishment of urban green spaces and steadily enhance them. Additionally, it includes a mandate for all cities and towns with a population exceeding 20,000 to establish urban greening plans that systematically embed green infrastructure and nature-based solutions into their urban planning efforts.

According to the 2023 ETC CA Technical Paper<sup>57</sup>, multi-level governance structures focusing on sub-national levels are steadily progressing. International urban initiatives are also localised in the EU. For instance, the **Sustainable Urban Resilience for the Next Generation (SURGe) Initiative** was launched under COP27 in 2022 with the aim to strengthen and speed up local and urban climate action. The SURGe initiative is based on multi-level governance, delivery and engagement in five interlinked areas: buildings and housing, urban water, urban mobility, urban waste/ consumption and urban energy. These networks and partnerships play a vital role in advancing local adaptation efforts by assisting sub-national governments and stakeholders through capacity-building initiatives, information dissemination, guidance, and financial support.

## Status of implementation of municipal adaptation plans in EU Member States

**Adaptation planning is increasingly becoming part of the norm, also at the municipal level.** Approximately 51% of European cities<sup>58</sup> have now established specific adaptation plans, a considerable rise from the 26% reported in 2018<sup>59</sup>. Various factors affect the creation and advancement of local climate and energy strategies, including the size of the city (which impacts technical and resource capacity), national laws on climate planning, and engagement in urban networks or initiatives. In 2020, around 123 million individuals in the 38 EEA-countries resided in local authorities committed to adaptation through the **Covenant of Mayors**<sup>60</sup>. This initiative continues to provide vital assistance to local authorities through capacity building, technical support, networking opportunities, and participation in European projects focused on the local level. The number of signatories of the Covenant of Mayors has since increased to 202.5 million. Figure 5 provides an overview of the evolution of European policy relevant to adaptation, national adaptation plans and strategies, and the number of signatories of the Covenant of Mayors with adaptation commitments for 2013-2023.

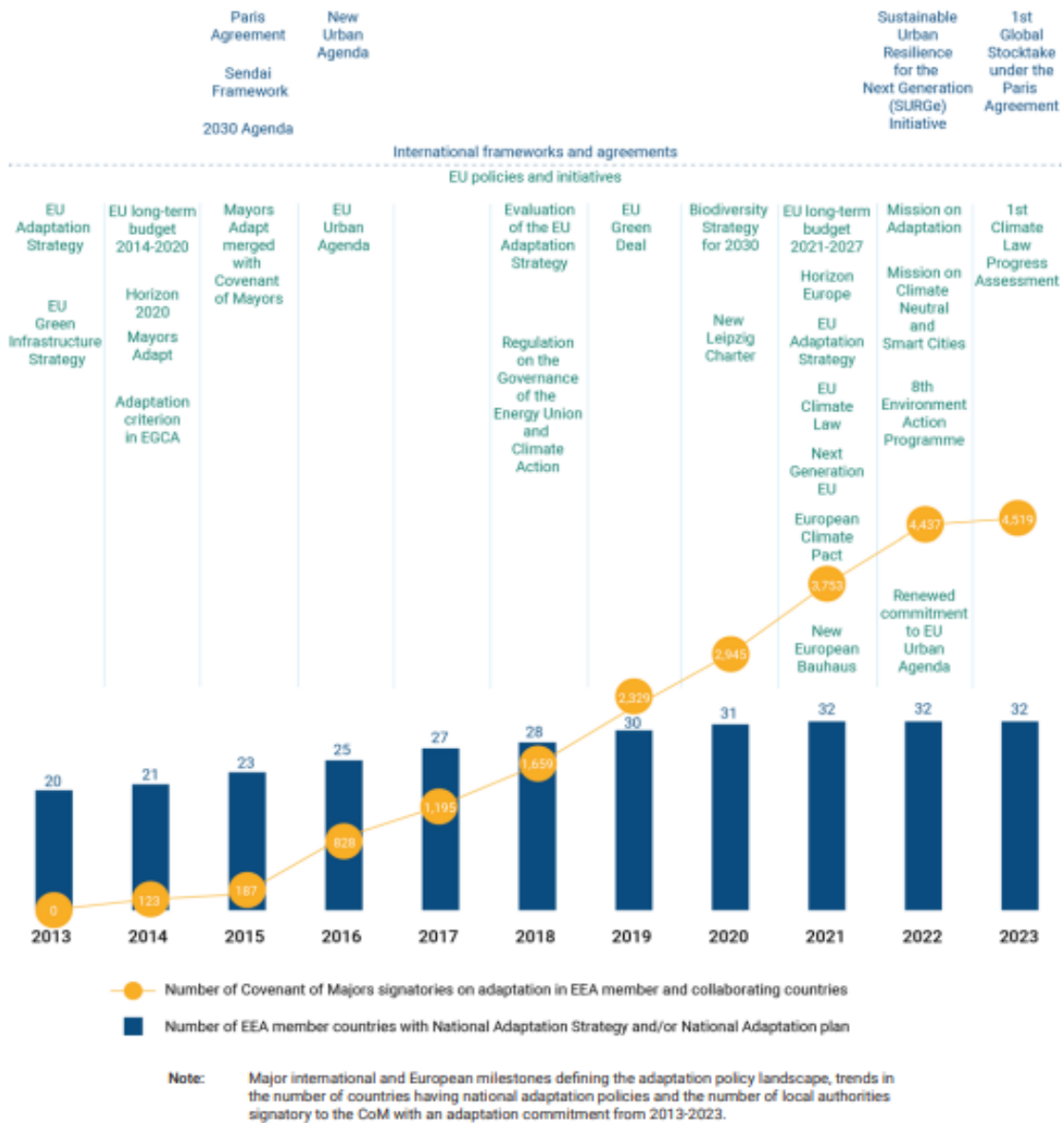
<sup>56</sup> EC, 2020, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: EU Biodiversity Strategy for 2030 Bringing nature back into our lives.

<sup>57</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>

<sup>58</sup> Reckien et al. (2024), "Plan quality characteristics of Local Climate Adaptation Plans in Europe", <https://doi.org/10.17026/dans-xd6-w7pc>, DANS Data Station Social Sciences and Humanities, V2

<sup>59</sup> EEA, 2024, Urban adaptation in Europe: what works? Implementing climate action in European cities, EEA Report 14/2023, Available at: [Urban adaptation in Europe: what works? – European Environment Agency \(europa.eu\)](https://www.eea.europa.eu/en/urban-adaptation-in-europe-what-works)

<sup>60</sup> Available at: [Covenant of Mayors - Europe | Covenant of Mayors - Europe \(europa.eu\)](https://www.euromayors.eu/)



Source: EEA, 2020<sup>61</sup> and EEA, 2023<sup>62</sup> and Covenant of Mayors<sup>63</sup>.

**Figure 5: Evolution of European policy relevant to adaptation, national adaptation plans and strategies, and the number of signatories of the Covenant of Mayors with adaptation commitments for 2013-2023**

<sup>61</sup> EEA, 2020b, Urban adaptation in Europe: how cities and towns respond to climate change, No 12/2020, Publications Office, Luxembourg.

Available at: <https://data.europa.eu/doi/10.2800/324620>

<sup>62</sup> EEA, 2023a, 'Reportnet 3', National climate change adaptation planning and strategies (2023). Available at: <https://reportnet.europa.eu/public/dataflow/895>

<sup>63</sup> Available at: [Covenant of Mayors - Europe | Covenant of Mayors - Europe \(europa.eu\)](https://covenantofmayors.eu/)

However, the prevalence of top-down regulatory frameworks and legal mandates for sub-national levels remains relatively low<sup>64</sup>. Requirements for regional and local governments to establish adaptation plans can significantly accelerate policy implementation. These obligations may stem from national climate legislation or other centralised laws, stimulating the development and enhancement of regional and local adaptation strategies. Nonetheless, **only seven Member States<sup>65</sup> reported adopting Regional Adaptation Plans (RAPs) between 2021 and 2023**. According to the European Environmental Agency (EEA), the expansion and progression of regional and local strategies and plans may naturally stem from national climate laws or other dedicated central legislation<sup>66</sup>. However, currently, this is not the prevailing scenario, as regulatory frameworks and legal obligations imposed from the top-down on the sub-national level remain a minority approach.

In 2018, a study involving 885 cities across the EU and UK revealed that only 26% had independent adaptation plans, while 17% had plans that combined both adaptation and mitigation efforts<sup>67</sup>. The study also suggested that various factors, including the size of the city, national laws on local climate and energy planning, and involvement in city networks or initiatives (such as the Covenant of Mayors), positively influence the creation and progression of local climate and energy plans. Significant advancements have been made since that time, with over half of European cities now equipped with specific adaptation plans<sup>68</sup>.

While these plans might differ in specific aspects, they typically adhere to a common framework. Notable examples can be seen in the cities of Sofia (Bulgaria), and Galway and Dublin (Ireland). The adaptation plan of Galway<sup>69</sup> is particularly distinguished by its thorough risk analysis, detailed implementation steps, the incorporation of adaptation measures into planning processes, enhancements to infrastructure, initiatives to raise public awareness, and continuous monitoring. This strategy has been partially prompted by a mandate from the Irish government that requires cities to develop robust plans, including evaluations of climate risks. Moreover, Galway is poised to unveil a new combined Climate Action Plan in 2024, further demonstrating its dedication to enhancing climate resilience.

A recent analysis evaluated local climate action plans based on several criteria: assessing impacts and risks, setting adaptation objectives, pinpointing adaptation actions, detailing implementation methods, conducting monitoring and evaluations, and engaging the community. **Although the overall quality of these plans has improved over time, the average quality rating still only reaches about one-third of**

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<sup>64</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>

<sup>65</sup> These include BE, GR, HU, IE, PT, ES, SE.

<sup>66</sup> EEA, 2024, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>

<sup>67</sup> Reckien, D., et al., 2018, 'How are cities planning to respond to climate change? Assessment of local climate plans from 885 cities in the EU-28', Journal of Cleaner Production 191, pp. 207-219 (DOI: 10.1016/j.jclepro.2018.03.220)

<sup>68</sup> Reckien, D., et al., 2022, Plan quality characteristics of Local Climate Adaptation Plans in Europe. DANS (<https://doi.org/10.17026/dans-xd6-w7pc>)

<sup>69</sup> Galway adaptation plan. Available at :

[https://www.galwaycity.ie/uploads/downloads/application\\_forms/environment/Galway%20City%20Council%20Adaptation%20Strategy%202019-2024.pdf](https://www.galwaycity.ie/uploads/downloads/application_forms/environment/Galway%20City%20Council%20Adaptation%20Strategy%202019-2024.pdf)

**the potential maximum.** This underscores the necessity for improved public engagement, more precise alignment of risks with objectives, and a focus on the unique adaptation needs of vulnerable populations<sup>70</sup>.

**In many EU Member States, sub-national adaptation remains primarily voluntary and non-binding, relying heavily on bottom-up initiatives.** A growing number of cities and municipalities are formulating their own adaptation strategies and plans as participants in the **Covenant of Mayors**<sup>71</sup> initiative. To comply with the Covenant, local authorities are required to create a **Sustainable Energy and Climate Action Plan (SECAP)**. Currently, there are more than 11,800 signatories, representing over 30% of the EU's total population. Among them, 8,076 SECAPs have been submitted, and 38% of signatories with SECAPs have already provided monitoring reports<sup>72</sup>. These SECAPs encompass 19,701 actions aimed at addressing climate change, with approximately 25% of these actions including adaptation plans, either separately or in conjunction with mitigation and/or efforts to alleviate energy poverty.

Figure 6 provides an overview of the adaptation actions planned and reported by the Covenant of Mayors (CoM) signatories in 2022 by sector. Most actions were reported in sectors such as water (17%), buildings (13.6%), the environment (11.7%), land (10.8%), agriculture (9.3%), and health (7.6%)<sup>73</sup>.

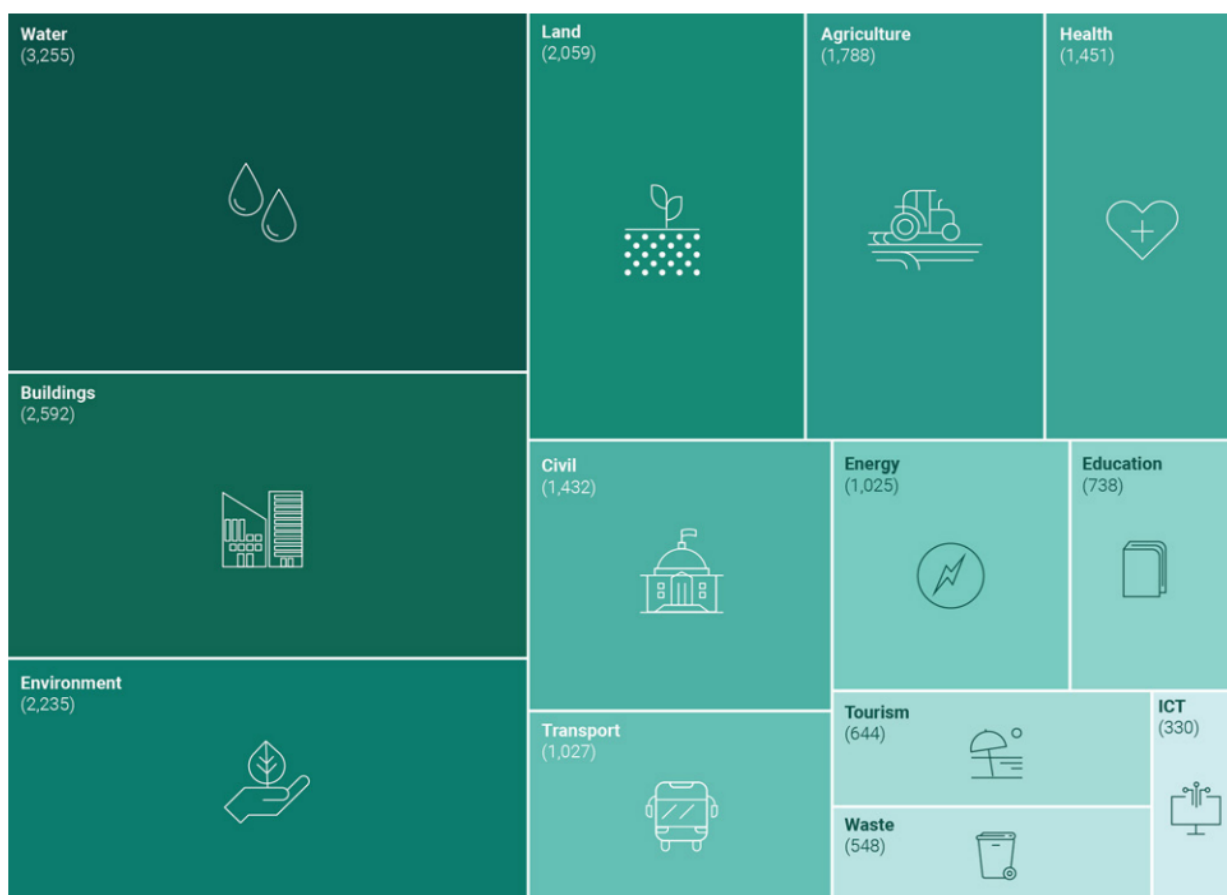
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<sup>70</sup> Reckien, D., et al., 2022, Plan quality characteristics of Local Climate Adaptation Plans in Europe. DANS (<https://doi.org/10.17026/dans-xd6-w7pc>)

<sup>71</sup> Available at: [Covenant of Mayors - Europe | Covenant of Mayors - Europe \(europa.eu\)](https://europa.eu/covenantofmayors/)

<sup>72</sup> European Parliamentary Research Service (2023), Regional and local adaptation to climate change, Gaps, challenges and opportunities. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS\\_IDA\(2024\)757589\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS_IDA(2024)757589_EN.pdf)

<sup>73</sup> EEA, 2024, Urban adaptation in Europe: what works? Implementing climate action in European cities, EEA Report 14/2023, Available at: [Urban adaptation in Europe: what works? – European Environment Agency \(europa.eu\)](https://www.eea.europa.eu/en/urban-adaptation-in-europe-what-works/)



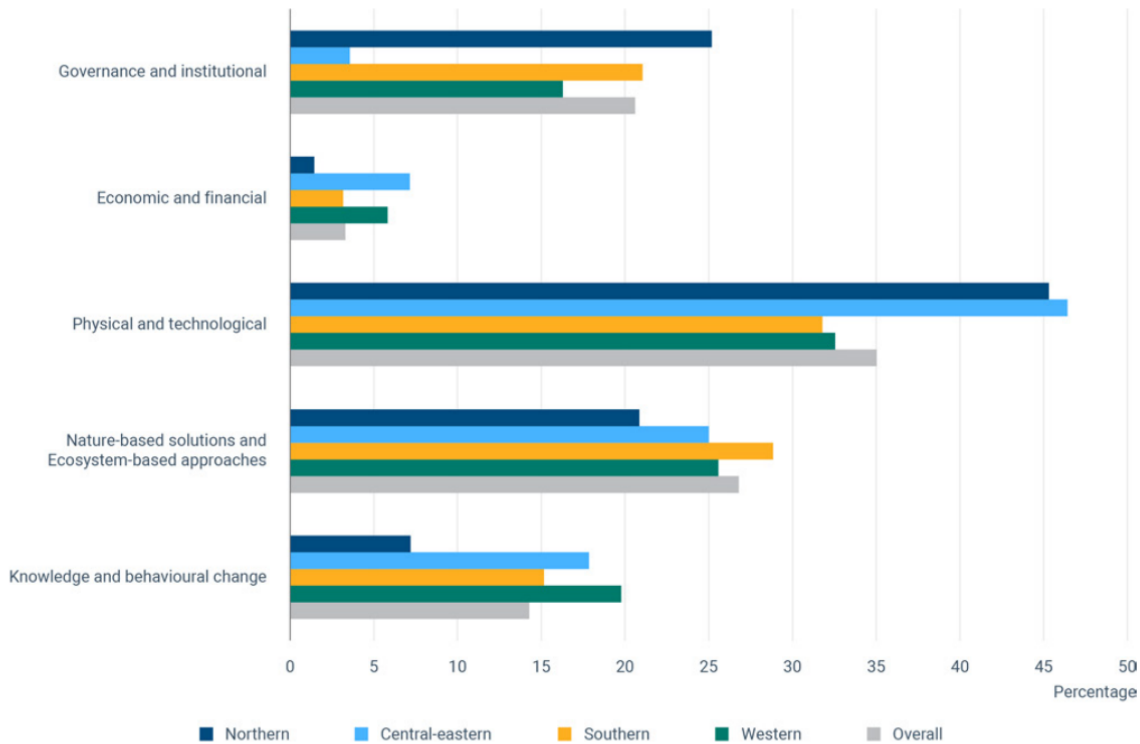
Source: EEA, 2024<sup>74</sup> based on EC-JRC, 2023<sup>75</sup>.

**Figure 6: Adaptation actions planned and reported by the CoM signatories in 2022, by sector**

The interdependence of various adaptation strategies based on a combined approach is crucial in many cases to fully optimise the impact of any specific adaptation measure. This necessity stems not just from the need to utilise scarce financial resources to tackle numerous issues simultaneously, but also due to the complex interactions between social, environmental, technological, and economic factors within any given initiative. Cities across Europe most frequently report physical and technological measures, followed by nature-based solutions and governance measures (see Figure 5).

<sup>74</sup> EEA, 2023, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>

<sup>75</sup> EC-JRC, 2023, GCoM – MyCovenant, 3rd Release – September 2022, European Commission, Joint Research Centre (JRC) (Dataset) PID: (https://data.jrc.ec.europa.eu/dataset/9cefa6ca-1391-4bcb-a9c8-46e029cf99bb)



**Notes:** This analysis is based on an interpretation of the action descriptions in the CDP database. Where an action involved several categories of measures, the main one was used in the classification.

Source: EEA, 2024<sup>76</sup> based on CDP, 2022<sup>77</sup>.

**Figure 7: Share of adaptation actions reported to CDP by European cities by type of action and region**

Other examples of **global city networks** relevant to climate change adaptation include:

- **C40**<sup>78</sup> connects nearly 100 mayors worldwide to tackle the climate crisis through various initiatives. It offers adaptation master classes, workshops, training, and repositories for best

<sup>76</sup> EEA, 2023, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>

<sup>77</sup> CDP, 2022, '2022 Cities Adaptation Actions by Action Group | CDP Open Data Portal', Available at: <https://data.cdp.net/Adaptation-Actions/2022-Cities-Adaptation-Actions-by-ActionGroup/wai8-pzfv>

<sup>78</sup> More information: <https://www.c40.org/>

practices. Its adaptation-focused subnetworks include the **Connecting Delta Cities Network**<sup>79</sup>, the **Cool Cities Network**<sup>80</sup>, and the **Urban Flooding Network**<sup>81</sup>.

- Launched in 2020 by the UNDRR, the **Making Cities Resilient 2030**<sup>82</sup> initiative builds on the decade-long Making Cities Resilient Campaign (2010-2020). It focuses on enhancing urban resilience against disasters through the adoption of risk reduction strategies. Participating cities were encouraged to actively manage their risks and share their knowledge with others. By June 2023, the initiative had grown to include over 1,500 cities.
- The **Resilient Cities Network**<sup>83</sup>, an evolution of the 100 Resilient Cities initiative started by the Rockefeller Foundation in 2013, collaborates with a global community of cities and chief resilience officers to foster partnerships and develop resilient urban solutions on a global scale. Eighteen cities from Europe are involved in this initiative.

Additional examples of **European city networks** relevant to climate change adaptation include:

- The **Climate Alliance**<sup>84</sup> includes nearly 2,000 members across 26 European countries, consisting of cities, towns, and regions committed to climate justice and partnerships with indigenous communities. Members commit to reducing greenhouse gas emissions by 95% by 2050, leveraging the Alliance's expertise in mitigation, adaptation, resilience, and energy poverty to support comprehensive climate action planning and monitoring.
- The **Council of European Municipalities and Regions (CEMR)**<sup>85</sup> consists of 60 associations from 41 European countries, aiming to influence European policy and provide a platform for dialogue among local and regional governments.
- **Eurocities**<sup>86</sup> connects local governments from more than 200 cities across 39 countries, providing a collaborative platform through various forums, working groups, projects, and events. This platform facilitates the promotion of the urban agenda in European policymaking and enables the sharing of knowledge and innovative solutions among member cities.

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<sup>79</sup> More information: <https://www.c40.org/networks/connecting-delta-cities-network/>

<sup>80</sup> More information: <https://www.c40.org/networks/cool-cities-network/>

<sup>81</sup> More information: <https://www.c40.org/networks/urban-flooding-network/#:~:text=The%20Urban%20Flooding%20Network%20supports%20city%20efforts%20to,surface%20flooding%20due%20to%20rainfall%20or%20riverine%20flooding.>

<sup>82</sup> More information: <https://mcr2030.undrr.org/>

<sup>83</sup> More information: <https://www.resilientcitiesnetwork.org/>

<sup>84</sup> <https://www.climatealliance.org/>

<sup>85</sup> <https://www.ccre.org/>

<sup>86</sup> More information: <http://www.eurocities.eu/>

- The **European Federation of Agencies and Regions for Energy and the Environment (FEDARENE)**<sup>87</sup> serves as a unified voice for over 80 members from 24 EU countries on issues related to the energy transition. It enhances the visibility of regional initiatives at the European level and incorporates local and regional perspectives into European discussions. FEDARENE regularly organises working groups that allow participants to share ideas, experiences, and best practices.
- **ICLEI-Europe**<sup>88</sup>, the European branch of the global **ICLEI Local Governments for Sustainability**<sup>89</sup> network, includes over 2,500 cities, towns, and regions from 125 countries. In Europe, ICLEI supports over 160 local and subnational governments, fostering connections to drive environmental, economic, and social progress. The organisation focuses particularly on climate adaptation and urban resilience and hosts the annual **European Urban Resilience Forum**<sup>90</sup> in cooperation with the EEA.
- **Energy Cities**<sup>91</sup> represents over 100 local authorities in Europe, aiding their energy transition efforts. It engages in discussions related to energy, environmental protection, and urban policy, influenced by EU institutions. Additionally, Energy Cities promotes local initiatives through the exchange of experience and expertise and by implementing joint projects.

Moreover, several countries have reported the engagement of regional and local governments in the **2023 EU Mission on Adaptation to Climate Change**<sup>92</sup>. Municipalities from 25 EU Member States<sup>93</sup> have signed the Mission Charter. A comprehensive list of all local and regional authorities that have endorsed the Mission Charter can be accessed via the Mission Portal<sup>94</sup>. Figure 8 visualises the city engagement in European initiatives on adaptation to climate change in the Covenant of Mayors and the EU Mission on Adaptation.

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<sup>87</sup> More information: <https://fedarene.org/>

<sup>88</sup> More information: <https://iclei-europe.org/>

<sup>89</sup> More information: <https://www.iclei.org/>

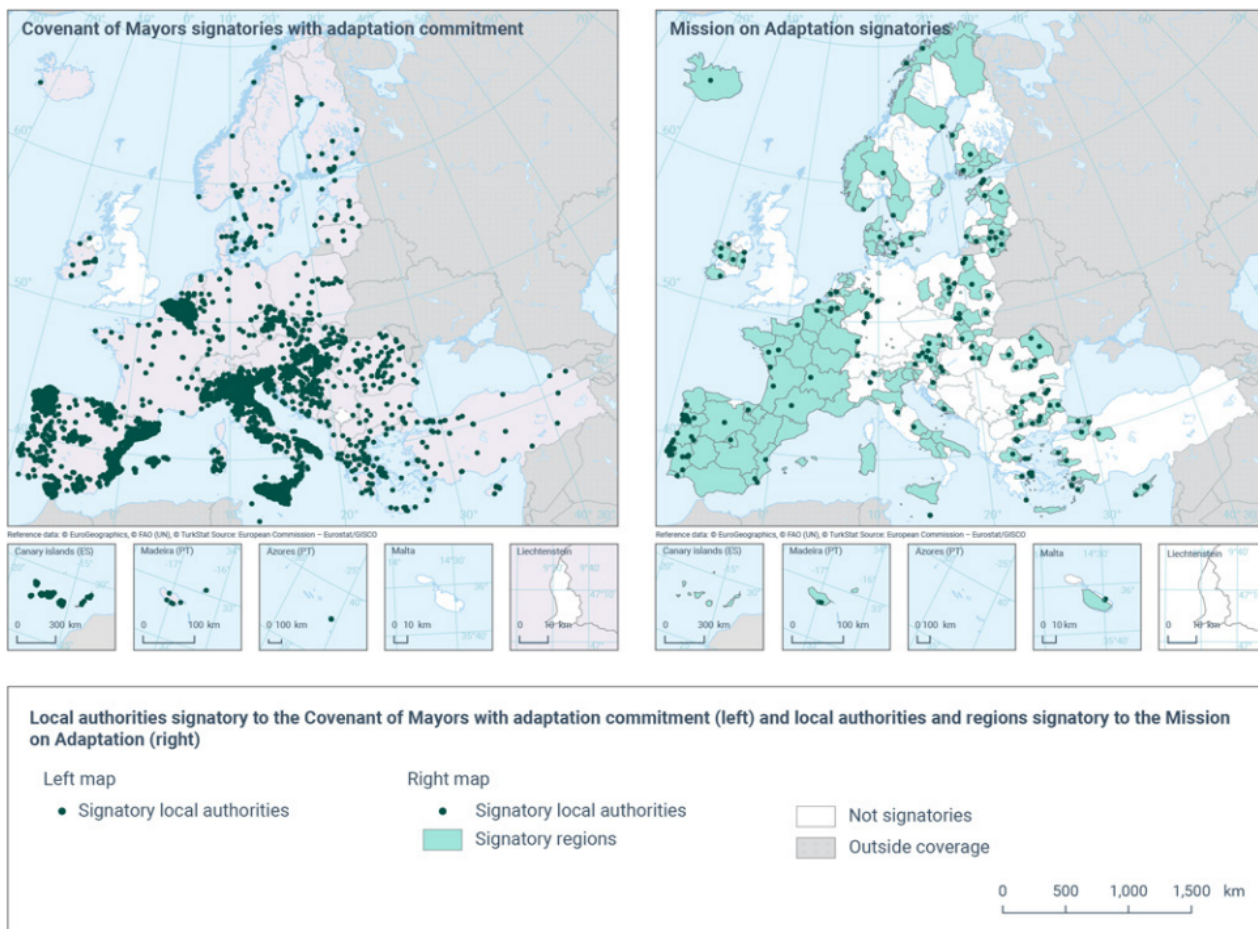
<sup>90</sup> More information: <https://iclei.org/events/10th-european-urban-resilience-forum/>

<sup>91</sup> More information: <https://energy-cities.eu/>

<sup>92</sup> EU Mission on Adaptation to Climate Change. Available at: [https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change\\_en](https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/adaptation-climate-change_en)

<sup>93</sup> These countries include : Austria, Belgium, Bulgaria, Croatia, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, and Sweden.

<sup>94</sup> Mission Portal : EU Mission on Adaptation to Climate Change. Available at : <https://climate-adapt.eea.europa.eu/en/mission/the-mission/regions-and-local-authorities>



Source: EEA, 2024<sup>95</sup> based on EU Covenant of Mayors for Energy and Climate, Mission on Adaptation Secretariat.

**Figure 8: City engagement in European initiatives on adaptation to climate change**

The **Urban Agenda for the EU**<sup>96</sup> represents an additional EU funding program designed to finance climate adaptation projects and support regions and local authorities (see Box 1). It is based on an innovative urban policy collaboration methodology that enables partnerships among EU Member States, cities, the European Commission, and additional stakeholders. It aims to decentralise and localise the UN New Urban Agenda ambitions within Europe, concentrating on improving financing, regulations, and knowledge associated with European policymaking and its execution.

### New Urban Agenda for the EU

The Urban Agenda for the EU originated from the Pact of Amsterdam in 2016. It is built upon the principles of subsidiarity and proportionality, and it encompasses the three pillars of EU policymaking and execution: better regulation, funding, and knowledge. The agenda concentrates

<sup>95</sup> EEA, 2024, Is Europe on track towards climate resilience? Status of reported national adaptation actions in 2023, Available at: <https://www.eea.europa.eu/publications/is-europe-on-track-towards-climate-resilience>

<sup>96</sup> Urban Agenda to the EU. Available at: [https://commission.europa.eu/eu-regional-and-urban-development/topics/cities-and-urban-development/urban-agenda-eu\\_en](https://commission.europa.eu/eu-regional-and-urban-development/topics/cities-and-urban-development/urban-agenda-eu_en)

on priority themes delineated within partnerships, including climate adaptation, with the aim of harmonising and aligning approaches to address the urban dimension across EU and national policies and legislation. Its primary objective is to "enhance the quality of life in urban areas." Through collaborative and integrated efforts involving various stakeholders such as cities, Member States, the Commission, and non-governmental organisations, the Urban Agenda contributes to the green and digital transitions by implementing practical measures aimed at tackling urban challenges.

Source: [European Commission](#)

Within the EU's climate change adaptation strategy, **the Commission emphasised its dedication to enhancing assistance, including direct financial aid, for local authorities**<sup>97</sup>. This aligns with the objectives outlined in the Urban Agenda for the EU. Challenges such as the financial downturn and the economic and social constraints imposed by the COVID-19 pandemic have constrained municipal budgets. Consequently, integrating adaptation measures into already strained budgets poses difficulties. However, incorporating these measures into long-term investments can yield economic benefits over time.

As outlined earlier, **funding opportunities exist for municipalities, yet numerous obstacles hinder their access to these funds**. A little over 15% of respondents in the previously referenced survey from the European Parliamentary Research Service (EPRS) indicated possessing full in-house capacity to seek EU funds, while 20% were unaware of any EU funds designated for climate change adaptation projects<sup>98</sup>. Municipalities require the ability to identify, apply for, and navigate various financing avenues. Achieving this necessitates dedicated human resources, as climate change adaptation remains a subsidiary responsibility for a limited number of staff members, albeit this trend is evolving. Existing instruments and platforms that can assist municipalities in overcoming these challenges are presented in the table below (see Table 3).

**Table 3: Climate change adaptation knowledge-sharing platforms**

Climate change adaptation knowledge-sharing platforms	Description
<a href="#">European Climate Adaptation Platform Climate-ADAPT</a>	Launched in 2012, this is a partnership between the European Commission and the European Environment Agency. The latter manages the platform, with support from the European Topic Centre on Climate Change Impacts, Vulnerability and Adaptation.

<sup>97</sup> European Parliamentary Research Service (2023), Regional and local adaptation to climate change, Gaps, challenges and opportunities. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS\\_IDA\(2024\)757589\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS_IDA(2024)757589_EN.pdf)

<sup>98</sup> European Parliamentary Research Service (2023), Regional and local adaptation to climate change, Gaps, challenges and opportunities. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS\\_IDA\(2024\)757589\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS_IDA(2024)757589_EN.pdf)

<a href="#">Adaptation to climate change mission</a>	One of the EU missions within the Horizon Europe research and innovation programme for the years 2021 to 2027.
<a href="#">Covenant of Mayors for Climate and Energy</a>	Launched in 2008, this is an EU initiative, led by the Commission's DG CLIMA
<a href="#">Copernicus Climate Change Service (C3S)</a>	Part of Copernicus, the EU's Earth observation programme established in 2014, C3S is managed by the Commission, and implemented in partnership with Member States, the European Space Agency, the European Organisation for the Exploitation of Meteorological Satellites, the European Centre for Medium-Range Weather Forecasts, EU agencies and Mercator Océan.
<a href="#">Climate Adaptation Investment Advisory Platform (ADAPT)</a>	A European Investment Bank (EIB) initiative under the EIB climate adaptation plan

Source: EPRS, 202499

**Certain countries lacking direct legal mandates for sub-national authorities noted that sub-national adaptation efforts can be influenced by alternative instruments.** These may include sub-national Climate Risk Assessments (CRAs) or regional climate projections featuring comprehensive assessments across multiple sectors. Additionally, adaptation may be integrated into formal planning processes such as spatial planning.<sup>100</sup>

Regarding **monitoring, reporting, and evaluation (MRE)**, countries indicated that sub-national activities are underway in numerous municipalities and across various scales. More than half of them noted that municipalities and regions bear responsibility for implementing and assessing their strategies or measures. Some countries mentioned that sub-national monitoring and evaluation align with national efforts. However, a few countries either lack comprehensive oversight of sub-national MRE activities or do not mandate full reports from municipalities on their adaptation actions.<sup>101</sup>

<sup>99</sup> European Parliamentary Research Service (2023), Regional and local adaptation to climate change, Gaps, challenges and opportunities. Available at: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS\\_IDA\(2024\)757589\\_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2024/757589/EPRS_IDA(2024)757589_EN.pdf)

<sup>100</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>

<sup>101</sup> ETCCA, 2023, Is Europe on track with climate resilience? – Status of reported national adaptation actions in 2023. Available at: <https://www.eionet.europa.eu/etcs/etc-ca/products/etc-ca>



# Case study: Milan

## Navigating Change: The Impact of Local Knowledge and Narratives in Milan

Simone Taddeo & Chiara Calderaro, CMCC

### Foundational assumptions and conclusions

Cities like Milan, facing significant climate challenges, must prioritise citizen engagement as a cornerstone of their adaptation strategies. By actively involving residents through initiatives such as the Permanent Citizens' Assembly, Milan ensures that climate policies are informed by diverse, on-the-ground perspectives. This participatory approach not only enhances the relevance and effectiveness of climate actions but also fosters greater public trust and commitment to sustainability goals. For this engagement to be impactful, it is essential to maintain clear communication, uphold high standards for climate services, and facilitate ongoing expert involvement, ensuring that decisions are both transparent and responsive to local needs.

### Methodology

Between June and July 2024, two representatives from the municipality of Milan, Italy, participated in a series of online interviews via Microsoft Teams and Zoom. These interviews aimed to gather detailed insights into the Climate Services provided by the city and their engagement with citizens. The primary focus was to understand the requirements and challenges faced by local administrations in managing the relationship between citizens, Climate Services, and municipal engagement. This approach aimed to provide a comprehensive view of Milan's climate change narratives.

A tailored question catalogue was developed for each category of interviewee, adhering to the Climateurope2 guidelines for engaging stakeholders. These question catalogues are located at the bottom of this case study. Candidates received the interview questions and an explanation of the interview objectives beforehand to help them prepare for the discussion. Detailed notes were taken during the interviews to capture key insights. To protect participants' anonymity, transcripts and recordings will not be made public and all insights gained will be reported in an anonymized form.

Table 4: Overview of Interviewees

Nr.	Country	Department
1	Milan municipality (Italy)	Milan's Urban Resilience department
2	Milan municipality (Italy)	Milan Changes Air (Air and Climate Plan), City of Milan

### Geographical context and climate risks

Italy is among the European countries most directly impacted by extreme weather events and other consequences of the climate crisis. This is mainly because Italy's unique geography exposes it to heightened risks from climate disasters: diverse geology makes it susceptible to floods and landslides,

while warming seas on either side increase the frequency and intensity of storms as temperatures rise. In August 2018, a weather station near Syracuse in Sicily recorded a staggering 48.8°C, potentially the highest temperature ever measured in Europe (World Meteorological Organization, 2024).

Climate change significantly affects cities, intensifying sea-level rise and extreme weather, which in turn disrupts urban infrastructure, housing, livelihoods, and public health (Strippoli, 2020; UN Environment Programme, 2023).

In Italy, according to the Euro-Mediterranean Centre on Climate Change's (CMCC) report, global warming will significantly affect weather conditions in northern Italy. Particularly the Milan area is affected, increasing the risk of adverse climate change effects on the city. (Euro-Mediterranean Centre on Climate Change, 2021).

The city of Milan is situated in an area well known for experiencing a high number of summer days, defined as days when the maximum temperature exceeds a specific threshold. In addition, the area faces extreme and intense rainfall events, raising the likelihood of flood events (Kazmierczak et al., 2020). The concerns about an increase in flooding events and extreme heat waves are also highlighted by the Legambiente report, which stresses that the city of Milan is one of the cities most affected by climate change (Legambiente, 2020).

Alongside with climate change impacts, another big issue that the city of Milan is fighting is represented by the atmospheric pollution, mainly caused by methane emissions and the combustion of fossil fuels, releasing gaseous pollutants into the atmosphere. The Swiss site IQAir, using the indicator known as American Air Quality Index (AQI), ranks the city of Milan among the most polluted cities in Europe. Other than human activities, there are also meteorological and geographical reasons for the high impact of pollution in Milan. The city is in fact set in the heart of the Po river Valley, which is a large plain surrounded by mountains. This geographical feature promotes air stagnation due to poor ventilation, preventing the dispersion of pollutants produced by human activities, which then accumulate at ground level (Pichierri, et al., 2012). Especially in the winter months, periods of atmospheric stability and the phenomenon of thermal inversion worsen the stagnation of pollutants. Thermal inversion occurs when the air is warmer at higher altitudes than at ground level. Since cold air is heavier than warm air, during thermal inversion there is no air circulation, and the cold air remains trapped at ground level, leading to the accumulation of pollutants (Bacci and Maugeri, 1992).

Protecting Milan from climate and air pollutants risks involves safeguarding its social, economic, and environmental well-being. With a population density close to 7,700 inhabitants per square kilometre, adapting to and mitigating the impacts of climate change is not only an environmental issue but also one of reducing exposure and managing equity and vulnerability. Indeed, climate change exacerbates existing social system weaknesses, raising concerns about human health, comfort, and overall liveability.

## Collaborative projects and the use of Climate Services

Since the impact of climate change on cities and their residents is particularly severe, the European Environmental Agency (EEA) report "Urban adaptation in Europe" stresses the necessity for European cities (including Milan) to adapt through measures like urban planning, economic incentives, and early-warning systems (European Environmental Agency, 2023). Indeed, urban regeneration plays a crucial role in improving climatic adaptation and responding to these environmental challenges through integrated planning. In doing this, the municipality of Milan has advanced towards integrating diverse data sources, such as satellite data, in-situ measurements, and external databases, to map the city's needs in near real-time and support sustainable planning (Puche et al., 2023). Integration is furthered

through active participation in European and national initiatives, facilitated by co-developing climate services with diverse institutions through collaborative projects and partnerships. Key examples include the REACHOUT project, which provides a Thermal Assessment Tool developed by Tecnia, a Flood Risk Assessment Tool developed by CMCC, and a Social Vulnerability Tool developed by Cork University. It is also noteworthy that the city not only utilises these climate services but also integrates them. For instance, it identifies the most socially vulnerable areas among the hottest ones by combining the social vulnerability tool with the thermal assessment tool. Additionally, the ARMONIA project, ClimaMI, and initiatives such as Spotted and Iride are instrumental in enhancing the city's resilience.

The city is also part of numerous networks such as the Resilient City Network, which help the municipal administration envision what form the city's adaptation might take. This participation is understood to be an essential first step to act on climate resilience. Milan, in turn, aims to take the lead and act as a pioneer for other Italian cities.

## The Air and Climate Plan

Milan is proactively tackling climate change with a strong focus on decarbonization and enhancing air quality through its comprehensive Air and Climate Plan, an action plan to become fully carbon neutral and a cycle-pedestrian city by 2050 with the aim to identify priority measures for climate change mitigation and adaptation. The Plan aims to achieve three main objectives:

- comply with the limits on concentrations of atmospheric pollutants PM10 and NO<sub>x</sub> (particulate matter and nitrogen oxides) set by Directive 2008/50/EC (implemented by Legislative Decree 155/2010 and subsequent amendments) to protect public health;
- reduce CO<sub>2</sub> (carbon dioxide) emissions by 45% by 2030 and become a Carbon Neutral City by 2050;
- contribute to limiting the local temperature increase to within 2°C by 2050 through urban cooling actions and reducing the urban heat island effect.

The Plan is mainly structured into five thematic areas, each with specific goals and actions. The first, Inclusive Milano, focuses on creating a healthy and inclusive city, aiming for a clean, equitable, open, and supportive urban environment. The second, Slow Milano, emphasises connected and highly accessible mobility solutions that are sustainable, flexible, active, and safe. The third, Positive energy Milano, aims to create an energy positive city by promoting reduced and efficient energy consumption.

The fourth, Cool Milano, seeks to enhance the municipality's urban environment by becoming greener, cooler, and more adaptable to climate change. Within the context of the fourth thematic area, a set of guidelines has been developed to address climate adaptation, focusing on managing on one hand the rising temperatures through cooling solutions and urban drainage, and on the other also mitigating the city's hydraulic risks. The guidelines aim to firstly analyse and monitor the city's climate vulnerabilities through the use of the climate profile maps developed by ARPA Lombardia and ARPAE; to combat escalating temperatures by using NbS solutions such as urban reforestation and green roofs and walls; and lastly to manage water flow and reduce flood risk through a "sponge city" approach.

The fifth and final thematic area of the Air and Climate Plan, Informed citizens, is also known as Milano Cambia Aria (Milan Changes Air) and focuses on innovating governance models and involving citizens actively. It aims to raise awareness about sustainable lifestyles and ways to reduce the city's ecological impact and climate risks. By fostering public engagement, it encourages all city stakeholders to contribute to ecological transformation, innovation, and societal and economic changes.

## The Permanent Citizens' Assembly on Climate

Within this fifth thematic area, the most important feature is the Permanent Citizens' Assembly on Climate, which has been created to give the city's residents a voice on issues related to combating climate change, improving air quality, and promoting ecological transition. While such assemblies have been recognized across Europe and worldwide for many years, the Milan climate civic participation body stands out not only as the first of its kind and the first permanent one in Italy, but also as a model for incorporating local knowledge and adaptive strategies into the municipality's climate initiatives. This, in turn, can help enhance the citizens' responsiveness and trust in climate services provided by the city.

The Permanent Citizens' Assembly on Climate in Milan was inaugurated in September 2022 and underwent its first year in a trial phase. After resolving initial challenges and confirming the success of the initiative, it has been fully operational since September 2023. It is composed of 90 citizens randomly selected from all residents of Milan. Each year, 10,000 people are randomly chosen and receive an invitation letter; among those who respond and confirm their willingness to participate, 90 final participants are selected. This selection aims to represent the Milanese population according to criteria such as age, gender, nationality, municipality of residence, and others, in order to ensure the greatest plurality of voices and viewpoints on the discussed topics (Milano Cambia Aria, 2024). The rationale behind the random selection lies in the fact that European and international experiences in civic participation show that groups of citizens, adequately informed and trained with the guidance of impartial experts, can make important and significant decisions for their community (Irvin et al., 2004; Bingham et al., 2005).

The Assembly's efforts focus on collaborating with engaged citizens to investigate specific actions outlined in the Air and Climate Plan. This includes overseeing their detailed design, implementation, and evaluation processes. Additionally, it provides recommendations, guidance, and specific feedback on the actions of the Air and Climate Plan, as well as other municipal projects linked to decarbonization being reviewed throughout the year.

The Assembly meets monthly in plenary sessions from January to December, with a break in July and August. Each meeting is led by facilitators and attended by experts and technicians from the Milan Municipality, who provide technical and scientific support to the citizens.

The Assembly has proven to be a successful participatory process, bringing together both individuals already interested in these topics and those who were more sceptical. Citizen involvement is grounded in scientific foundations, including showing how the climate data and climate services are used by the city and have a tangible impact on municipal policies - and consequently, on their future lives. This has helped disseminate a narrative that turns away from alarmism and eco-anxiety, addresses the climate change problem practically and invites imagining the future realistically. Conversely, through the structured deliberations and discussions of the Assembly, decision-makers can tap into community-specific knowledge and concerns, helping to tailor climate policies that are responsive to local needs.

To illustrate how the relationship between climate services and citizens, mediated by the municipality, benefits both sides, we may think about the Climate Story, one of the outputs of the REACHOUT project. This dissemination tool narrates the experiences of citizens facing climate change, using maps and climate services to demonstrate both the climate risks and the municipal efforts to address them. Milan's Climate Story follows an elderly man, Ambrogio, and his granddaughter, Gaia, during the major heat wave of 2022. It uses the Thermal Assessment Tool developed by TecNALIA, as well as urban reforestation maps and green space proximity maps developed by CMCC, to create a narrative that first reflects the citizens' experiences and then helps them see the heat problem from a municipality

perspective, showing the policies the city is implementing and their effectiveness, and proving how these actions are necessary and will improve their lives. Although the Climate Story was presented in the spring of 2023, given its high potential it was decided to update it by including the Citizens' Climate Assembly in the co-creation process, along with the local public transportation agency "Agenzia Mobilità Ambiente e Territorio" (AMAT), and the Civil Protection, to revise the scenes with the support of an illustrator. In May 2024, the Climate Story was presented to the Permanent Citizens' Assembly aiming to have the citizens evaluate the story and gain feedback on plausible improvements and expansions. Involving citizens has meant on one hand raising awareness and fostering knowledge in the citizens, and on the other helping to create a climate narrative that is even more tailored and attentive to territorial needs and specificities, allowing climate tools to be used more effectively.

The activities of the citizens in the context of the Assembly are monitored by the municipal departments and the steering committee; subsequently, independent bodies identified by the administration monitor and ensure the implementation process of the citizens' resolutions in the following years. Through the Assembly's activities, including the creation of an Annual Work Report with recommendations and suggestions, the Municipality actively assesses and evaluates the effectiveness of its climate policies.

It has also been observed that citizens who participated once in the Assembly tend to continue and deepen their involvement in municipal activities, often joining volunteer groups. For example, the Climate Volunteers Program engages citizens of all ages, encouraging them to dedicate time and creativity to concrete actions that spread good practices and address the major environmental and social challenges facing Milan (Milano Cambia Aria, 2024). Additionally, it has been noted that citizens involved in the Assembly or volunteer activities tend to engage their friends, family and others in these municipal efforts, thereby amplifying and enhancing the effectiveness of the adaptation initiatives.

## Other activities of Milano Cambia Aria

In addition to the Permanent Assembly, other effective climate communication methods within Area 5 of the Air and Climate Plan include the monthly newsletter "Bollettino mensile di Milano Cambia Aria." This newsletter updates citizens monthly on initiatives, concrete actions, and opportunities offered by the city related to climate change and air quality. The emphasis on practical information and simple language in both the newsletter and on the municipal website has proven effective in widely disseminating municipal information and data.

Another important initiative is the participatory process for creating an Alliance for the Air and Climate, between businesses and the Municipality of Milan. Currently, twenty resilient Milanese businesses are involved in a co-design phase, allowing to share the already existing efforts of the local businesses in terms of sustainability and to stimulate further possible collaborations. The guidelines developed during the co-design phase will subsequently be published. Local businesses will therefore be able to join the Alliance through the online platform "Milano Cambia Aria."

## Lessons learned

This case study allows us to raise some considerations on the following issues:

- Milan is already integrating climate services co-developed through European projects. The implementation of qualitative standards for climate services could therefore further improve good practices already in place. These standards would ensure that climate services are tailored to local needs, inclusive, and clearly communicated. They promote transparency, adaptability, and sustainability, making decisions well-informed and impactful.

- In turn, within the municipality it is recognised that there is a need for deeper awareness of the standards and a wider involvement of experts in this sector. Good synergies between departments are already in place thanks to European projects, but more knowledge transfer is required.
- The Milan Municipality leverages the Permanent Citizens' Assembly on Climate and other initiatives as key mechanisms to explore local knowledge needs, share narratives of change and climate service effectiveness, and enhance trust through participatory decision-making and accountable governance practices.

## Question Catalogue used for Milan case

Questions posed to Milan's Urban Resilience Department Project Manager, but not all were answered. The responses received are thoroughly detailed in the case studies.

1. Can you give us an overview of the climate services that Milan is currently using to address climate change?
2. What are the main objectives of these services and how are they integrated into the city's decision-making processes?
3. What were the key factors that led to the development of Milan's Air and Climate Plan?
4. What specific objectives does the plan aim to achieve, and how are these objectives funded?
5. Can you describe the decision-making process, and the main actors involved in the creation of the plan?
6. What adaptation measures have been implemented so far, and what results have been achieved?
7. Are there monitoring systems in place to evaluate adaptation progress? If so, what tools and indicators are used?
8. Are there monitoring systems in place to evaluate adaptation progress? If so, what tools and indicators are used?
9. How does Milan's local adaptation plan align with European, national, and regional adaptation strategies?
10. Have specific standards, such as ISO 14090 / ISO 14091, been adopted in the planning and monitoring of adaptation actions?
11. What is the role of NGOs, citizen initiatives, and other non-governmental actors in the city's climate adaptation?
12. Are there collaborations in place between the city and these stakeholders to support climate adaptation?
13. What are the main narratives developed by the city regarding climate change adaptation?
14. What actions or strategies have been effective in building citizen trust in the climate adaptation process?
15. Is there a minimum quality level in the climate services used by the city of Milan?
16. Has there been an integration process between climate services?
17. How would the city benefit from climate services with quality standards?
18. Are there examples in the co-production process of climate services that the city of Milan is using where a quality standard might have been counterproductive?

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# Case Study: Landshut

## City of Landshut - Climate adaptation concept; Perspective of WP5

Julian Bräuer & Silke Beck, Technical University Munich

### Brief description of the service

The City of Landshut, founded in 1204 along the banks of the Isar River, has a rich history of managing the dual nature of its riverside location. Throughout its existence, Landshut has grappled with the Isar's role as both an economic lifeline and a source of recurring flood risks (City of Landshut, n.d. a). As the city has grown to its current population of 75,000 and continues to expand, the need for effective climate adaptation strategies has become increasingly critical (City of Landshut 2023a).

Landshut's history of climate adaptation efforts dates back to 1955 with the construction of the "Flutmulde," an artificial arm of the Isar River designed to automatically fill during floods (Rückhaltebecken). This stormwater pond has been a reliable protector against river-borne flood events (Wasserwirtschaftsamt, 2020). However, the city has faced new challenges in recent years, particularly from extreme storms and heavy rainfalls. In response to these evolving threats, Landshut has implemented several key measures. Following a catastrophic flood in 2013, the city launched a construction project in 2018 to build a new pumping station. This facility was specifically designed to handle disaster situations when all other water management systems, including flood relief channels, stormwater overflow basins, and storage sewers, are overwhelmed (KSB, n.d.).

The city's commitment to climate adaptation took a significant step forward in 2023 with the implementation of a comprehensive climate adaptation concept. This initiative focuses on addressing risks related to extreme precipitation and heat, particularly in urban areas. The concept includes innovative measures such as the introduction of mobile trees and the addition of greenery to bus stops, aimed at mitigating urban heat island effects (City of Landshut, 2023a).

Landshut's adaptation efforts have been put to the stress test in recent years. In 2021, the city experienced torrential flooding that caused massive property damage. However, during the severe floods that affected South Germany in June 2024, Landshut's historic Altstadt was largely protected thanks to the Flutmulde, demonstrating the effectiveness of the city's long-term adaptation strategies (UFZ, 2024).

Despite these achievements, Landshut continues to face challenges. An analysis of climate change risks and effects on local infrastructure and citizens revealed ongoing vulnerabilities to extreme events and limitations of the existing assessment and governance frameworks. The high degree of soil sealing in urban areas, combined with a lack of cooling effects from green spaces and water features, poses significant health risks to citizens (City of Landshut, 2023a). These findings have underscored the importance of continued adaptation efforts on the basis of climate services.

### Knowledge holders

The climate adaptation efforts in Landshut involve a diverse group of stakeholders and knowledge holders, each playing a crucial role in shaping the city's response to climate-related challenges.

At the forefront is the City Administration of Landshut, particularly the Office for Environment, Climate & Nature Protection. This department takes the lead in planning and implementing climate adaptation measures, coordinating with other municipal offices as needed. The city administration's role is pivotal in translating climate data and adaptation strategies into actionable policies and projects. It also represents a link between the ecosystem of the actors involved (City of Landshut, 2023a). A crucial part of this ecosystem are external consultants who have played a significant role in providing specialised knowledge and (climate) services. Notably, GEO-NET Umweltconsulting GmbH from Hannover and MUST Städtebau from Cologne were commissioned to develop Landshut's climate adaptation concept. These consultancies brought expertise in urban climate modelling and planning, helping to bridge the gap between complex climate data and practical urban planning needs (City of Landshut, 2023a).

The German Weather Service (DWD) has provided basic climate data and analysis, forming the foundation for much of Landshut's climate adaptation work. Their 1996 report on meteorological measurements in the Landshut urban area served as a starting point, which has been updated and expanded upon the years since. Regional and state-level bodies also contribute to the knowledge base. The Bavarian State Ministry of Housing, Construction and Transport selected Landshut as one of eight Bavarian project municipalities for the model project "Climate-friendly urban development" in 2020. This initiative aims to integrate climate protection and adaptation aspects into early-stage planning decisions (Bayerisches Staatsministerium für Wohnen, Bau und Verkehr (n.d.)).

The citizens of Landshut are also recognized as important knowledge holders. The city has engaged its residents through participatory processes, acknowledging the value of local knowledge in developing place-based solutions. Public participation events have been held where citizens were presented with the aims of the adaptation concept and invited to make suggestions for location-specific solutions throughout the city (City of Landshut, 2023a).

## Salient points for focused analysis

Landshut's climate adaptation efforts present several key points that warrant focused analysis. These points highlight the city's approaches, challenges, and areas for potential improvement in climate adaptation strategies.

Firstly, the city's use of urban climate analysis stands out as a critical component of its adaptation strategy. As part of the climate adaptation concept, a comprehensive urban climate analysis was conducted to map climatic events across the entire urban area (City of Landshut, 2023b). This analysis aimed to provide detailed data on days and nights with particularly high heat loads, considering both current and future climate scenarios. The use of the FITNAH 3D urban climate model allowed for high-resolution calculations, enabling precise spatial knowledge of overheated settlement areas, climatically important green spaces, and night-time cold air processes (City of Landshut, 2023b). This level of detail is crucial for targeted implementation of adaptation measures and informed urban planning decisions according to place-based needs.

The standardisation of meteorological parameters using z-transformation is another noteworthy aspect of Landshut's approach. This method addresses the challenge of establishing clear, comprehensible standards for evaluating climate data. By using z-transformation, the concept suggested creating a system that allows for comparison of assessment criteria across different modelled variables (City of Landshut, 2023b). The adaptation concept also draws on two state-level guidelines focussing on "Water-sensitive urban development in Bavaria - recommendations for sustainable and climate-adapted rainwater management in Bavaria" (StMUV, 2020) as well as "Guidelines for climate-oriented communities in Bavaria" (Centre for Urban Ecology and Climate

Adaptation, 2020). These guidelines can potentially be reviewed for best-practice guidelines to detect possibilities for standardisation.

Landshut's experience with climate services demonstrates the challenges and opportunities in localising climate data for urban planning. To gain a better understanding of the services involved, a differentiation as in Panenko et al. (2021) proved to be explanatory in order to embed the information used in the Landshut case within the larger climate service typology:

Landshut's climate services implementation progressed from basic meteorological data to localised, actionable information through collaboration with private consultancies. The city successfully tailored climate services to its specific needs, involving multiple stakeholders in the process. Landshut's experience underscores the importance of localising climate services while emphasising the necessity of differentiated understanding of climate services according to the stakeholders involved.

One way for Landshut to include its citizens is by the implementation of "real-world experiments". These experiments represent an innovative approach to climate adaptation. Recognizing the complexity of implementing adaptation measures, particularly in the densely built-up city centre, the city has opted to experiment with selected measures on a small scale. This approach allows for the evaluation of the measures' effects and their reception by the citizens before wider implementation (City of Landshut, n.d. b). Launched in spring 2024 with two experiments in the old town, this method aims to practise iterative adaptation strategies that can be refined based on real-world outcomes.

The Isar River's transformation from a wild, torrential force to a heavily controlled waterway exemplifies a significant change in environmental management and cultural perceptions. Historically, the Isar was known for its untamed and dangerous nature, often causing sudden hardship through its floodwaters (Wasserwirtschaftsamt 2018). However, from the mid-19th century onward, extensive engineering efforts were undertaken to tame the river. These included fortifying, straightening, and embanking the river, and converting it into a chain of reservoirs. These modifications aimed at flood control, land reclamation, and power generation, but they also led to ecological degradation, making the river less accessible and turning it into a barrier rather than a vibrant ecosystem (Wasserwirtschaftsamt 2018).

In a significant shift towards restoration, local authorities and regional partners are now working to return the Isar to a more natural state through projects like the EU-sponsored LIFE initiative. This effort aims to reconnect communities with the river and restore its ecological health, allowing people to experience the river's natural beauty while revitalising the local environment. This approach, described as "conservative innovation," seeks to preserve traditional socio-economic orders while fostering progress (Pfothenhauer, Wentland, Ruge 2023).

## Lessons learnt

The climate adaptation journey of Landshut offers several valuable lessons that can inform future efforts both within the city and in other urban areas facing similar challenges.

One of the primary lessons is the importance of integrating climate services with local knowledge and needs. While climate data and projections from national agencies like the German Weather Service (DWD) provide a crucial foundation, Landshut's experience highlights the need to translate this information into locally relevant and actionable insights. The engagement of external consultants to bridge the gap between raw climate data and practical urban planning needs demonstrates the value of specialised expertise in making climate services match with place-based needs.

The city's experience also underscores the importance of public participation in the adaptation process. By involving citizens in identifying vulnerabilities and suggesting place-based solutions,

Landshut has tapped into local knowledge (City of Landshut 2023a). Fieldwork in this case study has shown that the underlying rationales of participation have an impact on the quality of the participation itself, as well as the satisfaction of citizens with the development of the concept.

Landshut's use of standardised methods for evaluating climate data, such as the z-transformation of meteorological parameters, offers lessons in creating comparable and communicable climate assessments (City of Landshut 2023b). In addition, it can be analysed to what extent guidelines at the federal state level have helped to transform place-based needs into adaptation strategies. This approach facilitates better understanding and comparison of climate risks across different areas, which is crucial for informed decision-making in urban planning and adaptation efforts.

The implementation of "real-world experiments" for testing adaptation measures can provide valuable insights into the benefits of flexible, iterative approaches to climate adaptation. This method allows for the refinement of strategies based on actual outcomes and community feedback, potentially leading to more effective and widely accepted adaptation measures based on co-production.

However, the case of Landshut also reveals areas for improvement in climate adaptation governance. The apparent lack of coordination and networking between local adaptation efforts and broader federal and national initiatives suggests a need for more effective vertical integration of climate adaptation strategies. Enhanced communication and knowledge sharing between different levels of government could lead to more comprehensive and effective adaptation outcomes. Lastly, Landshut's experience emphasises the importance of continuous monitoring and evaluation of adaptation measures, given the dynamic nature of extreme events and remaining uncertainties to assess and downscale them. As the city moves forward with implementing its climate adaptation concept, establishing robust frameworks for adaptive governance (including assessing of measures in a regular way, and readapting to novel challenges) to enhance the effectiveness of various strategies will be crucial for long-term success. Existing work such as Panenko et al. (2021) can help to increase the salience of climate services by differentiating between different kinds of climate services and their intended usage.

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# Case study: EU Outermost Region – French West Indies

## Climate Services to support justice & agro-ecological transition in former French colonies in the EU (Outermost regions)

Grit Martinez, Ecologic Institute

### Background

The French West Indies (FWI) comprise the Caribbean islands Guadeloupe and Martinique. As in other islands of the Caribbean Community (CARICOM), agriculture is a main sector and historically played a structuring role by creating wealth, social cement, and identity. The FWI are former French colonies that belong to the Outermost Regions of the EU. Therefore, they are non-sovereign countries that are governed under the same regulations as in mainland France, but their abilities to respond to climate change varies due to postcolonial governance structures.

Climate Change adaptation plans were not widely used in public policies due to local and environmental factors which ranked climate change as a secondary priority related to the agricultural importance of monocultural agro-export goods such as sugarcane and banana. Observations and testimonies of researchers and stakeholders on climate data and available knowledge showed that information on climate change and its impacts was not readily accessible for major stakeholder groups such as local farmers with native descent. These farmers are knowledge holders of the so-called creole garden farming method: A multi-strata, multi-use agroforestry system intended for production of local fruit and vegetables, characterised by the association of a large diversity of different plant species, forming several vegetations. Hence the need for co-developed climate change services including local knowledge and narratives appears to be very evident.

### Location and Population

The FWI are composed of two regions: the archipelago of Guadeloupe and the island of Martinique along the Caribbean Sea in the West and the Atlantic Ocean in the East. Guadeloupe archipelago and Martinique island have a 1628 km<sup>2</sup> and 1128 km<sup>2</sup> surface area respectively, with a population of 390 704 in Guadeloupe and 376 847 in Martinique in 2018. The population of Guadeloupe and Martinique is mostly composed of people of African descent with a smaller part composed of European and Asian (Indian and Chinese). After World War II, in 1946, Guadeloupe and Martinique received the status of French overseas departments, which meant that they became an integral part of France. Nevertheless, the agro-export status quo is based on the concentration of production in the hands of land oligarchies. These benefit from agreements that protect their interests through quotas or rights of access to the French market. This economic model also results in a low diversification of production and a high degree of extroversion.

### Climate Risk, Municipal Knowledge Needs and Climate Services

During the last decades, the FWI have had to deal with many climatic events of various intensity, associated with a strong impact on the conditions of production and agricultural reproducibility. Cyclones impact the Caribbean area regularly with increasing intensity destroying many plantations (banana cultivation is the most exposed), but also degrades soil fertility. Massive erosion phenomena

are consecutive to heavy rains. Global warming, but also the intensification of the exchanges of passengers and goods, creates favourable conditions for spread and emergence of new diseases and epidemics (Black Sigatoka, Citrus Greening, etc.) in the FWI.

Since the main economic sector is agriculture, farming still remains socially and culturally very important. Farm sizes range from less than one hectare to more than one hundred. Agricultural lands are currently mainly used for sugarcane and banana. Vegetables, fruits, tubers and flowers represent a smaller part of the local market and do not cover the food requirements of the local society. In fact, they need to be exported from mainland France. Agriculture has invested different roles over time and today there are two systems that co-exist: (1) The plantation economy, inherited from the colonial era mainly based on two dominant crops: sugar cane and banana. This economic model is based on a development driven by the agricultural rent resulting in a low diversification of productive activities and a high degree of extroversion towards France. It is also an agro-export model based on the concentration of the means of production in the hands of a land oligarchy and benefits from protection agreements such as quotas or rights of access to the French market, now weakened by globalization. (2) The diversification and multifunctional agricultural model, supported by the newly adopted law “Loi d’Avenir”, which promotes crop diversity and biodiversity, and opened up opportunities for valuing agriculture. Smallholder family farming in these areas is likely to meet these new aspirations and expectations. It diversifies with alternative agricultural products to those from the conventional system and concentrates innovations and agroecological local practices.

In this context, the agroecological transition has ecological, economic and social dimensions since it will help to take better advantage of the interactions between humans, plants, animals and the environment. It should also stimulate local crop diversification, help reduce import dependency and minimise vulnerability to climate change. The transition could come through several actions such as (1) teaching and advising farmers to produce in a different way and connected to their cultural heritage and history (creole garden productions), (2) setting up networks to enable farmers to share their experience, (3) reducing pesticides and fertilisers used on crops, (4) developing organic agriculture and agroforestry. Concerning the use of pesticides, the crisis of Chlordecone in 2009, was a real trigger for the agroecological transition in Guadeloupe and Martini. The organochlorine pesticide was already banned in France in 1978 but was used in the banana plantations in the FWI until 1993. Chlordecone is a so-called endocrine disruptor, commonly known as an environmental hormone. If such a substance enters the body, it can affect the hormonal system and cause illness such as cancer even in the smallest quantities. Even more than 25 years after it was banned, chlordecone is still found in considerable quantities in the French Antilles and contaminates the entire food chain.

Faced with the challenge of adapting to climate change, the agroecological transition of production became a very relevant base for designing innovative strategies and using climate services. The transition is based on various combinations, dealing both with adaptation and mitigation, that is (1) reduction of food imports and its associated carbon footprint (the two islands are more than 80% dependent on food staples from France), (2) replacement of imported synthetic inputs by production of local organic inputs (manufacturing and use of local biofertilizers and biopesticides), (3) anticipation and adaptation to climate risks to build and consolidate the resilience of farming systems by including local knowledge and heritage. This last point is particularly important to tackle, in order to define with policy makers and stakeholders the choices and the best paths for achieving a successful agroecological transformation.

Observations and testimonies of researchers and stakeholders on data and knowledge available about the impact of climate change on agriculture can be summarised as follows: (1) Existing scientific studies are sparse and heterogeneous; (2) Climate data need to be cleaned and pre-processed; (3) There are

different granularity levels of interest for data; (4) There is a clear expectation of local agricultural partners to get relevant information.

To support the co-development of climate services within the European Research Area for Climate Services (ERA4CS), in the INNOVA project, a platform containing geographic data and local knowledge was developed. It aims to support the usage of climate services which fits the new climatic conditions in agriculture by including local knowledge and identity from smallholder farmers. The platform provides geo-referenced information, explores available climate data and produces climate change scenarios related to a given activity. The data and knowledge platform was co-created with key agricultural stakeholders to be scalable and informative to allow users (farmers and agricultural authorities and others) to store, search and visualise various pieces of information and knowledge about the impact of climate change. Data analytics without using standard/ guidance was conducted on key indicators that are defined and extracted from agricultural and climatic data in order to better characterise seasonal disturbance and changes into plant life cycles in correlation with temperatures, rains and droughts variability.

## Narratives of change

In 2013, around 90% of FWI's food came from imports, a majority of which has historically been from France. This includes products like milk, potatoes, onions, tomatoes, beetroots, etc. Due to the higher costs of importing products into the island, the prices of basic commodities and food staples in Guadeloupe are much higher than in metropolitan France, while the average salary in Guadeloupe is lower than in mainland France, except for officials working for the French government who receive significantly higher salaries to offset the higher costs of living on the island.

Unemployment and poverty rates were double than those in France. From 2006 to 2007, several riots against high food prices shook the island. In 2009, the tensions cumulated in a social crisis addressing the unequal social and economic treatment of the mostly creole population compared to the citizens in mainland France. During this time an NGO with the Creole name "lyannai kont pwofisayn" (LKP) was founded to protest against this unequal condition of the residents of Guadeloupe. The word "lyannai", used in the name of the NGO, means "conviviality". Martinique writer Édouard Glissant (1928–2011), an important author of the French-speaking Caribbean and intellectual mentor to questions of post-colonial identity and cultural theory, had used the term "conviviality" as a synonym for creating joint forms of knowledge to overcome distance and separation from one's own culture. The NGO used the codeword "conviviality" to mobilize feelings of cultural identity coupled with the narrative of the "creole garden" (a multi-strata, multi-use agroforestry system intended for production of local fruit and vegetables, characterized by the association of a large diversity of different plant species, forming several vegetations) for a movement to fight post-colonial structures expressed amongst others through food dependencies from mainland France.

## Trust in climate services and knowledge about standards

Against this background, governmental support for an agroecological transition has been forced to emerge. For example, a new legislative framework (Economic Development Scheme of Regional Communities) now underlines the ambitions for a green economy, a shift away from the current monoculture to the production of crops and vegetables for local consumption and food sovereignty. The national policy (Loi d'Avenir) on Agriculture and Food and a strategic plan for the agroecological transition is supporting diversification towards multifunctional agriculture, focusing on small-scale family farming. However, the Loi d'Avenir takes public expectations of agriculture into account, requiring a degree of public accountability for spraying. It will require hedges around fields to catch spray drift and users will be required to post warnings of upcoming crop treatments in public buildings, like schools, nurseries, retirement homes and clinics. Also, grass root initiatives, promoting small-scale

farming/urban gardening, are spreading over the islands. This could open up new, fairer opportunities for agricultural production and consumption for the Creole and non-Creole population. However, trust cannot be won back easily, especially after the still ongoing legacy of unjust economic and social conditions for the vast majority of the population. Still, consulted stakeholders (farmers and agricultural authorities) expressed a vision rooted in the socio-cultural identity of “creole garden” being a synonym for sovereign agricultural production. Thus, climate services and standards are being understood by farmers as highly supportive for the development of a self-sufficient diverse agricultural production. The term “standard” however has not entered into the vocabulary or minds of stakeholders in FWI yet given the enormous challenges society is facing to proceed to a just and fair access to data and information e.g. for farmers and clean and safe environmental resources for the population, which are issues out of question in mainland France since many decades.

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# Case Study: Latin America

## “Agroclimatic Round tables in Latin America – perspective of WP5

Carmen González Romero, Barcelona Supercomputing Center

### Description of the service

Agroclimatic Round Tables (or Mesas Técnicas Agroclimáticas, MTAs in Spanish) were first established in Colombia in 2015 as an agroclimatic Early Warning System and have been proliferating in Latin America since then. As of 2024, there are more than 64 MTAs, covering a total of 11 countries in the LATAM region, and expanding to Africa and Asia.

The backbone argument of the MTAs is that agriculture is highly sensitive to variations in both weather and climate, and that farmers face uncertainty in the weather patterns over the short term, and climate patterns over the longer term. The essence of the Theory of Change (ToC) behind the MTA approach is: If farmers and the local rural community at large can access and understand weather and climate forecasts and the response of their crop production, processing, and marketing options under their local conditions, they can make better decisions on how to manage their farms and businesses (Loboguerrero et al. 2018), making them more resilient to changes in climate. Additionally, although this is not the original perspective of the development of MTAs, tailored forecasts and recommendations could support reduction of CO<sub>2</sub> emissions and support countries to achieve their National Determined Contributions. If farmers access and use agroclimatic data in their decision-making processes, they can produce more environmentally-friendly and sustainable harvest by reducing pesticides and fertilisers inputs, making it more cost effective and mitigating their CO<sub>2</sub> impact.

At the cornerstone of the MTAs is the generation and communication of historical data, seasonal and sub-seasonal forecasts, tailored to local conditions and needs, to the communities influenced by the MTAs. MTAs gather farmers from the area of influence, but also local governments, NGOs, International Organizations, private businesses, research centres and universities, etc. It is a space free of charge, usually led by a local institution.

The weather and seasonal climate forecasts, produced by the National Meteorological and Hydrological Services (NMHS), are used as an input for monthly meetings, where growers and personnel from state and other local agencies and the community at large discuss and analyse them, providing a set of agriculture-related recommendations to farmers. The aim of these recommendations is for farmers and other members of the community to make better decisions. A basic premise in the process is that knowledge-intensive practices require learning through interaction and shared understandings, rather than through one-way directed knowledge transfer or recommendations (Loboguerrero et al., 2018). In addition to this agroclimatic information, some MTAs started to include health-related information and recommendations during COVID.

The communication of the climate data and the agroclimatic and health-related information varies depending on the MTA we are referring to. In most cases, the institutions and personnel attending the MTA develop a digital bulletin that is shared through various channels: WhatsApp groups, email distribution lists and relevant websites. These bulletins are adapted to local needs, too. For example, in Guatemala, ANACAFE, the National Coffee Association and leader of the MTA Centro-Sur, developed a less technical bulletin, with graphic designs and a more simplified text targeting those

with low levels of literacy. In the MTA in Quetzaltenango (Guatemala), the bulletin is written in both Spanish and k'iche', a local Mayan language. In Honduras, certain MTAs also share the information in the bulletin by local radio stations at early hours of the morning, when most farmers listen to the radio on their way to the fields.

The content of the bulletins reflects the information disseminated and discussed at the MTA session. The demand and preferences of farmers and other stakeholders to obtain agroclimatic information is identified during the first sessions of the MTAs and continuously updated (as needed) through a monitoring system. It is necessary to acknowledge and to understand the social differences found in the farmers' environment (e.g., inequality and lack of equity between men and women) (Giraldo et al. 2021). The roles, responsibilities, and daily activities carried out by women and men determine how they perceive changes and socio-environmental risk and how they respond and adapt to them (Bee, 2016). Consequently, women and men may have different needs, access, and response to climate information (Kristjanson et al., 2017). In order to avoid exacerbating the gender inequalities that prevail in other institutional structures, it is relevant to evaluate the diverse challenges and opportunities that men and women face to incorporate climate information into agricultural decision-making and livelihood planning (Gumucio, et al., 2018).

## Knowledge holders

According to the ToC, MTA's stakeholders (including representatives from both the public and private sector) access climate information at multiple timescales (historical, weather and seasonal forecasts). Then, they assess how these can affect agri-food systems, develop recommendations to respond to predicted climate variations, and generate actionable information for broader dissemination (Giraldo et al. 2021).

The demand for this climate service (the MTA) usually follows a bottom-up approach and comes from institutions in contact with farmers (either NGOs, international organisations, universities, research centres or agribusinesses cooperatives, just to mention a few examples). However, the request to establish an MTA can also come from the government, usually the Ministry of Agriculture. Depending on the location of the MTA, the government might fund the MTA (e.g. the National MTA in Colombia), ensuring the sustainability of the service. Otherwise, the different institutions attending the MTAs need to absorb the cost, attract funding, or leverage existing projects and initiatives.

The role of local stakeholders is key for the success and sustainability of the MTA. Through continuous participation in the MTA, they define different aspects of the demand of this climate service. For example, they choose the crops and time scale of interests for each MTA. They actively discuss past agroclimatic events and update, with their own personal experiences, and the climatic threats for each MTA, crop and season. Additionally, through the interactions between the different stakeholders (including personnel from the NMHS), they receive informal capacity building and can build a space to share climate science-based knowledge and traditional local knowledge.

## Salient points for focused analysis

The MTAs have created a space to facilitate traditional and scientific literacy, democratising agroclimatic knowledge and fostering significant improvements in participation and collaboration among the participants. Extensionists from governments and field officers from private institutions, gained a deeper understanding of the effects of climate variability, which enabled them to provide better guidance to farmers, ultimately leading to greater awareness and use of the agroclimatic information. Moreover, the MTAs incorporate farmers' traditional knowledge (e.g., bioindicators) to the state-of-the-art climate science through its bulletins. The MTAs serve as a local hub to exchange

knowledge about several topics (aside from agroclimatic information), and to build capacity among the participants. The MTAs also contributed to the creation of local inter-institutional partnerships and helped attract new and strengthen existing climate adaptation projects and actions at both the national, regional and local levels.

The institutional arrangements play a crucially important role for the development of the MTAs, however, due to the local nuances, there is not a fit-for-all public strategy to follow. While there is a wide set of local institutional arrangements across the MTAs, all of those with a high success score have in common that they receive central financial and coordination support from the Government, international cooperation organisations, and major national producers' associations. In Colombia, central support is especially crucial for financial resourcing (mainly coming from the Ministry of Agriculture), climate forecast provision (from the NMHS), and for coordination (from international cooperation organisations). In Guatemala, the Ministry of Agriculture does not directly provide significant financial resources, but the MTAs leverage contributions of many other actors and projects and coordinate the scaling (while allowing for local governance to contribute) across the country. This central support allows for a highly decentralised governance system that is adaptable and responsive to local needs (in terms of information, capacities, and general technical support), but at the same time maintains a high level of coordination and resource (personnel, financing, capacities) flow between the central and the local organisations. On the contrary, in Honduras, where governance was centralised, the levels of success observed were much lower, and it seems unlikely that progress will be made swiftly toward a higher performance level unless changes in the governance take place. Institutional arrangements (or lack thereof) also played an important role in the slow growth and low levels of success in Nicaragua (Giraldo et al. 2021).

## Lessons learnt

Despite the different local realities in all the locations where the MTAs have been established, there has been some effort to standardise the design and development of the MTAs. The result of this implementation varies significantly from one location to another in terms of governance of the MTAs, funding and resources available, crops of interest, climatic threats, stakeholders participating in the meetings, data and information shared, sustainability of the service, etc.. However, an operational guideline has been published (Giraldo et al. 2021) to support the systematic implementation of MTAs and sharing valuable lessons learnt from more than 8 years of experiences developing these climate services in Latin America and the Caribbean. This guide is aimed mainly at leading local institutions in the agricultural sector that are interested in implementing a space for discussion in their regions. It covers eight steps, which are carried out with the participating institutions. Given the specific nature of the site, there are a number of preparatory activities that need to be done prior to each meeting.

This guideline establishes a step-by-step process to:

1. Understand the scope, background and lessons learned in the MTA that have already been implemented in different countries. It supports the inclusivity of the climate service.
2. Identify the structure and local demand for each MTA: which activities each institution carries out, which crops and areas they work in, and their interest in being part of the MTA (through actor mapping). It ensures the saliency of the climate service. It is necessary to identify the preferences of farmers to obtain agroclimatic information, due to important social differences found in their environment (e.g., inequality and lack of equity between men and women) since women and men may have different needs, access, and response to climate information. Climate services may risk exacerbating the gender and race inequalities that prevail in other institutional structures and social environments. Therefore, it is relevant to evaluate the diverse challenges and opportunities that men and women face in order to incorporate climate information into agricultural decision makers (Giraldo et. al 2021).

3. Assess the coherence among the objectives, goals and activities for the establishment of the MTA through a formalisation mechanism (e.g., letter, regulation, agreement). It supports the governance and subsidiarity aspect of the climate service.
4. Generate a starting point to explore the climatic and available crop information in the region.
5. Build a strategic plan for the operation of the MTA, including a monitoring and evaluation strategy to ensure the legitimacy and robustness of the climate service.

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# Case Study: Paris

## Use of climate services in the development and implementation of the climate adaptation strategy of the city of Paris

May Hobeika, Ramboll

### The Adaptation strategy of the city of Paris

This case study examines how the city of Paris uses Climate Change Adaptation Services (CCAS) in the development and implementation of its climate adaptation strategy. Climate Change Adaptation Services (CCAS) are defined as "*activities, consultations and other forms of interaction that enable decision-makers to make better use of data and tools to support adaptation decision-making, including efforts to identify information needs*" (Weichselgartner and Arheimer, 2019)<sup>102</sup>. These include for instance the use of climate projections, climate data, climate risk assessment procedures and tools. The city of Paris does not have a municipal strategy or plan for climate change adaptation per se in the sense of the European Commission's Communication on Enhancing the European Administrative Space from 2023<sup>103</sup> or the Covenant of Mayors<sup>104</sup>. However, under French national law, the city of Paris has implemented a Territorial Climate-Air-Energy plan ("Plan Climat-Air-Énergie Territorial", PCAET).

The Territorial Climate-Air-Energy Plan (hereafter municipal climate plan) is a local strategy implemented by local authorities to combat climate change, improve air quality, and promote the energy transition. It is made mandatory for municipalities with more than 20,000 inhabitants by the Energy Transition for Green Growth Act of 2015. Regions and departments are also subject to this obligation. Among other objectives related to climate mitigation, clean air and energy, the plan aims to prepare territories for the inevitable impacts of climate change by anticipating risks and strengthening the resilience of infrastructure and populations. The climate adaptation measures included in the municipal climate plan include for instance support systems for those most at risk, such as the "REFLEX" file<sup>105</sup> implemented during heatwaves. In the latter, vulnerable individuals receive multiple daily calls to ensure their welfare.

### Municipal governance process and knowledge holders

The Paris City Council is constituted of deputies to the Mayor of Paris who have specific responsibilities, including one elected representative for climate issues. Within the Council, municipal councillors, including the deputy mayor, represent a spectrum of political parties. Once environmental policies are proposed, the technical department works closely with the elected climate representative to secure the necessary budget, whether it is for conducting relevant studies or for the execution of adaptation measures. This process exemplifies not only a top-down approach but a reciprocal relationship with the technical department, which also proactively makes proposals to the city council. Indeed, the technical department also proactively engages with the C40 network – a collaboration of

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<sup>102</sup> Weichselgartner, J., & Arheimer, B. (2019). Evolving Climate Services into Knowledge–Action Systems. *Weather, Climate, And Society*, 11(2), 385-399. <https://doi.org/10.1175/wcas-d-18-0087.1>

<sup>103</sup> EC (2023). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Enhancing the European Administrative Space (ComPAct) (COM(2023) 667 final).

<sup>104</sup> Available at: [Covenant of Mayors - Europe | Covenant of Mayors - Europe \(europa.eu\)](https://covenantofmayors.eu/)

<sup>105</sup> See: <https://mairie20.paris.fr/pages/fichier-reflex-21605>

cities dedicated to addressing climate issues – to draw inspiration from global best practices. They share these innovative ideas with the city councillor, suggesting policies and actions that can benefit the city of Paris.

### **Municipal climate adaptation finance**

Adaptation activities within the municipal climate plan of the City of Paris are underpinned by a diverse array of budget lines. A thorough evaluation of the city's climate budget was conducted to define the specific amount earmarked for climate mitigation actions. In a less methodical approach, an assessment of expenditures reveals that adaptation is being indirectly financed by numerous other departments as well. This revelation indicates that the overall budget for adaptation surpasses initial estimates and is similar to the budget for climate mitigation.

The adaptation department of the City of Paris itself has a substantial budget of several million euros. However, when accounting for the financial resources allocated by additional departments, the total investment for adaptation measures is significantly higher. By consolidating all the budgets, it becomes evident that nearly every budget line is connected to adaptation activities, particularly in the realm of urban planning and development.

Additional resources are deployed towards training, dissemination of information, and support for those most vulnerable to climate impacts. For example, the city of Paris is actively engaging in resolving climate adaptation issues, with a focus on providing shelter for those in direst need. The funding approach is notably cross-functional, encompassing multiple departments that contribute to adaptation efforts. This collaboration occurs even when the adaptation element of their work is not explicitly designated as such within the departments' posts.

## **Use of climate services**

### **The role of climate services**

The climate plan of the city of Paris was thus introduced in 2015, based on a vulnerability study of the city of Paris undertaken in 2012. This study led to the emergence of a discussion on climate adaptation and placed climate adaptation higher on the city's political agenda. As a result, adaptation issues were included in the mandatory municipal climate plan in 2018, making it clear on a political and regulatory level that Paris is working on climate adaptation and mitigation as two complementary elements. The Paris climate plan is set for a comprehensive review every six years, with the next one scheduled for adoption by the end of 2024. This new draft climate plan is particularly focused on the challenges of adaptation. The opening chapters of the latter are pivotal to climate adaptation, as they concentrate on critical topics such as environmental health and disparities amongst communities.

**The underlying vulnerability research thus represented a climate service that played a crucial role** for municipal decision-makers to include climate adaptation in the municipal climate plan. The groundwork for the updated climate plan rests substantially on the 2012 vulnerability study, which includes revised climate forecasts and their impacts on various systems. This updated study shifted the perspective on resource scarcity, suggesting serious implications by 2030 instead of the previously anticipated 2050. In addition to strongly influencing Parisian policymakers, the findings of the vulnerability assessment have been instrumental in persuading and educating both the general public and economic stakeholders, fostering an informed dialogue on the imminent environmental challenges.

The necessity of basing the climate plan on robust and reliable scientific data has led to **vulnerability studies and climate assessments becoming indispensable documents to the policymaking process** of the City of Paris regarding climate adaptation measures. Recognising that data can quickly become

outdated, the adaptation department proactively proposed an updated analysis of the 2012 vulnerability assessment in 2020, anticipating the arrival of a new municipal team in 2020. The objective was clear: present the incoming administration with the most current data to underscore the imperative of focusing on climate adaptation.

By 2021, this forward-looking study was published<sup>106</sup>, envisaging the climatic circumstances up to the year 2030. The projection not only highlighted the urgency of the situation but also served as a call to action for immediate steps towards adaptation. To bridge the gap between complex scientific findings and political decision-making, the municipality commissioned external consultants to distil the comprehensive study into accessible communication materials. This **strategic simplification had a significant impact**. It resonated with political leaders, serving as an effective educational tool and reinforced the narrative for urgent climate action. It is this **interplay between scientific rigour and effective communication** that remains key to mobilising political will and resources for adaptation strategies. The study was also delivered to the Climate Academy<sup>107</sup> for educational purposes.

### Sources of knowledge and related challenges

A diverse array of sources is underpinning the climate plan. Prominent among them are insights from climatologists at the IPCC<sup>108</sup> and the GREC<sup>109</sup> (climatologists of the region Paris belongs to), which provide expert guidance on climatic data and projections. Moreover, there is an active engagement with citizens and civil society through consultation mechanisms. These range from exploratory walks which address the intersection of gender and climate issues to in-depth dialogues and collaborations with associations. Data is also sourced from major institutions such as social and health services.

**Navigating the nexus between a forward-looking approach and present-day application remains challenging.** Data, however, empowers the city to make informed decisions. For instance, through collaboration with the International Organization for Migration (IOM), the city of Paris realised that the dynamics of people moving to and from Paris, potentially due to climate-related factors, warranted detailed examination. Consequently, it became clear there is a necessity to develop an intricately tailored plan that encompasses the nuances of climate migration. Importantly, migration is viewed not merely as a challenge but also as an opportunity for the Paris region, as newcomers from the global south bring with them a wealth of climate knowledge and skills. This perspective triggered a smaller, focused study, laying the groundwork for a dedicated policy that acknowledges the multi-faceted nature of migration and its potential benefits to the metropolis.

### Access to data

Access to climate data and information is markedly more straightforward for major urban centres, as they tend to be focal points for researchers and institutions. Indeed, large cities such as the City of Paris often allow scientists and research institutes to disseminate their data within these hubs.

Within this context, the City of Paris has taken initiative to generate its own data. A significant example of this is the current initiative to build a municipal thermal observatory. This instrument will serve for monitoring urban buildings and environments to determine the effectiveness of actions aimed at influencing temperature and enhancing thermal comfort for its inhabitants. There is an expressed desire within the city's administration to establish a comprehensive observatory network. This network would facilitate constant oversight of various measurement points throughout the city, thereby

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<sup>106</sup> See: <https://cdn.paris.fr/> and <https://www.pseau.org/>

<sup>107</sup> See: <https://www.academieduclimat.paris/>

<sup>108</sup> See: <https://www.ipcc.ch/>

<sup>109</sup> See: <https://grec-idf.eu/>

enabling an ongoing evaluation of policy impacts. Such a system would be vital in verifying the efficacy of initiatives and ensuring they yield tangible benefits in terms of climate change mitigation and adaptation.

The city of Paris recognises the importance of incorporating scientific backing to the process of producing data and knowledge. By advocating for the publication of all collected data into the public domain, the City of Paris exemplifies a commitment to transparency and the broader application of knowledge in tackling climate-related challenges.

## The role of standardisation of climate services

In the context of urban planning and environmental policy, **the City of Paris has thus far made marginal use of formalised standards for climate services** in its operational framework. For instance, the city does not use the ISO 14091:2021 standard. This limited use of standards is, in part, attributed to a deficiency in familiarity and comfort with these instruments amongst city officials. One belief might be that adherence to rigid standards could impair their flexibility and humanistic approach to policy implementation. Another explanation could be that city administrators are uncertain about the potential benefits standards might bring or whether they could inadvertently complicate processes, leading to a loss of the nuanced and adaptive nature that currently characterises their work. This ambivalence hints at a broader debate within the municipality about the balance between structured guidance and the need for bespoke solutions that reflect the unique socio-environmental tapestry of Paris.

## Lessons learnt

From the examination of the climate services utilised in the development and implementation of Paris's climate adaptation strategy, several key lessons emerge. The Territorial Climate-Air-Energy Plan (PCAET) has operated as Paris' local effort to prepare for climate change, incorporating a strong focus on adaptation since its mandatory implementation in 2015. The municipal governance process highlights how elected officials, including the deputy mayor for climate issues, play a critical role in mobilising support for climate adaptation measures. This is bolstered by close collaboration between the technical department and the Paris City Council, which is not static but rather a dynamic, two-way engagement.

Furthermore, the interaction with knowledge holders and the use of climate services by the city of Paris has been critical in developing a municipal adaptation strategy. The climate plan, reviewed every six years, is grounded in a vulnerability study from 2012 which set the stage for a focus on adaptation to climate change. This has underscored a proactive approach from the adaptation department in updating data to stay current, highlighting, and fostering informed public dialogue on environmental challenges through exploratory city walks, in-depth dialogues and collaborations with associations, and continuous exchange with scientific experts. Another significant contribution has been bridging the gap between complex scientific data and policymaking through two-way communication. The creation of accessible communication materials from dense climate studies has proven effective in educating and mobilising both policymakers and citizens.

The adaptation strategy in Paris is underpinned by a wealth of diverse data sources, including the IPCC and local climatologists, alongside active engagement with citizens through various participatory mechanisms. Moreover, large cities such as the city of Paris often serve as focal points for scientific research, and have greater access to climate data, driving them to produce their own data as well. In terms of standardisation, so far, the City of Paris did not adopt formalised standards, potentially due to a lack of familiarity and comfort with these instruments amongst city officials. This indicates an

ongoing debate about finding the right balance between structured guidance and tailoring solutions, reflecting concerns about losing flexibility and the current humanistic approach.

# Case study: Ghent

## Use of climate services in the development and implementation of the climate adaptation strategy of the city of Ghent

Francesca Finello, Ramboll

### The Adaptation strategy of the city of Ghent

In November 2020, the City of Ghent adopted its third Climate Plan<sup>110</sup>, covering the period 2020-2025. The fourth Plan will be adopted in 2025, and it will cover the period 2025-2030. The preparation of this plan will start after the municipal elections that will be held in October 2024. Notably, there is no obligation for cities in Flanders to adopt a Climate Plan, this is rather a voluntary decision from the municipality.

The 2020-2025 Climate Plan covers both climate change mitigation and adaptation. Ghent aims to make the city “climate-proof” and to reduce its CO<sub>2</sub> emissions by 40% by 2030. By 2050, the city will be climate-neutral, in line with its commitment to the Covenant of Mayors for Climate & Energy. The plan addresses different themes: energy-efficient housing, renewable energy, companies and tertiary sector, transport, food, circular economy and climate adaptation. It also includes the cross-cutting objective of establishing a “social and equitable” climate policy, involving everyone in the climate transition and paying particular attention to those who struggle to make ends meet.

According to the Climate Plan and the vulnerability analysis conducted, **Ghent will be mostly exposed to heatwaves, droughts, heavy rain and floods.** The administration wants to design a city that is liveable and resilient to these hazards. The adaptation actions identified in the Plan cover the whole adaptation cycle<sup>111</sup>, from assessing climate change risks and vulnerability to monitoring and evaluation of adaptation. They also include subsidies<sup>112</sup> for citizens to adopt their own adaptation actions.

Hazard-specific vulnerability studies underpin the measures identified in the Climate Plan. In particular, dedicated studies were conducted focusing on droughts<sup>113</sup>, heatwaves<sup>114</sup> and floods. These analyses are conducted by universities, research institutes, and consultancies – in collaboration with the city administration. Often, other city departments or even members of the regional government are included in a sounding board for such projects. Besides these city-specific studies, the Ghent administration also makes use of information available on the Flemish regional climate portal, Klimaatportaal Vlaanderen<sup>115</sup>.

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<sup>110</sup> City of Ghent (2020) 2020-2025 Climate Plan. See: <https://www.calameo.com/read/0063954479db097ad1e64>

<sup>111</sup> EEA, Adaptation Support Tool. See: <https://climate-adapt.eea.europa.eu/en/knowledge/tools/adaptation-support-tool>

<sup>112</sup> City of Ghent (2022) Subsidy regulations for climate adaptive interventions for the period 2023-2025. See: <https://stad.gent/nl/reglementen/subsidiereglement-voor-klimaatadaptieve-ingrepen-voor-de-periode-2023-2025>

<sup>113</sup> Sumaqua (2021) Creation of a water balance model and drought study for Ghent. See: <https://www.calameo.com/read/006395447019e640c8dc0>

<sup>114</sup> VITO, City of Ghent (2013) Heat study. See: <https://stad.gent/sites/default/files/page/documents/Hittestudie%20Gent.pdf> and <https://stad.gent/sites/default/files/media/documents/Hittestudie%20Gent%20Samenvatting.pdf>

<sup>115</sup> VMM, Klimaatportaal Vlaanderen. See: <https://klimaat.vmm.be/klimaatportaal-je-kompas-naar-een-klimaatbestendig-vlaanderen>

**Adaptation is also mainstreamed in other sectoral policies**, such as the Rainwater and drought plan<sup>116</sup>, Heat Plan, Green structure Plan<sup>117</sup>, Urban development plan. Mainstreaming is crucial in the field of adaptation, as it aims to ensure the objectives of different policies are coherent and mutually support one another.

## Municipal governance process and knowledge holders

The city administration is divided into different thematic departments. The Climate and Environment Service is included in the Urban Development Department, together with services that deal with urban and spatial planning, mobility and housing. The inclusion in this cross-subjects department, as well as the participation in different cross-sector working groups, facilitates the integration of climate change adaptation in other sectoral policies. The team dedicated to climate change adaptation provides advice to other services and colleagues on how to integrate adaptation in their policies and measures.

**Besides relying on collaboration with different departments within the municipality, the city of Ghent also coordinates action with the Flemish (regional) and Belgian (federal) governments.** On the one hand, the Ghent administration relies on information provided by the Flemish government to make decisions and makes use of subsidies provided at the regional level. On the other hand, Ghent also provides feedback on what works on the ground and needs in terms of information and support. As Belgium is quite small, it is easy for a mid-size city such as Ghent to enter into contact with officers of the regional and federal government.

Finally, the city of Ghent makes use of European Funds (e.g. InvestEU, the Innovation Fund, Horizon Europe, Interreg, LIFE and Elena) to implement their Climate Plan.

## Use of climate services

### The role of climate services

The city of Ghent makes use of different types of climate services to develop its Climate Plan, hazard-specific plans as well as to mainstream adaptation in other sectoral policies.

### Sources of knowledge and related challenges

The main sources of knowledge used for decision-making in relation to adaptation within the **Ghent administration are the following: city-specific vulnerability analyses, Flemish Climate Portal, Citizen intelligence and science, monitoring and evaluation of implemented adaptation measures, scientific and grey literature.**

The Flemish Climate Portal includes a web-based Impact tool<sup>118</sup>, Plan tool<sup>119</sup> and Project tool<sup>120</sup>. The Impact tool helps explore the consequences of climate change in different municipalities – both in the present and the future (2030, 2050 and 2100 scenarios). As the impact tool provides information at the area level (1 km<sup>2</sup>) within the municipality, downscaling information from the Copernicus Climate Service at the Flemish level, **the city administration often uses this tool to support decision-making for specific climate hazards (where this level of granularity of information is sufficient, such as heat).**

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<sup>116</sup> Ghent is drawing up a rainwater and drought plan. See: <https://stad.gent/nl/groen-milieu/nieuws-evenementen/gent-maakt-een-hemelwater-en-droogteplan-op>

<sup>117</sup> City of Ghent (2012) Green structure plan. See: <https://www.calameo.com/read/006395447344b7846aabf>

<sup>118</sup> VMM, IMPACTtool. See: <https://impacttool.toepassingenvmm.vlaanderen.be/2>

<sup>119</sup> VMM, PLAN-tool. See: <https://klimaat.vmm.be/tools/plan>

<sup>120</sup> VMM, PROJECT-tool. See: <https://klimaat.vmm.be/tools/project>

The Plan tool helps explore the potential for multiple adaptation measures on a map (e.g. paving, green roofs, tree shades etc.) and gain insights into the costs and benefits of different options. The Project tool helps cities design climate-proof projects. Specifically, the tool helps with the following: adding climate adaptive measures to a specific project design, calculating the adaptation score and seeing how the project or area becomes more climate-proof, adjusting the dimensioning or adding measures for a higher adaptation score, and an indication of costs of adaptation measures. The Ghent administration is less familiar with these tools and therefore uses them less often.

**The availability of funds plays a role in the decision-making process relating to what type of climate services are used.** The administration tries to strike a balance between the scale of information needed to make informed decisions, the information that is already available at the Flemish level and the available funds. Where information available on the Flemish Climate Portal is not sufficiently granular or up to date, the city chooses to fund specific vulnerability studies.

Finally, **the City of Ghent also makes use of citizen intelligence and science to make decisions on adaptation.** Over the past 10 years, the City of Ghent has involved and consulted stakeholders (e.g. citizens, entrepreneurs, scientists, students, non-profit organisations) and Ghentians in the development of climate plans. For instance, in preparation of the 2020-2025 Plan, the Advisory Board for Nature and the Environment invited all citizens concerned to have a say. To this end, the Advisory Board organised six interactive thematic workshops between 21 November and 10 December 2019. **Depending on the needs at hand, the administration engages with citizens directly or they collect feedback from NGOs and civil society associations representing the views of specific groups of citizens. The city also makes use of citizen science to monitor the consequences of climate change at the local level.** For instance, some citizens have volunteered to monitor groundwater levels or soil temperature.

Scientific literature and guidance documents developed by EEA, EU Mission on Adaptation and the European Commission are often used to support the decision-making process.

**As Ghent is a university city, it is often involved in research and pilot projects in collaboration with local universities and research institutes.** This constitutes an advantage for the administration that can benefit from these knowledge-creation processes on climate change impacts and adaptation measures.

Finally, the city of Ghent also monitors and evaluates the effectiveness of adaptation measures put in place. **Although this is not done in a systematic way across all measures, mostly due to limited availability of resources, knowledge from point evaluations on specific actions is used to revise the measures in following programming periods.** Finally, within the scope of the Covenant of Mayors, a two-yearly evaluation of the climate adaptation strategy is provided using environmental indicators (for instance, the proportion of paved surfaces) and result indicators (including the number of new street trees, m<sup>2</sup> of green roofs and m<sup>2</sup> of public space disconnected from the drainage system or where asphalt has been removed).

### **The role of standardisation of climate services**

The Ghent administration does not make use of standards (e.g. ISO 14091:2021 - Adaptation to climate change) to support adaptation-related decision making. Partly, this is because of lack of knowledge of such standards, and partly because they believe that these do not address the needs of the municipality. Standards are not considered to be flexible/adaptable enough for use at the city level. Moreover, cities are often submitted to a significant planning load, and standards are seen as adding a layer of complexity. When complying to standards implies further administrative burden, this is not

seen as an adequate solution for cities – in particular medium-to-low size ones. Cities rather need tools that are flexible and easy to use.

The municipality expressed a need to receive support and guidance on how to prioritise adaptation measures, where most of the difficulties relating to decision-making currently lie, but this does not necessarily need to be provided in the form of a standard.

## Lessons learnt

From the examination of the use of climate services in the development of adaptation decisions in the city of Ghent, several key lessons emerge:

- The city needs to strike a balance between scale of information needed and resources available in order to decide what type of climate services to use;
- Climate services provided by the regional government at a sufficient level of granularity are very useful for cities to take adaptation decisions;
- Standardised climate services are not known well and often do not seem adapted to the needs of cities.

# Case Study: Ammerland, Germany

Werner Krauß, University of Bremen

## Towards adaptation: Climate protection in the district of Ammerland, Lower Saxony (Germany)

### 1. Introduction

This case study explores integrated climate adaptation and protection measures in the rural district of Ammerland, Northern Germany. Central to this study is the development and implementation of a municipal "Integrated Climate Protection Plan," supported by the German National Climate Protection Strategy (NKI). Additionally, it examines the emergence of a local citizens' initiative, "Klimamarkt" ("climate market"). The report documents how these different forms of local knowledge come into play, how they differ, intersect, and complement each other. This case study illustrates the implementation of climate adaptation as a multifaceted process, highlighting the role of citizen engagement, local knowledge and the need for new democratic forms of decision-making.<sup>121</sup>

#### 1.1. Climate Managers

The district of Ammerland in Lower Saxony began activities under the header "Climate Needs Protection!" ("Klima braucht Schutz!") in 2013. The aim was to reduce CO<sub>2</sub> emissions for which the district is responsible by 20 percent by 2020, and to increase the share of renewably generated electrical energy, with a strong focus on public participation. In addition, consulting services provided additional incentives for energy saving and energy efficiency in both the private and commercial sectors. Like many other municipalities, the district of Ammerland initiated climate activities on its own, including adaptation measures in sectors like water management.

In recent years, from 2020 onwards, climate activities gained new traction with the implementation of "climate managers" in the municipalities of the district. These climate managers have two years to develop an "Integrated Climate Protection Plan" for their respective municipalities. After approval through the municipality, climate managers have another three years to implement the plan, which is evaluated every year.

The production of the climate plan is supported and guided by a software program called 'Der Klimaschutzplaner' (the climate protection planner, no date), which offers guidance in climate monitoring. This software is standardised and certified by BSKO, a systematic communal greenhouse gas emission balancing tool provided by the Federal Environment Agency. It offers guidance regarding energy use in the municipality, provides optional paths, and enables compatibility with other municipalities in Germany. These concepts are based on standardised software (BSKO standard), which enables comparability among municipalities and is already used by more than 3,600 municipalities in Germany. The climate managers are financed by a program of the German environmental ministry.

The German Climate Initiative, known as the Deutsche Klimaschutzinitiative (DKI), is a comprehensive program established by the German Ministry for the Environment to advance climate protection efforts. It is the national adoption of the European Climate Initiative and the International Climate

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<sup>121</sup> See also Krauß (2023).

Initiative. The DKI aims to support innovative projects that contribute to reducing greenhouse gas emissions, increasing energy efficiency, and promoting renewable energy sources. This support is instrumental in helping Germany meet its climate targets, which include a significant reduction in greenhouse gas emissions by 2030 and achieving climate neutrality by 2045. The initiative includes measures to enhance resilience and to adapt to the inevitable impacts of climate change.

### **1.2. Citizens Initiative “Klimamarkt” (Climate Market)**

The citizen initiative "Klimamarkt" (Climate Market) partially results from the ERA4CS project "Co-development of climate services for action" (CoCliServ, 2017-2022)<sup>122</sup>. During the project, the University of Bremen initiated workshops with stakeholders and concerned citizens in Northern Germany. In 2019, a local environmental activist asked us to stage another workshop in the district of Ammerland, which we titled "Klimamarkt." This workshop involved several working groups on topics such as mobility, construction, land use, health, and others. In a follow-up "Klimamarkt," we discussed the results and how to proceed, and how to "come into action." Ever since, a group of six to eight people, including the CoCliServ member of the University of Bremen, has organised a plethora of activities in the district. While the CoCliServ project ended in 2022, the University of Bremen still actively supports the group as a primary example of citizen engagement.

The Klimamarkt is an independent group. In terms of Bremer et al. (2022), it could be tentatively labelled a "social climate service." The initiative organises climate-related activities, engages in networking among climate groups and activities, raises awareness, and creates a public space for climate concerns.

## **2. Implementation of the Climate Managers**

Implementing climate managers in districts covered by the ERA4CS project was highly controversial. Suggested by concerned politicians and activists, several municipalities rejected the installation of climate managers because they did not want to "install another bureaucratic nuisance" or "another green paper tiger." In other municipalities, the opportunity was welcomed, and climate managers were installed.

In 2019, the municipal council of Edeweicht in the district of Ammerland decided to hire a climate manager. Between January 2020 and June 2022, this climate manager produced an integrated climate protection plan for the municipality, involving the participation of local actors and the following criteria:

"The climate protection concept serves the municipality of Edeweicht as a strategic basis for decision-making and a planning aid for its climate protection activities. With the help of the climate protection concept and climate protection management, climate protection is sustainably anchored in the municipality as a cross-sectional task. These (tasks) include the analysis of the climate protection situation, the calculation of a municipal energy and greenhouse balance according to the territorial principle, the determination of potentials for the generation and utilisation of renewable energies and energy efficiency, the calculation of a climate protection scenario until 2050, the development of strategies to increase climate protection potentials, and the derivation of prioritised fields of action." (Translation by the author, Ross 2022: VIII)

The six main fields of action covered in the final report of the climate protection plan are (1) construction, sanitization, and heat transition, (2) renewable energies, (3) mobility, (4) education, advisory, and participation, (5) climate adaptation and emission sinks, and (6) a climate-neutral

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<sup>122</sup> <http://cocliserv.cearc.fr/>

administration. The final plan provides detailed insight into the infrastructure of the municipality, identifies the main sources of emissions, and discusses potential sinks and other details. To create and track accountability, there are in-built controlling mechanisms and incentives such as the "Edeweicht climate bonus" for the transition toward climate-friendly housing.

Special data are provided by specialised consulting offices, which make use of data sets for emissions and other issues that are not directly available to the climate managers, also following the BSKO standard. The BSKO Standard is an accounting standard that creates energy balances, such as a final energy-based territorial balance for stationary and mobile sectors. It includes a detailed breakdown into sectors and energy carriers, among other things.

There were several workshops with local actors, including young people. Due to the pandemic, the workshops were mostly online. Additionally, there were online tools such as a map of the municipality, where the public could write comments, share impressions, and make suggestions. An online portal provides access to resources for use by individual households, for spatial planning, communal energy saving, and so on. The mayor, especially green politicians and activists considered the completion of the plan a great success.

The climate managers and their plans have a precarious existence; they are dependent on public and political approval to become effective and permanent. The plans provide incentives that need engagement to transform them into effective action.

### 3. Citizens Initiative “Klimamarkt”: Creating a Public Space for Climate

The core of the citizens' initiative “Klimamarkt” consists of 6-8 people who meet more or less regularly to discuss and develop new activities to create public awareness of climate issues.

The main activities are the actual climate markets. Between 2019 and 2024, the group organised six climate markets. Some of them were theme-oriented, such as discussing the results of the first Klimamarkt workshop or expressing anxiety and mixed feelings in the face of dire climate predictions by the IPCC, wildfires from Portugal to California, and the COVID pandemic. In the meantime, there have been three annual climate markets that assembled local and regional "climate-friendly" initiatives, organisations, or other activities. In an old farmhouse open for public activities, the Klimamarkt invites 20 or more of these organisations, such as local beekeepers, a bicycle organisation, a one-world and fair-trade shop, collectives presenting their herb garden or communal gardening, regenerative energy collectives, and many others who represent "climate-friendly activities." For the municipal climate managers, the Klimamarkt serves as an important public platform, supported by official welcome speeches by the district manager. Last but not least, these actual markets provide a friendly atmosphere, beyond alarmism, doom, or resignation. They embrace both individual and collective activism, without educating or pressuring visitors.

The Klimamarkt organises many other activities, such as a "Climate Art Competition," a "Climate Writing Competition," and public discussions about climate issues with politicians of the main parties before elections.

Peatlands are another important issue in Ammerland, and also for the Klimamarkt. The Klimamarkt participates in the protest against the construction of a highway through Ammerland that crosses many peatlands, and they initiate various activities such as lecture series or webinars on the rewetting

of the numerous peatlands in Ammerland. With peatlands becoming a public issue, the district of Ammerland has now submitted a proposal for a peatland project.

#### 4. Lessons learned

There are many cross-sectional activities between different forms of climate knowledge. On the one hand, there is the German Climate Initiative, and on the other, there is grassroots citizens initiative, the Klimamarkt. Many of the issues covered by the “Integrated climate protection plan” were already made public or are still promoted by the Klimamarkt. Many of the activities are complementary, but they are not identical. The following list exemplifies this at similar issues and highlights the differences and intersections.

**Climate managers** are intermediaries and knowledge brokers, but at the same time, they provide local data for the climate protection plan. As such, they are users, purveyors and providers of climate services.

**Klimamarkt** provides basic knowledge about emissions, adaptation and mitigation strategies, both on individual and communal level. They are a communal climate service, they serve as knowledge brokers and intermediaries.

**Climate managers’** use of standardised tools like BSKO ensures a systematic approach to creating energy balances and climate protection plans, providing reliable data for tracking progress and making informed decisions.

**Klimamarkt** activities are more fluid and adaptive, responding to community interests and immediate climate concerns through various events and initiatives.

**Climate managers** are restricted to a few stakeholder events or interactive websites, dependent on public participation.

**Klimamarkt** provides informal, ongoing public spaces for climate discourse, fostering continuous community engagement through events and activities.

**Climate managers** rely on standardised tools and scientific data to guide their planning and implementation processes.

**Klimamarkt** activities incorporate local knowledge and community experiences, particularly in areas like peatland conservation.

**Climate managers** use formal educational tools and structured advocacy efforts to raise awareness and promote energy efficiency and sustainability.

**Klimamarkt** employs creative and interactive methods, such as art and writing competitions, to engage and educate the public about climate issues.

**In summary**, the lessons learned from the report highlight the importance of integrating the structured, data-driven approaches of climate managers with the adaptive, community-focused activities of Klimamarkt. At the same time, they show the limits of integration; the activities are based on different forms of knowledge, and it is important to keep these differences in mind. This intersection of different kinds of knowledge and engagement strategies can create a more comprehensive and effective framework for local climate action, but it can also end up in colonising local knowledge and its forms

of participation. While the activities of the climate managers are restricted to the municipality, the Klimamarkt makes climate change a public issue and turns “matters of fact” into public “matters of concern”.

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