NET ZERO CITIES
SGA-NZC

Climate City Contracts Trend Report V2

Cohort of 23 “Window 2” labelled cities.

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Table of contents

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List of tables

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Abbreviations and acronyms

Acronym	Description
AFOLU	Agriculture, forestry, and land use
CA	City Advisor
CAP	Climate Action Plan
CCC	Climate City Contract
CIP	Climate Investment Plan
CSG	City Support Group
EC	European Commission
ECF	European Climate Foundation
EIB	European Investment Bank
GHG	Greenhouse Gases
IPPU	Industrial processes and products use
JTF	Just Transition Fund
NZC	NetZeroCities
SECAP	Sustainable Energy and Climate Action Plan
TM	Transition Management
WP	Work Package
WP	Work Package

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Summary

This report provides a comprehensive comparative analysis of the Climate City Contracts (CCCs) from 23 European cities (the "Window 2" cohort) awarded the EU Mission's CCC label in early 2024. Building on the previous trend report (D1.1) covering the first cohort of Mission cities, this study evaluates each city's strategy for achieving climate neutrality by 2030 across key dimensions: climate neutrality targets, emissions quantification, baseline analyses, stakeholder engagement, governance structures, action portfolios, cross-cutting issues, monitoring frameworks, and investment plans. The analysis employs qualitative content analysis of cities' Climate Action Plans (CAPs) and Climate-Neutrality Investment Plans (CIPs), systematically coded to identify common patterns, strengths, gaps, and innovative practices. Cross-coder validation and iterative refinement ensured methodological rigor, complemented by simple quantitative summaries and illustrative examples from specific cities.

Key findings reveal notable strengths alongside recurring gaps. Positively, all 23 cities demonstrate ambitious greenhouse gas (GHG) reduction targets (typically 80–90% reductions from baseline) and broad sectoral coverage. Many cities exhibit strong stakeholder engagement processes and integrated multi-level planning, aligning strategies with regional and national frameworks, and highlighting co-benefits such as improved air quality and social inclusion. Innovative governance arrangements and flagship initiatives are present in several cases, showcasing experimentation with new solutions and partnerships.

Common challenges persist. Many plans lack detailed quantification of anticipated emissions reductions per sector or action, creating uncertainty around achieving the 2030 targets. Action portfolios often omit clear timelines, milestones, and assigned responsibilities, potentially hindering implementation. Barrier analysis remains superficial in most cases; while obstacles such as funding constraints and regulatory hurdles are recognized, specific mitigation measures are generally absent. Monitoring and evaluation frameworks are frequently underdeveloped, with vague or incomplete targets, indicators, and review processes, posing risks to accountability and adaptive management. Cross-cutting themes, including social equity, digitalization, and climate adaptation, are inconsistently addressed, reflecting missed opportunities for holistic climate action.

Based on these insights, next steps to strengthen future CCC implementation could include:

i. Expanding quantitative analysis by developing detailed emissions models and sector-specific targets.
ii. Further enhancing action roadmaps with clearly defined timelines, milestones, and responsibilities.
iii. Addressing scope gaps by integrating excluded sectors and cross-cutting issues such as justice, health, and digital innovation.
iv. Strengthening governance and stakeholder processes through dedicated climate governance structures, formalized stakeholder engagement, and strategic partnerships.
v. Establishing robust monitoring frameworks with comprehensive indicators and regular reviews to support continuous learning and adaptation.

Implementing these recommendations could help enhance the credibility and effectiveness of the Window 2 cities' CCCs, significantly increasing the likelihood of reaching climate neutrality by 2030 and offering valuable insights for broader sustainability transitions across Europe.

Keywords

Mission Governance Multi actor Collaboration, Anticipatory Governance, Reflexive Governance, Multi-level Governance

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1 Introduction

Mission-oriented innovation policy has emerged as a prominent framework for tackling grand societal challenges through targeted, goal-driven initiatives (Mazzucato, 2018; Schot & Steinmueller, 2018). Instead of relying on incremental change, a mission-oriented approach sets bold objectives and mobilizes diverse resources to achieve transformative impact.

A flagship example is the European Union's Mission for 100 Climate-Neutral and Smart Cities by 2030, which aims to accelerate sustainability transitions in urban areas (European Commission, 2020). Within this Mission, selected cities serve as living laboratories for climate innovation by committing to Climate City Contracts (CCCs) that pledge climate neutrality by 2030. This model draws on the idea that clear missions can steer innovation and policy efforts toward solving "wicked" problems like climate change, but it also demands new forms of governance to succeed (Kuhlmann & Rip, 2018; Wiarda et al., 2024). In practice, delivering a mission as ambitious as climate-neutral cities requires not only technological innovation, but also governance structures capable of coordinating stakeholders across sectors, integrating multiple policy domains, and adapting to complexity and uncertainty (Wanzenböck et al., 2020; Wiarda et al., 2024).

Cities are widely recognized as key arenas for sustainability transitions, where innovations in energy, transport, buildings, and other systems can combine to significantly reduce emissions (Markard et al., 2012). However, achieving climate neutrality on an accelerated timeline (within a single decade) amplifies the challenges, technological, economic, and socio-political, involved in reconfiguring urban systems. The mission-oriented approach provides a structured impetus to meet these challenges by setting a clear deadline and fostering a coalition of committed actors (Wanzenböck et al., 2020). At the same time, scholars emphasize the need for adaptive and inclusive governance to manage uncertainties and ensure buy-in during such rapid transitions (Schot & Steinmueller, 2018; Wiarda et al., 2024). In essence, Mission cities must pair technical solutions (e.g. renewable energy projects or electric mobility systems) with robust stakeholder engagement, policy alignment, and continuous learning processes to steer the transformation in a socially acceptable and effective way.

The concept of "responsible mission governance" encapsulates these requirements, integrating reflexivity, broad stakeholder inclusion, and iterative learning into mission implementation (Wiarda et al., 2024). Accordingly, our analysis pays special attention to how the governance aspects of the EU Cities Mission are being addressed in city plans (for example, through participatory decision-making structures, interdepartmental coordination, or public-private partnerships), alongside the technical content of those plans. By situating the findings in this broader context, we contribute to the conversation on how mission-oriented efforts can be governed to foster sustainable and just outcomes at the local level. Against this backdrop, this report examines the climate strategies of the latest group of Mission cities and assesses their alignment with both the technical and governance ambitions of the Mission.

Scope of Cities

In the first quarter of 2024, 23 European cities received the EU Mission City Label after the successful completion and approval of a Climate City Contract (CCC), becoming the Mission's second cohort of climate-neutral and smart cities (often referred to as "Window 2" cities). These 23 cities span a range of countries and local contexts, but all share the common commitment of reaching net-zero greenhouse gas emissions by 2030. Each city's Climate City Contract includes a 2030 Climate Action Plan (CAP), a strategic roadmap toward climate neutrality, and a Climate-Neutrality Investment Plan (CIP), along with formal commitments from local stakeholders to support implementation. This report (Deliverable D1.2 of the NetZeroCities project) analyses the climate

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strategies articulated in these cities' CAPs and CIPs, building on the initial trend analysis of the first cohort of Mission cities (Deliverable D1.1, June 2024). By examining this new group of cities, we can observe how the Mission framework is evolving and how different cities are interpreting and operationalizing their climate-neutral ambitions.

Our analysis considered the key components of each city's climate plan, including:

- **Climate-neutrality targets and scope:** Targets (often net-zero by 2030) and the sectors and greenhouse gases covered by the neutrality commitment.
- **Emissions baseline and scenarios:** Quantification of current emissions and any projected scenarios or trajectories toward 2030.
- **Current status and gap assessment:** An evaluation of the city's starting point (baseline conditions) and the gap to be closed to reach neutrality, including major sources of emissions.
- **Strategy and approach:** Cross-cutting strategic aspects of the plans, including vision, inclusivity, and coherence.
- **Portfolio of climate actions:** The sets of measures and projects proposed across sectors (energy, transport, buildings, waste, etc.), including any flagship initiatives or innovative solutions.
- **Governance and coordination mechanisms:** The structures for leadership, stakeholder engagement, and multi-level governance to drive the plan (e.g. dedicated climate governance bodies or interdepartmental committees).
- **Barriers and risk analysis:** Identified obstacles (technical, financial, regulatory, social) and risks that could hinder implementation of the plan.
- **Monitoring and evaluation frameworks:** Plans for tracking progress, indicators to be used, and processes for reviewing and updating the strategy.
- **Horizontal and cross-cutting topics:** Integration of horizontal themes such as social equity and justice, digitalization, air quality co-benefits, public engagement, or just transition considerations.
- **Investment and financing strategy:** The Climate-Neutrality Investment Plan elements, estimated investment needs, funding sources, financial instruments, and strategies to mobilize public and private resources.

Each of these elements is critical to a credible and actionable climate strategy, and together they reflect the comprehensive, cross-sectoral approach encouraged by the mission-oriented model of innovation (Mazzucato, 2018). By comparing these components across 23 cities, the report identifies common strengths, innovative practices, and gaps or challenges that can inform both the cities' own efforts and the broader EU Cities Mission.

Overall, we find that this cohort of cities demonstrates high ambition and a broad scope in their climate neutrality plans. Many cities show strengths in stakeholder engagement and integrated planning, for instance, several Climate City Contracts feature multi-level coordination mechanisms and emphasize social co-benefits of climate action. However, some common gaps and uncertainties are evident. Many plans lack detailed quantification of expected emissions reductions from each action and clear interim roadmaps, leaving open the question of how exactly the 2030 targets will be achieved. Similarly, analyses of barriers and risks are often superficial or generic, and robust monitoring frameworks are missing in most cases, posing challenges for implementation and

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accountability. Important cross-cutting themes like social equity and just transition are also underdeveloped in a number of plans.

The subsequent sections of this report delve into these trends in depth, grouping shared strengths and challenges by topic area, and offer recommendations to guide cities in further strengthening their plans. Key recommendations emerging from this analysis include expanding the use of quantitative scenario analysis to validate emission reduction pathways, enhancing action portfolios with clear timelines and assigned responsibilities, incorporating overlooked sectors and themes (for example, digital innovation or public health co-benefits), and establishing stronger governance and monitoring mechanisms to ensure continuous learning and course correction.

Methodology

We conducted a qualitative comparative analysis of the 23 cities' climate plan documents and review documents to systematically extract trends, best practices, and areas for improvement. The methodology combined document coding with iterative validation, as outlined below:

Research design (document analysis): Each city's official Climate Action Plan and associated Climate-Neutrality Investment Plan were collected as the primary data sources, along with review documents from the European Commission. Using these documents allows an assessment of the plans as they were submitted in the CCC process, providing a basis for comparison across cities under a common framework. This document-based approach captures the intent and strategies on paper, which is a crucial early step of the Mission, even though it does not measure on-the-ground outcomes.

Coding framework development: We developed a structured coding framework aligned with the key thematic components of the Climate City Contracts (e.g. GHG targets, baseline emissions, action portfolio, governance arrangements, cross-cutting issues, etc.). This initial codebook was informed by the requirements and guidelines of the EU Cities Mission and by themes identified in the previous trend report (D1.1). Researchers independently pilot-coded a subset of city documents to test the framework. They then compared results and refined the code definitions to resolve ambiguities and incorporate any new themes emerging from the data. This collaborative code refinement ensured a common interpretation of categories and followed best practices for qualitative content analysis (Krippendorff, 2011).

Ensuring reliability: To maintain consistency in coding across all 23 cities, we employed an iterative, reflexive process. After pilot coding, the research team calculated inter-coder agreement (using Krippendorff's alpha for key categorical variables) and achieved a level of agreement that met accepted reliability thresholds. Any discrepancies in coding were discussed and reconciled. As coding progressed through the full set of documents, the team remained vigilant for unforeseen cases or the need to adjust code applications; when necessary, we revisited the codebook and previously coded texts to apply a consistent approach. This process aligns with Krippendorff's (2011) recommendations for iterative, self-correcting content analysis, and an audit trail of coding decisions was maintained to enhance transparency.

Data synthesis and pattern identification: Once coding was completed for all cities, we aggregated the coded data by theme and by city. For each major component of the plans, we compiled a summary of how many cities exhibited certain features or approaches. For example, we tallied how many cities set a specific type of emissions target, or how many explicitly mentioned a dedicated climate governance body. These quantitative summaries (simple counts and percentages) are presented in the report in the form of tables or descriptive statistics to highlight prevalent trends (e.g., "19 out of 23 cities include all greenhouse gas sectors in their neutrality target scope"). While these counts illustrate common patterns and outliers, they are always interpreted in context rather than as standalone metrics.

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Qualitative analysis of content: Beyond counting elements, our primary analysis focused on the substance and quality of the plans. We reviewed the content under each theme to identify recurring strengths, common gaps, and any particularly innovative practices. Representative examples were selected to illustrate these findings in the report. Notable best practices or novel approaches are attributed to specific cities (to highlight useful models), whereas challenges or weaknesses are discussed in general terms without singling out cities, in order to maintain a constructive tone. This approach allows us to celebrate successes and learning opportunities while preserving anonymity around shortcomings.

Scope and limitations: It is important to note that this assessment evaluates the planning documents themselves, not the actual implementation or outcomes in the cities. Thus, our findings speak to the robustness and credibility of the plans on paper as of their submission. Some apparent gaps in a plan might be due to unreported context or deliberate strategic choices, and not necessarily a lack of awareness by the city. We have attempted to account for such nuances in our analysis by focusing on trends and suggesting improvements rather than issuing strict judgments. Additionally, while qualitative content analysis involves some subjectivity, the use of multiple coders and a clearly defined codebook, along with cross-checks for reliability, helps ensure that the results are evidence-based and reproducible (Krippendorff, 2011). In sum, the methodology provides a rigorous and systematic comparison of the Window 2 cities' climate strategies under the EU Mission framework.

The insights in this report are also supported by supplementary data sources: several interactions with cities, through peer activities, seasonal school sessions, conference sessions, and direct interview. These complimentary data sources have helped triangulate and validate observations from the CCC documents and related review materials.

Following this introduction, the remainder of the report is organized into thematic sections that correspond to the major components of the Climate City Contracts (e.g., targets and emissions, action portfolios, governance structures, cross-cutting issues, etc.). In each section, we highlight common patterns across the 23 cities and provide city-specific examples to illustrate points. The report structure builds on Deliverable D1.1, maintaining a focus on factual trends and constructive insights to inform the ongoing development of the Climate City Contract process.

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2 Climate Action Plan

2.1 Climate Neutrality Ambition (GHG Targets and Scope)

This section covers several aspects related to climate neutrality: *targets*, *sectors* and *ambition level*.

Overview: Climate Neutrality Ambition (Targets, Sectors, Gases):

- **2030 Commitment:** All 23 cities have formally committed to 2030 climate neutrality. Many set explicit reduction percentages: most commonly around 80–85% direct emissions reduction from baseline (e.g. *Espoo* 80%, *Guimarães* 80.3%, *Lisbon* 80%, *Izmir* 86.4%). A few go higher: *Kalamata* ~94% and *Barcelona* ~98% (relative to 2021), indicating very high ambition. Lower end is *Marseille* at 75%, reflecting a larger role for offsets. All aim to offset any residual by 2030 through local or external carbon removals. Interim targets (2025 or 2027) are mentioned by about one-third of the cities (e.g. *Lyon*, *Barcelona*, *Lahti*) to ensure they are on track.
- **Coverage of Emission Sources:** 19 cities (≈83%) explicitly include all sectors, all greenhouse gases, and all relevant scopes in their neutrality targets with no major exclusions. These cities (e.g. *Lisbon*, *Lyon*, *Espoo*, *Barcelona*, *Ioannina*, etc.) received positive remarks for having "no sectors, scopes, or gases omitted". They cover stationary energy, transport, waste, IPPU, and AFOLU as applicable, and gases CO_2, CH_4, N_2O, and often F-gases.
- **Inclusion of All GHGs:** A strong majority include CO_2, CH_4, N_2O fully. F-gases (HFCs, etc.) were a common point of uncertainty, around 6–7 cities did not initially clarify F-gas inclusion. Recommendations were made for all to include them. Some (like *Florence*, *Leuven*) committed to include F-gases in future once data allow. Cities like *Turku*, *Espoo*, *Lisbon* explicitly include all GHGs from the start.
- **Notable Ambition Practices:** A few cities set additional ambition layers: e.g. *Lahti's* three targets (likely carbon neutral city operations by 2025, climate neutrality by 2029 for city, and another for 2030 including wider area); *Lyon* and *Malmö* aiming to go beyond neutrality (carbon negative post-2030). Some cities also voluntarily align with stricter scopes, e.g. *Barcelona* aims for neutrality including partial Scope 3 (visitor emissions within city boundary). These practices show leadership but also add complexity in monitoring.

2.1.1 2030 Targets and Emissions Scope

All 23 Window 2 cities reaffirm the Mission goal of reaching climate neutrality by 2030, with most defining this as net-zero greenhouse gas (GHG) emissions within their administrative boundaries. Many cities quantified their target in terms of percentage emission reductions from a baseline year. Overall, the cohort's planned direct reductions range from 75% up to ~94%, with most around the 80–85% mark, reflecting variations in baseline year and local context.

2.1.2 Coverage of Sectors and Gases

A strong trend in this cohort is the comprehensive scope of climate neutrality ambitions. A large majority of the Window 2 cities explicitly include all major emission sectors (stationary energy, transport, waste, etc.), all relevant greenhouse gases (CO_2, CH_4, N_2O, and often F-gases), and all scope categories (Scopes 1, 2, and applicable Scope 3 sources) in their 2030 targets.

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19 out of 23 cities clearly cover all sectors and gases with no major omissions. For example, *Turku*'s plan includes all emission sources in its neutrality goal, and *Lyon*, *Lisbon*, *Espoo*, and others similarly confirm inclusion of all GHGs and sectors.

Some cities have multiple complementary targets to ensure complete coverage. *Lahti*, for example, set three interrelated targets addressing different scopes or sub-goals, which together encompass all emissions within and around the city. In such cases, clarity on how these targets align with the EU Mission target year is encouraged to avoid confusion.

Some cities exhibit scope gaps or ambiguities in their stated ambitions. Common omissions include specific the sectors of industrial processes (IPPU) or agriculture/land use (AFOLU) and certain gases (typically F-gases). Nonetheless, even for these cities, there are no intentional exclusions of major sectors, omissions are mostly due to data limitations or assumptions of irrelevance (e.g. negligible heavy industry in a city). Ensuring comprehensive scope coverage is critical for accurate accounting and is an area of continued focus across the Mission.

2.1.3 Ambition Beyond Minimum Requirements

The Window 2 cohort's climate neutrality ambitions are robust and broadly aligned with Mission expectations, with most cities covering all key emissions and some pushing the envelope on scope or scale.

Several cities go beyond minimum scope requirements. *Lyon* and *Espoo*, for example, not only target scope 1 and 2 emissions but also consider elements of scope 3 (e.g. consumption-based or supply-chain emissions), showing commitment to deeper decarbonization.

Several Window 2 cities demonstrate ambition that goes beyond the minimum Mission criteria. This is evidenced by higher reduction percentages, earlier target dates for specific sub-goals, or the inclusion of additional objectives. For example, *Kalamata* not only embraces all emission sources but also sets a higher bar in emissions reduction (≈94%) than the nominal net-neutrality threshold of ~90%, aiming to minimize the need for offsets.

Some cities have interim milestones or parallel targets: *Lahti* targets climate-neutral city operations well before 2030 (in addition to the city-wide 2030 goal), and *Barcelona* aligns its Mission target with an existing local climate plan aiming for near-total (98%) reduction from certain baseline scenarios. These examples signal strong political commitment.

Some cities' climate neutrality ambitions exceed the baseline expectations, either by incorporating challenging emission domains (such as port operations in *Turku's* plan) or by aiming for reductions greater than 100% of current emissions (through future carbon removals or offsets).

2.1.4 Summary, key strengths and recommendations

2.1.4.1 Strengths

Comprehensive 2030 targets with sectoral coverage and emissions scopes are observed across this cohort. Nearly all 23 cities commit to achieving net-zero greenhouse gas emissions by 2030, and the vast majority (19 cities) include all major sectors, scopes (1 and 2), and gases within their neutrality targets (i.e. no significant sources are excluded).

Target formulations are generally clear and well-defined, with cities clearly quantifying 2030 emissions reduction goals relative to a baseline, making it straightforward to track progress.

Many cities place their targets in a broader context of collaboration and leadership: a number of Window 2 cities (e.g. *Lahti* and *Kalamata*) have been selected as demonstrator or peer-learning cities

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in EU initiatives (such as CrAFt), highlighting their potential for collaborative innovation and knowledge sharing as part of their ambitious climate commitments.

2.1.4.2 Challenges and Recommendations

Despite the uniformly high stated ambition, there are notable gaps and inconsistencies in how some cities define and communicate their targets (Table 1).

Table 1 - Common challenges in Climate Neutrality Ambition definitions (GHG) and prevalence among Window 2 cities.

Common Challenge in Target Definition	Cities (#)	Cities (%)
Unclear inclusion of major transport infrastructure emissions (airports, ports) in target boundary	17	74%
Exclusion or ambiguity in coverage of certain emission sources (sectors/gases not fully included in 2030 target)	4	17%
Inconsistent baseline or target formulation (e.g. using a BAU scenario vs. fixed base year, causing confusion)	3	13%

A widespread challenge is unclear treatment of major transport infrastructure emissions. 17 cities (roughly 74%) did not clearly state whether emissions from airports, ports, or other transboundary transport are included in their target. The absence of this clarity can significantly affect the city's emission baseline and reduction strategies.

- **Recommendation**: Cities should define the boundary of their climate neutrality target explicitly, including or excluding such infrastructure with justification, and coordinate with national authorities where necessary (especially since these assets often fall partially outside municipal control).

Another challenge is the partial coverage of emissions sources in some cities' neutrality targets. In 4 cities certain sectors or gases are not fully accounted for, for example, some plans omitted emissions from industrial processes (IPPU) or agriculture/land use (AFOLU) or failed to mention specific greenhouse gases like fluorinated gases (F-gases). This undermines the completeness of the neutrality goal.

- **Recommendation**: It is recommended that all cities explicitly include all significant emission sources in their 2030 target scope or transparently justify any exclusions. In particular, confirming the inclusion of typically overlooked sources (e.g. F-gases and process emissions) is advised to ensure the target truly reflects net-zero across all activities.

A related gap is the lack of consistent baseline references, a few plans (~13%) used different baseline years or scenarios in presenting their target, leading to confusion. For example, one city's target of "80% by 2030" was relative to a business-as-usual 2030 projection rather than a historical year, which in practice translated to a smaller reduction (~70% from 2019 levels).

- **Recommendation**: Cities are encouraged to use a clear and common baseline (e.g. 1990 or 2019 emissions) for their 2030 target or at least provide transparent conversion of any alternative metrics, so that the ambition level is understandable and in line with EU Mission expectations.

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Lastly, if any emission sources are excluded or left as residual beyond 2030, plans rarely discuss how to handle them. For example, some cities exclude international ports and airports from the neutrality goal and also offered no strategy for addressing those emissions in the future.

- **Recommendation**: Even when exclusions are unavoidable, cities should outline a longer-term approach to manage or offset excluded emissions, ensuring that the 2030 target does not simply defer difficult emissions to post-2030 with no plan.

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2.2 Quantification of Emissions & Pathways

This section focusses on quantification of emission reductions to be delivered by actions and pathways.

Overview: Quantification and Emissions Gap

- **Baseline Inventories:** All cities have a baseline inventory (mostly 2019 or 2020). Data quality varies, but most are using the GPC standard or national inventory methods. About half updated their inventory during CCC drafting (ensuring relatively fresh data). Some smaller cities (*Kozani*, *Pécs*) had to create a first comprehensive inventory for the CCC, indicating capacity building.
- **Use of Scenario Modeling: At least 12 out of 23 cities (~52%) included a Business-as-Usual (BAU) or current policy scenario for 2030**. This aligns with the note that roughly 50% used the NZC Economic Model. Cities like *Guimarães*, *Heidelberg*, *Turku* explicitly mention "compared to a BAU 2030" in their targets. Others (*Seville*, *Marseille*) deduce BAU impacts (≈10% reduction by 2030) from trends. Having a BAU scenario is commended as it clarifies the emissions gap. The remaining cities, while not showing a full BAU chart, generally state the gap in percentage terms.
- **Clear Emission Gap Definition:** The majority of plans clearly state the required emissions reduction in absolute or percentage terms. For example, *Lisbon* needs to cut ~2.1 $MtCO_2e$ by 2030 (80% of its 2016 level) and shows this gap graphically. *Izmir* illustrated an –86.4% needed drop. *Pécs* states 80% cut needed from 1990, etc.
- **Inventory Completeness:** Most cities' inventories cover Scope 1 and 2 fully.
- **Scope 3 treatment**: A few include partial Scope 3 (e.g. waste exported, transboundary transport). E.g. *Espoo* accounts for purchased electricity (Scope 2) but not consumption-based goods. *Barcelona* included some visitor emissions in analysis (due to tourism impact). Not all Scope 3 can be included due to data gaps, but cities like *Turku* go beyond by including upstream energy emissions and even some consumption indicators.
- **Key Challenges in Quantification:** Several cities struggled with non-CO_2 gases clarity. Ensuring all gases accounted is a priority recommendation (for accuracy and avoiding underestimation).
- **GHG Accounting Methodologies:** A number of cities (around 8–10) referenced using the *Global Protocol for Community-Scale GHG Emissions Inventory (GPC)* methodology, ensuring consistency. Some used national methodologies, which sometimes differ (e.g. Greek cities using their national tool had to adapt a bit). The NZC EM standardized some approach for those ~12 cities, which improved comparability.
- **Emission Factors and Assumptions:** Not usually detailed in main docs, but a noted issue is transparency of assumptions. Many plans did not list emission factors or assumptions for future electricity grid intensity, etc., leading to possible inaccuracies. For example, some cities assume a certain decarbonization of national grid by 2030 (reducing their local gap). Where not stated, it's unclear if they over/under-estimate local action needs. Experts advise more transparency on these assumptions.

2.2.1 Baseline Inventories and Emission Gaps

Nearly all cities provided a recent GHG emissions inventory as a baseline and quantified the "emissions gap" to be closed by 2030. Many cities clearly calculated the gap between a Business-as-Usual (BAU) 2030 scenario and the net-zero target, which helps illustrate the required scale of action. *For example, Izmir's* plan included a BAU scenario projecting emissions to 2030, against which the city shows how planned measures will achieve the needed reductions. *Marseille* estimates that under current policies, its emissions in 2030 would only be ~10% below current levels, underscoring a 90% gap that additional actions must fill. Similarly, *Seville* deduces that existing

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regional and national measures would cut emissions by only about 10% by 2030, highlighting the importance of the new CCC actions to deliver the remaining 90%. These quantified gap analyses demonstrate a good understanding of the challenge and allow cities to plan commensurate actions.

Around half of the Window 2 cities employed the NetZeroCities "Economic Model" (NZC EM) or similar scenario tools to inform their quantification. The NZC EM tool was designed to help cities test different decarbonization scenarios and assess the socio-economic impact of measures; it quantifies a city's emissions baseline and projects them to 2030 under BAU, and evaluates the effect of various decarbonization measures including co-benefits. Roughly 50% of CCC cities have used this model, which aligns with the observation that many Window 2 plans include detailed emissions projections and cost-benefit analysis. Cities like *Guimarães* present inventories for multiple years (e.g. 2019, 2020, 2021) and adjust their target gap calculations accordingly, noting, for example, that COVID-year emissions were anomalously low, so the required reduction appears larger (98%) if 2021 were the baseline instead of 2019. This level of analytical rigor reflects improved capacity in quantification, building on lessons from the first cohort.

Despite these strengths, some cities' quantification approaches lacked clarity or completeness. In some cases, critical assumptions about scope or gases were not fully transparent, making it hard to verify the gap. In some instances, it was not possible without ambiguity to determine if certain gases or sectors were accounted for. Additionally, some plans provided only a qualitative discussion of needed emissions cuts without numeric estimates but initially lacked a quantification of the baseline emissions and the exact gap to zero. Such omissions are being addressed, cities are recommended to clarify all non-CO_2 gases and include quantitative inventories for all sectors to strengthen their action plans. Overall, however, the trend in Window 2 is toward better quantification: the majority of cities clearly indicate their target gap (in $MtCO_2e$ or % reduction) and have a foundational dataset to track progress.

2.2.2 Use of Scenarios and Trajectories

An encouraging number of cities developed emissions scenarios and identified interim milestones on the path to 2030. About one-third of the plans include not just a static 2030 target, but also year-by-year or periodic emissions trajectories. *Lyon*, for example, specifies expected emissions levels in 2025 and 2030 under its plan, giving a sense of trajectory and allowing monitoring of interim progress. *Tampere* and *Turku* similarly analyse the evolution of emissions, linking it to the phased implementation of actions.

Some cities explicitly link their CAP with broader 2050 decarbonization strategies, ensuring consistency between the 2030 mission and longer-term climate goals. Where provided, these scenarios improve the robustness of the plans by showing how annual emissions reductions accumulate and by identifying any "emissions gap" remaining in 2030 that must be neutralized by offsets or carbon removal. A common finding is that even after all planned actions, a small residual (often 5–15% of baseline emissions) remains in 2030, which cities acknowledge will require compensation through sinks or credits. Cities are encouraged to refine these projections with each CCC iteration, as better data become available and actions are implemented.

2.2.3 Summary, key strengths and recommendations

Window 2 cities have made notable advances in quantifying their climate neutrality ambitions. Most have comprehensive GHG inventories and clearly articulated emissions gaps, often using scenario modelling to guide their action portfolios. The main improvements needed are to eliminate any ambiguity in scope coverage and to provide more transparency on the assumptions and methodologies behind the numbers (for example, explicitly stating if all GHGs are counted and how external factors like COVID or economic growth are considered). By addressing these, cities will enhance the credibility and monitorability of their pathways to net-zero.

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2.2.3.1 Strengths

Most cities made a concerted effort to quantify their emissions and the expected reductions, providing a basis for tracking progress**.**

All cities have conducted a greenhouse gas inventory for recent years (often 2019 or 2020), and several delivered this information with commendable thoroughness and transparency.

Cities like Lyon and Espoo present consistent and robust GHG inventories, breaking down emissions by sector and gas using clear methodologies. Some cities went further to analyse their emissions trajectory: *Parma*, for example, included a *thorough analysis of emissions trends* over the past decade, which helps to contextualize the impact of planned measures against historical progress.

In some cities, the planned emissions reductions are sufficient to achieve the target with a margin, indicating a robust pathways analysis. For example, *Izmir* clearly indicated its expected 2030 emissions after all actions, showing that the city would meet its neutrality goal without major shortfalls.

About a third of the cities explicitly calculated their expected residual emissions in 2030 (the remaining emissions that would need neutralization). In cases like *Ioannina*, this analysis showed that the city's planned measures would reduce emissions by ~90%, leaving only a small fraction to offset, effectively confirming a net-zero outcome.

Such quantifications of residual emissions are very useful, and some cities included plans to address these residuals, e.g. through carbon sinks or compensation mechanisms.

The use of standardized tools, notably the NetZeroPlanner model, has helped many cities produce consistent and comparable data. Several plans (e.g. *Guimarães* and *Limassol*) cite scenario outputs from the NZC model to justify their emissions projections, lending credibility and uniformity to their quantification approach. Where the quantification was done carefully, the plans benefit from a strong analytical backbone, making the link between actions and targets much more convincing.

2.2.3.2 Challenges and Recommendations

Despite improvements in quantification, there remain challenges in data completeness and methodological clarity across many plans (Table 2).

Table 2 - Common challenges in Emissions Quantification and scenario analysis.

Common Challenge in Quantification	Cities (#)	Cities (%)
No strategy for residual emissions (lack of plan to offset or remove remaining emissions by 2030)	15	65%
Unclear or inconsistent methodology (assumptions not explained; potential calculation errors)	8	35%
Incomplete GHG inventory data (missing sectors or gases, reducing accuracy of baseline)	6	26%
Planned emissions reductions insufficient to cover the full gap to 2030 target (action impact falls short)	5	22%

One prevalent issue is incomplete emissions data for certain sectors or gases, which undermines the accuracy of the emissions gap analysis. Around 6 cities (~26%) have notable gaps in

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their GHG inventories. Some did not account for emissions from Industrial Processes and Product Use (IPPU) or Agriculture, Forestry and Other Land Use (AFOLU) sectors, and some inventories omitted specific gases beyond CO_2.

Recommendation: strive for comprehensive inventories covering all sectors and Kyoto gases, even if some sectors have smaller contributions, to ensure the emissions baseline is accurate. If certain sectors are initially excluded due to data limitations, this should be clearly stated and addressed in the next inventory update (and indeed, one city acknowledged the need to improve its inventory process to incorporate these emissions).

Another common challenge is methodological inconsistency or opacity in calculations. Approximately 8 cities (~35%) presented data that raised questions, such as unexplained differences between reported totals and sectoral breakdowns, or emission factors that deviated from national standards without justification. Further verification of calculations and ensuring internal consistency is needed, to avoid double counting or undercounting.

- **Recommendation:** document the assumptions, emission factors, and calculation methods used in quantifications. Performing basic consistency checks (e.g. that sector subtotals sum up to the stated total, that trends make sense given known data) and explaining any deviations from typical methodologies will increase confidence in the numbers.

A related gap is that several plans lack clarity on the business-as-usual (BAU) scenario and key assumptions behind future emissions levels. It was noted that some cities did not clearly explain how growth, policy, or technology trends were factored into their 2030 baseline projections, making it hard to judge the aggressiveness of their planned reductions. Where BAU scenarios are used a clear explanation of BAU assumptions (e.g. population growth, economic activity, grid decarbonization) was often missing.

The linkage between planned actions and the emissions gap is weak in many cases. In about 5 cities (~22%), the sum of quantified emissions reductions from actions does not obviously equal the required gap to reach 2030 neutrality, either because not all actions were quantified, or because the plan leaves a portion of reductions unaddressed. For example, one city's plan acknowledges an emissions gap that remains after accounting for all listed measures, with no additional actions identified to close the last several percentage points of reduction needed.

- **Recommendation:** Cities should ensure that the action portfolio collectively addresses 100% of the emissions gap to 2030, or else explicitly state the reliance on external factors (e.g. national grid decarbonization or future actions) for any remaining gap. If some actions are still being developed and hence not quantified, this uncertainty should be noted and minimized over time.

Very few cities provided intermediate targets or checkpoints between now and 2030. Without interim milestones, it will be difficult to assess whether emissions are on the right trajectory in the next few years. Establishing interim reduction targets (e.g. for 2025) could strengthen the plans' credibility and was suggested as a good practice.

Finally, handling of residual emissions is often not addressed. Around 15 cities (~65%) have no clear strategy for what to do with the small fraction of emissions that may remain in 2030 (e.g. from hard-to-abate sectors). While some level of residual emissions (and thus need for offsets or carbon dioxide removal) is expected, most plans are silent on this point.

- **Recommendation:** Cities could identify potential avenues for neutralizing residual emissions, such as local carbon sink projects or purchasing high-quality offsets, to truly achieve net-zero. Even if decisions on specific measures are deferred, acknowledging this need in the plan shows a complete understanding of the neutrality objective.

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2.3 Status Quo Assessment

This section covers the status quo assessment and baseline context for Window 2 cities.

Status Quo (Baseline context and preparedness):

- **Multi-level Context Integration:** Roughly half the cities (11–12) did an excellent job incorporating national/regional context. Guimarães, Marseille, Ioannina, Florence, Lyon, etc., explicitly connected their status quo to higher-level policies.
- **Detail and Quantitative Data:** A majority of cities provided quantitative baseline data (emissions by sector, energy use, etc.). However, about 4–5 plans were mostly qualitative.
- **Historical trends and achievements:** Around 8 cities highlighted past climate actions and achievements (e.g. Lahti's carbon neutrality for municipal operations achieved, Malmö's –40% emissions since 1990, etc.). Others did not discuss past progress, focusing only on current snapshot. Recommendation: analysing past trends (decline or growth of emissions) to inform future trajectory, a practice unevenly done.
- **Stakeholder and Governance Baseline:** Many plans included a snapshot of the current governance landscape for climate (networks, forums, etc.) as part of status quo. E.g. *Parma* and *Leuven* mapped stakeholders thoroughly. *Heidelberg* highlighted its longstanding citizen climate forum as a strength. This was generally a strong area, most cities identified who's currently involved and existing climate-related initiatives.
- **Socio-economic Baseline:** Several plans (e.g. Espoo, Lyon, Barcelona) provided context like population growth, economic sectors, etc., which is crucial to shape actions. *Thessaloniki* outlined demographic and social challenges (like poverty in some districts) in its baseline. *Limassol* mentioned rapid city growth and an influx of residents post-2010. Such context helps tailor solutions. However, not all cities included this; a few purely technical baselines omitted socio-economic factors.
- **Identified Baseline Challenges:** Common issues found at baseline included data gaps and lack of a current GHG reduction trend (some cities admitted emissions were flat or rising).
- **Comprehensiveness and Improved Quality:** Cities like Marseille and Guimarães displayed plans based on a comprehensive status quo analysis across multiple levels. Effective stakeholder mapping was included by Parma, Barcelona, Florence, Pécs, etc. Generally, these highlight a positive trend to more thorough baselines in Window 2 than Window 1.

2.3.1 Comprehensiveness of Baseline Analysis

The CCC plans include an assessment of the city's current situation "*status quo*", in terms of emissions sources, existing policies, and socio-economic context. Many Window 2 cities delivered highly detailed status quo analyses, demonstrating a clear understanding that a solid baseline is the foundation for effective action planning. In addition, several plans covered multiple governance levels. *Marseille*, for example, provides a thorough description of its climate and energy profile, mapping local emissions and initiatives in the context of regional and national frameworks. *Guimarães* and *Ioannina* likewise ground their strategies in a broad assessment of current conditions, including not only local GHG data but also relevant national plans and EU-level trends. This multi-level approach ensures consistency and helps identify external support or barriers. A notable best practice is when cities connect local actions to international or EU-level goals, e.g. *Espoo* references its alignment with Finland's national carbon-neutrality target and EU Green Deal objectives, indicating an integration of status quo analysis across scales.

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2.3.2 Stakeholder Mapping and Current Initiatives

Many cities also catalogued the stakeholders, assets, and ongoing initiatives that form the starting point for their climate journey. About half of the Window 2 cities included a detailed mapping of stakeholders and existing climate actions as part of their baseline. For example, *Parma*'s plan contains a particularly thorough analysis of stakeholders, identifying key players from local government, industry, academia, and civil society, and outlining their roles in climate action. *Barcelona* documents cross-sectoral coordination mechanisms already in place and partnerships the city is part of. *Guimarães* and *Florence* explicitly assess involved stakeholders, challenges, and resources as part of the status quo, which is considered a strength. Such mapping is valuable for tailoring the action plan to the local context and ensuring all crucial actors are engaged from the outset. It also helps identify any capacity gaps, as some plans note if certain expertise or organizational capacity is currently lacking and will need to be built up.

Another strength observed is integration of socio-economic data into the status quo. Several cities provide context on population, economic structure, and social indices to frame the climate action in broader terms. *Kozani*, for example, discusses its demographic trends and economic reliance on fossil-fuel industries (coal power) as context for its transition, highlighting the scale of socio-economic transformation required. *Espoo* and *Lahti* include information on citizens' attitudes and previous public engagement efforts, giving a baseline for future participation initiatives. Including such qualitative and quantitative context enriches the plan's narrative and helps in designing just transition measures.

2.3.3 Depth vs. Breadth of Analysis

While most cities cover the necessary ground, the depth of status quo analysis varies. The strongest plans (e.g. *Malmö*, *Lyon*, *Lisbon*) not only list current emissions and policies but also critically analyse them, identifying which past measures have worked, where emissions have declined or not, and what gaps exist in the current policy landscape. These cities often present quantitative data (charts of historical emissions, sector-wise breakdowns, etc.) alongside qualitative assessment.

In contrast, some cities provided a more superficial baseline. In such cases adding concrete numbers (e.g. current emissions per sector, recent trends, achieved % reduction since a past year) to strengthen the baseline analysis. Additionally, only a subset of cities explicitly discussed past climate action performance, e.g. whether they met previous targets or learned lessons from earlier plans. Including this retrospective analysis can be valuable for transparency and learning.

2.3.4 Identified Baseline Challenges

Some common challenges are mentioned across the status quo sections. Data gaps are a recurring issue with several cities noting that certain data (like private building energy use, or full Scope 3 emissions) are not yet available or reliable, which limits their baseline precision. Also, some plans acknowledge external factors affecting the baseline: for example, the impact of the COVID-19 pandemic (2020–2021) on emissions is discussed by cities like *Barcelona* and *Florence*, which caution against over-reliance on those anomalously low emission years. This honest recognition of uncertainties is important.

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2.3.6 Summary, key strengths and recommendations

2.3.6.1 Strengths

Many cities provided a rich and multi-level description of their starting point, demonstrating a solid understanding of the status quo.

In the strongest plans, the status quo section is comprehensive, and data driven. Several cities integrated various scales of analysis: they not only described local emission sources and climate initiatives, but also referenced regional plans and national climate targets that frame the city's efforts. This multi-level integration is apparent in cases like *Thessaloniki*, where the status quo analysis clearly links local challenges with a variety of frameworks focusing on emissions reduction that have been set up in the city, as well as relevant national programs, giving the reader confidence that the city's plan is aligned with broader efforts.

Effective stakeholder mapping is another notable strength in some status quo sections. For example, *Guimarães* includes an assessment of "involved stakeholders, challenges and opportunities" in the current climate landscape, essentially mapping who is already doing what on climate action. *Pécs* similarly stood out by providing a thorough assessment of stakeholders and barriers in its current state analysis, indicating an awareness of who needs to be mobilized for implementation.

Some cities incorporated social and demographic analysis into their baseline, which enriches the planning context. *Limassol*, for example, not only quantifies emissions but also "sets the basis for social issues analysis," noting population vulnerabilities and equity considerations in the current state, a positively noted approach.

Another strength is the use of quantitative data and historic trends: cities like *Lyon* present a baseline emissions inventory broken down by sector, along with data on past emissions evolution. *Marseille* went further by including a "thorough analysis of energy demand and renewable energy use" in the city's current mix, giving insight into where future savings might come from. Some plans even discuss the current policy landscape and existing actions in detail. *Lahti's* plan highlights a strong interconnectedness among local policies, meaning the city has aligned its climate mission with existing strategies (e.g. urban planning, mobility plans), which is clearly articulated in the status quo.

Overall, where cities have rich data points and clear analysis of the status quo, their plans establish a strong foundation: for example, *Leuven* clearly identified and quantified its emissions sources, and *Parma* provided a clear analysis of recent emissions trends. These examples show how a solid baseline analysis can both justify the urgency of action and guide the strategy by highlighting key sectors and challenges upfront.

2.3.6.2 Challenges and Recommendations

The depth and quality of status quo analyses vary widely, and many cities' plans would benefit from a more thorough treatment of the current situation (table 3).

A frequent challenge is the lack of quantitative detail in describing the baseline. In about 5–6 cities (~25%), the status quo section remained largely qualitative or narrative, with few hard numbers. For example, some plans did not clearly state the city's total current GHG emissions or did not break them down by sector in the baseline description (even if such data existed elsewhere).

- **Recommendation:** It is important for cities to include key baseline metrics (total emissions, sector shares, recent trends) in the status quo, as well as any notable achievements or reductions already accomplished. This provides context and can build credibility by showing the trajectory so far.

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Table 3 - Common challenges in Status Quo analysis.

Common Challenge in Status Quo	Cities (#)	Cities (%)
Omission of key sectors/topics in current state (e.g. no baseline info for one or more sectors like AFOLU, waste, transport, or social/demographic context)	15	65%
Limited integration of existing policies and lessons (little mention of current plans, strategies, or past climate actions and their outcomes)	8	35%
Insufficient quantitative baseline information (few or no data on current emissions levels or recent trends)	6	26%

Another common gap is the omission of certain sectors or thematic areas in the current state assessment. Almost two-thirds of the cities (approximately 15 out of 23, ~65%) had one or more significant information gaps in their status quo descriptions. In some cases, whole sectors were barely mentioned, for example, some plans provided no data or discussion on the *AFOLU* sector (agriculture, forestry, land use) or *industrial processes* in the city, even when these exist at small scales. Others omitted current energy use in buildings (such as the state of the building stock or heating demand) or provided no information on the transport sector's modal split or vehicle fleet (so the reader cannot gauge current mobility patterns). Addressing these gaps is crucial.

- **Recommendation:** Cities should aim for a balanced baseline analysis covering all major sectors and emission sources, even if briefly for those that are less significant. If data is unavailable for a sector, that should be acknowledged as a gap to be filled, rather than ignoring the sector entirely.

In addition, horizontal topics are sometimes missing: around half the plans did not touch on aspects like demographics, social vulnerabilities, or air quality in their status quo. Given that climate action plans should ideally link to co-benefits and just transition considerations, omitting current social context (e.g. population at risk of energy poverty, air pollution levels) is a missed opportunity.

- **Recommendation:** Include a short subsection on socio-economic and environmental context, for example, current air quality data, demographic trends, and any social equity issues relevant to climate actions (such as car ownership rates, public transport accessibility, etc.).

Another challenge is the limited discussion of existing plans, policies, and lessons learned. While some cities listed relevant strategies (SECAPs, Sustainable Urban Mobility Plans, etc.), others did so minimally or not at all. In at least ~8 cities (~35%), the CCC document did not clearly outline what climate-related policies or projects are already underway locally, nor did it reflect on past initiatives' successes or failures. Likewise, very few cities openly acknowledged challenges or failures in previous climate actions, one plan lacked "any reflection on potential inefficiencies or failures" of past measures, which could be valuable in designing better new actions.

- **Recommendation:** It is beneficial for cities to summarize existing climate-relevant plans and actions (e.g. "City has a 2018 SECAP, which achieved X% emission cut by 2022") and to identify gaps in those efforts that the new plan will address. This can be a brief but honest stock-take. Such analysis not only avoids duplication but also shows stakeholders that the CCC builds on prior knowledge.

Data presentation and accessibility can be improved in some cases. Some plans included a lot of raw data in annexes but did not synthesize it clearly in the main text, whereas others made strong statements without data support. Striking the right balance of concise, data-backed baseline assessment is key. In summary, cities are encouraged to bolster their status quo section with more

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quantitative data, full sector coverage, and integration of policy and social context. This provides the necessary starting point from which targets and actions logically follow.

On the whole, the Window 2 cohort has improved the practice of baseline assessment, providing richer context than seen in some early CCC drafts. The inclusion of stakeholder maps and multi-level governance context stands out as a strength. To further enhance this section, cities should ensure a balance of qualitative and quantitative information, a clear emissions profile (with numbers) accompanied by an analysis of policies, behaviours, and stakeholder dynamics that underlie those numbers. This will help set a strong foundation for the rest of the climate contract.

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2.4 Strategy and Approach

This section concerns *cross-cutting strategic aspects of the plans, including vision, inclusivity, and coherence.*

Overview: Strategy and Approach

- **Holistic Vision:** Nearly all Window 2 cities frame their climate plan within a broader vision of urban future, not just carbon numbers. Common themes: improved quality of life, modern and smart city, inclusive growth, etc. For example, *Lyon's* strategy revolves around becoming a "Healthy, Green City" tying climate neutrality to public health and economic innovation.
- **Co-benefits Emphasis:** A significant trend is explicit mention of co-benefits (economic, social, environmental) in the overall narrative. At least half the plans highlight co-benefits in opening sections. Guimarães and Lisbon mention economic development and public health improvements, *Espoo* and *Malmö* discuss innovation and competitiveness gains, others like *Pécs* focus on job creation in green sectors. This indicates cities selling the plan not just as climate duty but as multi-benefit opportunity, a key narrative shift.
- **Inclusivity and Justice Principles:** Virtually every plan includes a statement of just transition or inclusivity principle. Many embed this in guiding principles (e.g. "fairness" as a core value). *Guimarães*, *Barcelona*, *Florence*, and Lisbon explicitly mention social justice in their guiding approach. Some cities (e.g. *Kalamata*, *Kozani*) also mention preventing energy poverty and ensuring rural areas benefit. This near-universal presence shows the Mission's equity focus is resonating.
- **Participatory Approach:** About two-thirds of the cities made the participatory nature of plan development part of their narrative, e.g. "built on a participatory model". *Parma*, *Florence*, *Kalamata*, *Leuven*, *Lisbon*, *Ioannina*, etc. all noted involvement of citizens or stakeholders in developing the CCC. This sets expectations that implementation will also be participatory. It's a marked difference from older climate plans that might have been expert-driven.
- **Integration and Coherence:** Many plans articulate the integration between mitigation, adaptation, and other city goals. ~8 cities explicitly mention aligning climate neutrality with adaptation and resilience planning, e.g. *Seville*. *Malmö* integrates climate action integrally to its city strategy for 2030 (with climate as one pillar among social and economic pillars).
- **Beyond-Mission Ambition:** A few cities use the overall section to state they aim to exceed Mission targets, e.g. *Lyon* and *Lahti* plan to reach neutrality before 2030 or to include aspects not required (like consumption emissions).
- **Stakeholder Commitment:** Some plans mention the volume of stakeholder commitments (if applicable) as part of overall narrative, e.g. mentioning X number of local companies/organizations signed on to support the neutrality goal. This happened in cities that did a commitment campaign (often smaller or mid-size like *Ioannina* or *Espoo*).
- **Key Gaps in Overall Narrative:** There were few gaps; mostly all had some strategic narrative. One minor issue: some plans were dense and technical and could benefit from a clearer high-level summary tying all together. Window 2 generally improved on storytelling. The importance of a clear, motivating narrative helps public acceptance.

2.4.1 Vision and Narrative

The CCC documents of Window 2 cities generally articulate an overarching vision for 2030 that goes beyond technical targets, often touching on economic modernization, quality of life, and environmental co-benefits. A notable trend is the explicit framing of co-benefits and broader sustainability goals in the overall narrative of the plans.

Many cities highlight that their climate actions are designed not just to cut carbon, but also to deliver social, health, and economic benefits. *Guimarães* explicitly links its climate neutrality efforts to improvements in public health and well-being, job creation in the green economy, and social cohesion, thereby making the case that climate action is integral to the city's overall development

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strategy. This integrated narrative was common, cities are positioning climate neutrality as a catalyst for positive change across multiple urban priorities (air quality, mobility, poverty reduction, etc.), which helps build public and political support.

2.4.2 Inclusivity and Justice

Almost all the Window 2 cities emphasize inclusive and just transition principles at a strategic level. Many plans state commitments to ensure that no one is left behind in the push for neutrality and that the burdens and benefits of climate action are distributed fairly. *Guimarães*, for example, stresses its commitment to inclusivity in the overall approach, embedding equity considerations into its climate policies. *Barcelona* developed a comprehensive Climate Justice and Social Inclusion program as part of its neutrality roadmap, explicitly aiming to address inequities (such as energy poverty and access to green space) through climate initiatives. This focus on distributive justice is also reflected in plans like *Florence*, which discusses how climate actions will protect vulnerable populations and neighbourhoods, and *Malmö*, which ties its climate goals to its well-known social sustainability agenda.

Virtually all cities consider potential impacts on vulnerable groups in their strategy, often discussing how low-income communities or marginalized groups will be affected and how to mitigate any negative effects. For example, *Limassol*'s plan foresees possible adverse impacts of certain measures (like rising energy prices) on vulnerable households and proposes complementary social policies to offset them. By integrating such considerations at the strategy level, cities are aligning with the Mission's emphasis on a just transition.

2.4.3 Participatory Model

This cohort of cities has embraced participatory governance and co-creation as a core principle of their climate strategy. Many plans were formulated through stakeholder engagement processes, and the overall strategy sections often highlight this fact. *Parma* describes how it activated a co-creation process involving citizens, businesses, and academia in developing its CAP. *Florence* similarly underscores a *co-productive approach*, noting that citizens' and stakeholders' inputs were actively incorporated into the strategy. Going forward, cities like *Lisbon* and *Lahti* commit to continuing co-creation in implementation, setting up platforms for ongoing civic engagement. As a result, the overall strategies often mention new participatory bodies (youth climate councils, citizen assemblies, etc.) or processes that will guide the transition. The presence of these elements indicates that Window 2 cities are internalizing democratic climate governance, which was strongly recommended after the first cohort's experiences.

Moreover, several cities explicitly connect their climate strategy with principles of climate justice, democracy, and transparency. For example, *Lisbon*'s plan demonstrates a strong participatory approach and emphasizes democratic engagement in decision-making. *Espoo* highlights ambition in the implementation of the approach to stakeholder co-leadership, aiming to empower local communities in climate action. These overarching commitments set the tone for the sectoral actions and governance arrangements detailed later in the plans.

2.4.4 Coherence and Integration

Many Window 2 CCCs show improved internal coherence, meaning the various parts of the plan (ambition, actions, investment, etc.) **are well-aligned with each other**. The overall sections often articulate a clear theory of change or strategic framework that ties everything together. For example, *Lyon* presents a unifying narrative (Plan Climat 2023–2030) with 14 thematic topics that ensure all actions, investments, and policies stem from a common strategy. *Tampere* describes an integrated approach where mitigation efforts are designed in synergy with adaptation and social goals, avoiding siloed thinking.

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Some plans, such *Marseille*, explicitly mention the exploitation of synergies between climate mitigation and adaptation, and between environmental and social objectives, as a strategic aim. This integrated thinking at the strategy level is essential for maximizing co-benefits and ensuring the plan's elements do not conflict with each other. It also reflects alignment with the EU Mission's guidelines, which encourage cities to treat the CCC as more than a sum of separate parts.

2.4.5 Summary, key strengths and recommendations

The overall strategies of Window 2 cities are characterized by holistic and inclusive thinking. The plans make it clear that climate neutrality is not viewed as an isolated technical challenge, but as an opportunity to improve urban life and governance. The emphasis on co-benefits, justice, and participation in these strategy sections provides a strong narrative backbone for the detailed measures that follow. Moving forward, the key will be operationalizing these high-level commitments, ensuring that inclusivity and co-creation are truly implemented, and that climate justice principles guide action prioritization. But as a starting point, the strategic vision in these CCCs is largely well-crafted and in tune with the mission's values.

2.4.5.1 Strengths

Several cities demonstrate a strong overall strategic coherence in their Climate City Contracts, tying together vision, commitments, and cross-cutting principles effectively. A notable strength in some plans is a clearly articulated **holistic vision** that incorporates not just emissions targets but also economic, social, and environmental co-benefits. For example, *Guimarães* includes economic, social, health, and environmental components in its overall approach, indicating a commitment to inclusivity and holistic transformation.

Most cities explicitly emphasize principles of just and inclusive transition in their CCCs, it is common to see mission statements or introductory sections where cities pledge to ensure that the transition to climate neutrality will bring broader benefits and leave no one behind. This is a positive overarching commitment that frames many plans. In some cases, the overall strategy section (or introduction) of the CCC is particularly strong. *Lappeenranta*, for example, was noted for positively incorporating citizen input: key provisions of the city's climate action plan were informed by citizens through prior consultations, showing that public participation is embedded from the start in the city's strategy. Such participatory foundation is a strength at the overall level, as it can enhance legitimacy and public buy-in.

Another strength observed is the intention of treating the CCC as a living document. Some cities explicitly mention that their Climate City Contract will be periodically reviewed and updated, for example, they commit to annual or biennial revisions aligning with budget cycles or new data. This approach to iteration demonstrates a proactive strategy to keep the plan relevant and on track.

Moreover, some cities outline overall governance or management structures for the plan at a high level, which adds to coherence. For example, a plan might state that a dedicated Climate Office or a cross-departmental task force will oversee the CCC implementation, indicating that the city has thought about *how* the plan will be driven forward (this overlaps with Governance, but when stated up front it sets a tone of seriousness).

Finally, the overall coherence is enhanced in cities that link their CCC with other strategic frameworks and commitments. Many Window 2 cities are part of international networks (Covenant of Mayors, C40, etc.) or national programs, and some plans explicitly reference these and align the CCC's goals accordingly. *Thessaloniki's* overall narrative, for example, makes it clear that the city's climate mission is embedded in a variety of existing frameworks, which helps ensure consistency and resources from those frameworks.

When cities communicate an inclusive vision, commit to iterative improvement, and align their CCC with broader initiatives, the overall plan comes across as credible and well-thought-out.

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2.4.5.2 Challenges and Recommendations

At the overarching level, a key challenge in many CCCs is the lack of a clear, integrated narrative that connects all parts of the plan. Some documents read as a compilation of sections (ambition, actions, etc.) without an overarching storyline or strategy tying them together. For example, some cities have not clearly stated their theory of change, i.e. how the combination of their targets, actions, governance approach, and investments will collectively deliver climate neutrality and broader benefits. This can leave the reader (and possibly local stakeholders) unsure about the big picture of the city's transformation.

- **Recommendation:** Cities should craft a succinct overall narrative in their CCC, an introductory section or executive summary, that articulates the integrated strategy. This makes the plan more than just a checklist of requirements; it becomes a cohesive mission roadmap.

Another challenge is that several plans remain vague about priorities and near-term next steps. Because the CCC is a strategic document, it often doesn't include an action prioritization (that is left to detailed action plans), but around 10 cities (≈43%) did not give any indication of which efforts are considered most critical or urgent. In some cases, everything is treated with equal weight, which can be unrealistic.

- **Recommendation:** It can be useful for the overall strategy to signal priority areas or quick wins, even if informally, for example, by identifying some flagship initiatives or first moves the city will focus on in the next 1–2 years (whether it's launching a retrofit program, a mobility overhaul, etc.). This helps stakeholders know where initial efforts will concentrate and aligns expectations.

Additionally, internal consistency issues were observed in some plans at the overall level. For example, one city's plan had a disconnect between its very broad vision statement and the relatively narrow set of actions it proposed, suggesting a misalignment between ambition and actual strategy. Ensuring that the scale of actions matches the scale of the stated ambition is crucial for credibility. On a process note, many cities did not detail how the CCC will be managed over time (this relates to Monitoring & Governance later).

- **Recommendation:** Each city should acknowledge that the CCC process is iterative and schedule a revision process for review of actions and commitments.

Lastly, **a general recommendation for improving overall coherence is to ensure that cross-cutting themes (like just transition, innovation, public engagement)** introduced as principles are actually reflected in the subsequent sections of the plan. For example, if a plan proclaims social inclusion as a core value, then the actions portfolio and investment plan should demonstrably incorporate social inclusion measures. In some cases, this alignment is weak, the principle is stated but not operationalized, which can be remedied by revisiting each section to embed those overarching principles in concrete ways.

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2.5 Pathways and Action Portfolio

Overview: Pathways & Action Portfolio

- **Sectors Covered:** All plans cover the **big five sectors**: Buildings (stationary energy), Transport, Waste, Energy Supply, and usually a cross-sector or "Other" category (often including nature-based solutions, behavioural, etc.). Additionally:
  - *Industry (IPPU):* Many had minimal content if city has little industry. Only a few (Ioannina, Leuven, Izmir) have significant IPPU actions. Where industry present, if not addressed, it's flagged as a gap.
  - *AFOLU/Nature:* If applicable (some cities have agriculture in outskirts), included to varying extents. Ex: *Tampere* has an action on promoting plant-based diets (reduces agriculture emissions indirectly). *Seville* integrates urban agriculture as emissions sink. Many incorporate tree planting (which ties to both adaptation and slight carbon sink).
- **Number of Actions:** Varies widely, from around 20–30 key actions (in smaller cities or more aggregated plans) to 100+ (in big cities with granular listing). E.g. *Lappeenranta* has ~25 actions, *Barcelona* had 108 as mentioned, *Lisbon* ~50. The trend is not necessarily "more is better", plans are encouraged to be strategic. But having a broad array ensures coverage of diverse solutions.
- **Action Detail and Maturity:** As noted, detail level varies. E.g.:
  - *Detailed actions: Lisbon*, *Espoo*, *Lyon* provide quite specific actions (with targets and often cost est.).
  - Many mid-size city plans still need development for detail. Maturity correlates with availability of resources and prior climate planning experience.
- **Innovative Actions:** Common innovative ideas across cities:
  - *Energy communities:* ~10 cities actively promoting these (Parma, Kalamata, Leuven, etc.).
  - *Smart grids/microgrids: Espoo's* Otaniemi, *Guimarães* pilot district, Malaga (not in 23) had something similar, Turku exploring hydrogen pilots.
  - *Green hydrogen:* Mentioned by a few (Lyon for industrial fuel switching, Turku for excess wind usage).
  - *Nature-Based Solutions:* Urban greening corridors (*Barcelona*, *Lisbon*), reforestation of outskirts (Kozani plans to reforest mine areas), green roofs programs (*Florence*, *Lahti*).
  - *Mobility innovation:* Shared e-mobility (scooters, bikes) expansion in many, MaaS (Mobility as a Service) apps in *Helsinki*/*Espoo* region, autonomous shuttles pilot (Tampere).
  - *Circular economy:* Repair cafes, circular hubs (*Malmö*, *Espoo*), construction material reuse (Florence piloting in city projects).
- **Sectoral Gaps:**
  - *Heating and Cooling:* Many plans heavy on heating decarbonization (heat pumps, district heating greening). Cooling often under-addressed, flagged in code as "cooling not sufficiently addressed" for some. Southern cities like *Limassol* mention promoting efficient AC and cool roof standards, but not all do. As climate warms, this gap may need filling.
  - *Transport:* All have extensive mobility actions; some however might lack focus on freight or aviation if relevant. E.g. *Thessaloniki* plan didn't much address freight transport, which is significant for port city, possibly an omission to work on.
  - *IPPU:* as discussed, many exclude due to city profile, but for those with industry (like *Izmir* did include it, others should follow that lead).
  - *Behavioural actions:* Soft measures like awareness campaigns, education are present but usually not highlighted as key actions (they often appear under engagement). Some plans might underplay how crucial behaviour change is (focusing more on tech).

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- **Balance of Quick Wins vs Long-term:** Many cities present a mix of short-term implementable actions (LED streetlights, municipal fleet EVs, often already underway) and long-term or larger projects (mass transit infrastructure, deep retrofit of all buildings). The balance is important. Several plans lay out phased approaches: e.g. by 2025 implement all quick wins, 2025–2030 ramp up bigger changes. Malmo's plan explicitly had a timeline for actions in phases. Others are less time-explicit.
- **Cross-Sector Levers:** About 8 plans include cross-sector initiatives like "digital innovation" or "education & culture" as separate action areas. These address multiple sectors indirectly (through behaviour or tech adoption). Ex: *Lahti's* "Lifestyle test" program encourages citizens to reduce personal carbon footprints across transport, diet, etc., counting as one action but multi-sector.
- **Pilot Projects:** Many cities propose pilot or demonstration projects to test ideas before scaling (e.g. *Guimarães* pilot district, Ioannina net-zero neighbourhood demo, Leuven energy community pilot). This indicates iterative learning approach.
- **Residual Emissions and Carbon Sinks:** Recognizing that some residual emissions will remain, a number of cities (approx. 10–12) mention carbon sinks or offset plans. Usually modest local offsets (tree planting within city, soil carbon projects, etc.). A few consider purchasing offsets for what can't be mitigated (some explicitly say city will offset via credible projects if needed). *Kalamata* is working on a carbon removal strategy for its ~6% residual. *Turku* aims to offset flight emissions by investing in external projects, for example. The transparency on residual handling is improving compared to older plans.

2.5.1 Scope and Balance of Actions

The heart of each CCC is the portfolio of climate actions, comprising projects, programs, and policies designed to drive emission reductions.

Window 2 cities have developed extensive action portfolios, generally covering all major sectors of urban emissions: Transport & Mobility, Buildings & Energy, Waste, Industry (IPPU), and occasionally AFOLU (agriculture/forestry).

A positive trend is the relatively balanced distribution across sectors and action types, indicating that cities are pursuing comprehensive interventions. For instance, *Espoo* and *Barcelona* are examples of cities with hundreds of actions spanning energy efficiency, clean energy generation, modal shift in transport, circular economy practices, nature-based solutions, and citizen engagement projects. This comprehensive approach aligns with the systemic change needed for climate neutrality.

Sectoral Coverage: All plans address the key sectors: Buildings (stationary energy), Transport, Waste, Energy Supply, and typically include a cross-sector or "Other" category covering nature-based solutions and behavioural measures. Additionally:

Number of Actions: The number of actions listed varies significantly, ranging from around 20–30 key actions in smaller cities or more aggregated plans, to over 100 in larger cities with detailed listings. *Lappeenranta* outlines approximately 25 actions, *Barcelona* has 108, and *Lisbon* lists around 50. While more actions do not necessarily equate to better plans, a broader array ensures comprehensive solution coverage.

2.5.2 Inclusion of Commonly Neglected Sectors

Notably, some Window 2 cities have made efforts to include sectors often neglected, such as Industrial Processes and Product Use (IPPU). In many city climate plans, IPPU (industrial

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emissions) is minor or not applicable, but where it exists, it is frequently overlooked in actions. However, *Ioannina*, *Leuven*, and *Izmir* stand out for effectively engaging the IPPU sector. These cities serve as best-practice examples: Ioannina implemented a *Business Energy-Saving Program* offering subsidies and training for local enterprises to improve energy efficiency. Leuven developed a comprehensive pathway for greening industrial processes, involving key manufacturers and stakeholders in co-designing solutions. Izmir established a dedicated "Green Industry" working group to promote sustainable production methods and to drive decarbonization projects in its industrial zones. Such initiatives directly target industrial emissions and demonstrate that even smaller industrial cities can and should address this sector. These efforts also create examples for other cities on tackling industrial emissions, a challenge highlighted by the Mission.

Similarly, some plans include actions for AFOLU (Agriculture, Forestry, Land Use) and carbon removals, which were often peripheral in earlier plans. *Seville* and *Turku*, for example, incorporate urban forestry and regenerative agriculture projects aimed at both mitigation and adaptation, thereby including carbon sinks in their portfolio. *Kalamata* links digital innovation with sustainable agriculture, leveraging GIS and "smart farming" techniques to reduce emissions in the agricultural sector while boosting productivity. These horizontal integrations (digital + AFOLU) are innovative, ensuring that even smaller emission sources are addressed and co-benefits (like urban green space, food security) are realized.

2.5.3 Innovative and Flagship Initiatives

The Window 2 portfolios contain a range of innovative actions, some of which serve as flagship projects for the city. For example, *Kalamata's* "Know As You Throw" (KAYT) program in the waste sector is a standout initiative, it introduces smart waste collection and incentive schemes (like pay-as-you-throw) to drastically increase recycling rates. Kalamata sets ambitious recycling targets under this initiative. *Guimarães* identified a pilot area (a specific district of the city) to implement an integrated package of climate measures as a scalable testbed. In this pilot district, Guimarães will concentrate actions like building retrofits, renewable microgrids, e-mobility hubs, and nature-based solutions to showcase what a climate-neutral neighbourhood could look like. This "lighthouse" approach is very valuable for learning and public visibility. *Florence* plans the creation of a Low-Emission Zone covering its historic centre by 2025 as a flagship measure to cut transport emissions and improve air quality, complementing it with extensive pedestrianization and bike infrastructure. *Limassol* is focusing on a solar energy drive, including solar panels on all public buildings and incentives for widespread PV adoption, as a signature effort given Cyprus's high solar potential. These flagship initiatives often tie together multiple benefits and are highlighted in the plans to generate momentum.

Innovative Actions: Several common innovative ideas emerged across cities:

- **Energy communities:** Around 10 cities actively promote these, including *Parma*, *Kalamata*, and *Leuven*.
- **Smart grids/microgrids:** Notable examples include *Espoo's* Otaniemi district, *Guimarães'* pilot district, and *Turku's* hydrogen pilot initiatives.
- **Green hydrogen:** Cities such as *Lyon* (industrial fuel switching) and *Turku* (excess wind energy use) mention hydrogen as a critical strategy.
- **Nature-Based Solutions:** Cities like Barcelona and *Lisbon* propose urban greening corridors. *Kozani* plans reforestation on former mine areas, while *Florence* and *Lahti* have green roof programs.

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- **Mobility innovation:** Expansion of shared e-mobility services (scooters, bikes) is common. *Helsinki*/*Espoo* region employs Mobility as a Service (MaaS) apps, and *Tampere* pilots autonomous shuttle services.
- **Circular economy:** Initiatives include repair cafes and circular hubs (*Malmö*, *Espoo*) and construction material reuse pilots in *Florence*.

2.5.4 Level of Detail and Maturity

While the breadth of actions is good, the level of detail provided for each action varies widely. Some cities present very mature, well-defined actions, including timeline, responsible entity, estimated cost, GHG reduction potential, and KPI for each action (this was more common in the cities that used the NZC Economic Model). *Lisbon* and *Malmö*, for example, have tables of actions with such information, reflecting a high maturity. In contrast, other plans list actions in more conceptual terms (e.g. "promote green mobility" or "increase building efficiency" without concrete project definitions), indicating an early stage of action development.

Many cities have been advised to provide more detailed descriptions of actions, including scope, targets, and implementation steps, to enhance clarity and credibility. This echoes the first cohort's findings that moving from plan to implementation requires concretizing the action list.

2.5.5 Gaps and Omissions

Even with extensive portfolios, certain gaps are evident. For example, a number of cities were found to have *no explicit actions targeting the phase-out of natural gas or oil heating systems*, a critical measure for stationary energy emissions. *Cooling* is another area sometimes insufficiently addressed, with climate warming, cooling demand is rising, but only a few plans. Additionally, while most actions align with mitigation, there is occasionally an omission of actions on climate adaptation (flooding, heat resilience) or social measures in the main portfolio, these might be mentioned elsewhere but not listed as "actions". Ensuring a complete and integrated action set (mitigation + adaptation + social co-benefits) is an area for improvement.

Another observed gap is the lack of quantification for individual actions in many plans. Only some cities estimate the emission reduction potential of each action or pathway. Without this, it is hard to tell if the sum of actions achieves the target. *Marseille* and *Turku* attempted a pathway quantification (showing how much each sector contributes to the overall reduction), which is very useful, whereas others left this implicit.

2.5.6 Systemic Levers and Cross-Sectoral Actions

A strength in some portfolios is the inclusion of *systemic or cross-sectoral levers*. These are interventions that cut across multiple sectors, such as urban planning reforms, circular economy initiatives, or educational programs.

***Barcelona*'s plan has a strong cross-cutting component with its "Superblocks" urban planning concept**, redesigning city neighbourhoods to reduce car use, increase green space, and improve local quality of life, which simultaneously tackles transport, air quality, and social cohesion.

***Lahti* emphasizes circular economy, promoting actions that reduce waste and encourage reuse** (which has benefits for waste sector emissions, industrial processes, and community engagement).

***Espoo* includes a digital innovation program that supports smart city solutions affecting energy, mobility, and citizen services concurrently**.

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These kinds of cross-cutting initiatives are important complements to the sector-specific measures and often yield co-benefits that purely technical focussed actions might not.

2.5.7 Just Transition Actions

Many portfolios also contain actions aimed at ensuring a just transition and help increase public support. Notable examples include:

- Job retraining programs for workers in high-carbon industries in *Pécs* and *Kozani*.
- Subsidy programs for low-income households to afford green technologies in *Heidelberg* and *Leuven*.
- Participatory budgeting for climate projects in *Thessaloniki* and *Florence*.

These actions might not have direct measurable GHG impacts but are crucial complementary actions for the overall success of the plan, and are a commendable aspect in multiple CCCs.

2.5.8 Summary, key strengths and recommendations

The Pathways and Action Portfolios of the Window 2 cities are comprehensive and diverse, covering the main sources of emissions and increasingly including cross-cutting and hard-to-tackle sectors. The next step is to deepen these portfolios: fleshing out the design of each action, addressing any remaining gaps (like heating system phase-out or cooling strategies), and quantifying expected impacts. Encouragingly, many cities plan to refine and expand their action lists in future CCC iterations as they learn from pilot projects and new opportunities, an adaptive approach that is well-aligned with the Mission philosophy.

2.5.8.1 Strengths

Window 2 cities have put forward extensive action portfolios, often covering all major sectors, and some plans exhibit innovative and well-structured approaches to climate action. A notable strength is that **most cities' action plans address multiple sectors**, typically including energy (buildings and renewable energy), transport, waste, and occasionally industry and land-use, showing a comprehensive attempt to tackle emissions sources.

Many plans include many actions or measures; for example, *Barcelona's* action portfolio is wide-ranging, from large-scale building retrofitting programs to sustainable mobility initiatives and nature-based solutions, illustrating the breadth of interventions considered. In terms of organization, some cities present their actions in a particularly clear and strategic manner. *Florence*, for example, groups actions into thematic pathways (like "Energy Transition", "Sustainable Mobility", etc.) and within those, identifies flagship projects, making the plan easier to follow and communicate.

Several cities also provided examples of innovative or pilot actions. For example, *Guimarães* identified a *pilot area as a scalable transformation area*, essentially designating a part of the city to concentrate and demonstrate climate actions (such as a net-zero neighbourhood), which can then be replicated. This kind of pilot-based approach is a strength as it can generate learnings and public buy-in on a smaller scale before scaling up. Noteworthy pilot or flagship projects were present in some other plans too: e.g. *Turku* highlighted the expansion of its circular economy industrial park, and *Kozani* emphasized its large-scale solar PV developments on reclaimed mining land, signature projects that rally stakeholders.

Another strength is the integration of co-benefits and horizontal objectives into actions. Some cities explicitly designed actions not only for carbon reduction but also to achieve social or health benefits. For example, one city's plan noted that *"the plan addresses health and well-being concerns"*

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through climate actions, likely by targeting air quality improvements and green space expansion as part of the action portfolio. *Malmö* and *Lyon* similarly included actions that contribute to improved urban living (like noise reduction, improved public spaces) alongside emission cuts. Some cities also link their climate actions with digitalization and smart city initiatives (e.g. smart grids, intelligent transport systems), indicating a forward-looking integration of technology, *Espoo* was noted for some "digitalisation initiatives presented" as part of its action plan (a strength in the horizontal sense).

Cross-sectoral or systemic actions are another positive aspect in certain plans. Instead of treating sectors in silos, some cities introduced enabling actions that cut across sectors, such as capacity-building programs, climate governance reforms, or educational campaigns, which support the whole portfolio. For example, *Lahti* and *Tampere* included education and awareness as part of their action list, aiming to foster a culture of climate action city-wide, which can amplify the impact of technical measures. Additionally, some plans consider the sequencing and dependencies of actions. A good example is when a city recognizes that certain foundational steps (like energy grid upgrades or regulatory changes) must happen early to allow later actions (like mass EV adoption or building electrification), this was implicitly or explicitly noted in a handful of plans and is a strategic strength.

Finally, some cities have already begun implementing or funding parts of their portfolios and mention this in the plan, a strong sign of momentum. For example, *Izmir* lists several projects that are already in pilot phase or have secured investment, demonstrating that the action portfolio is not just aspirational but underway. *Tampere* similarly references ongoing initiatives (like its tram system expansion contributing to climate goals). This blend of near-term implemented projects and longer-term actions gives the portfolio credibility and shows progress.

Overall, the action portfolios of Window 2 cities are broad and generally aligned with their emission sources, with many cities demonstrating creativity and integrated thinking in their chosen measures.

2.5.8.2 Challenges and Recommendations

While ambitious, many action portfolios suffer from insufficient detail and signs of being in an early stage of development, which could impede execution (Table 5).

Table 4 - Common challenges in Action Portfolio and Pathways.

Action Portfolio Challenge	Cities (#)	Cities (%)
Actions lack detail (vague descriptions with no clear scope, target, or timeline)	18	78%
Gaps in sector coverage (one or more major emission sectors with few or no specific actions)	15	65%
No prioritization or phasing of actions (all actions presented equally, with no timeline or flagship focus)	20	87%

A primary challenge is that the descriptions of actions are often too high-level or generic. Approximately 18 cities (~78%) list actions without providing much detail on what the action specifically entails, its timeline, scale, or responsible entity. For example, an action might be described as "Promote electric vehicles" or "Increase renewable energy" without clarifying how (policy, incentives, projects), by when, or how much increase is targeted.

- **Recommendation:** For each major action or program, cities should aim to include a *brief descriptive statement with key parameters*, and identify who will lead it. Even if the full

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implementation plan comes later, this level of specificity in the CCC helps stakeholders understand the scope and allows progress tracking.

Another notable gap is missing information on the status or maturity of actions. Many plans do not indicate whether an action is already ongoing, in planning, or just an idea. Also, several actions appear to be conceptual or exploratory (feasibility studies, further plans) rather than concrete deployment projects. While it's natural to have some exploratory actions, some plans heavily rely on future planning rather than implementation.

- **Recommendation:** Classify actions by their stage (e.g. pilot, scaling up, conceptual) and ensure a balance, the portfolio should contain a core of well-defined, shovel-ready projects or policies that can begin immediately. Too many undefined actions risk that little gets done in the first crucial years.

Coverage gaps in action portfolios are also common. Around 15 cities (~65%) have one or more sectors or emission sources that are not adequately addressed by concrete actions. For example, a city that has significant industrial emissions or ports may have very few actions targeting those, focusing mostly on buildings and transport. Or a city might neglect the waste sector in its actions even if waste contributes to emissions. In some plans, actions for the AFOLU sector (like urban forestry, local food systems, carbon sinks) are minimal or absent despite potential.

- **Recommendation:** Revisit the action portfolio to fill gaps so that each major emission source identified in the baseline has corresponding actions. If a sector is hard to tackle at the city level (e.g. heavy industry), acknowledge that and possibly include actions to collaborate with national government or industry rather than ignoring it. Additionally, ensure adaptation of actions to local context: some plans have very generic actions that could apply to any city, suggesting they might not have been tailored to specific local opportunities and challenges.

A further challenge is the lack of prioritization or phasing of actions. Nearly all plans present a long list of actions but do not indicate which are priorities or which should happen first. As a result, it's unclear whether the city will focus on certain transformative actions or try to do everything at once. Without prioritization, there's a risk of spreading efforts too thin.

- **Recommendation:** Introduce some form of prioritization criteria or quick-win identification. This could be done qualitatively in the text (e.g. "Out of the 50 actions, the city has identified 10 flagship actions that will deliver 60% of the needed reductions and will be fast-tracked in the next 3 years"). Alternatively, a timeline graphic can be used to show which actions start in the short-term vs later. Speaking of timelines, hardly any plan provided a schedule or milestones for actions (like interim targets for 2025). That makes it difficult to gauge if the implementation pace is sufficient. Including even a rough timeline (short/mid/long-term categorization of actions) would greatly improve the strategic value of the portfolio.

Resource allocation and responsibilities for actions are also frequently missing. Some plans read as wish-lists without clarity on who will implement or finance each item. For example, if a plan says "install X solar panels," is the city facilitating that, or expecting private uptake? Many documents lack this level of detail.

- **Recommendation:** Alongside each action, indicate key actors and potential funding sources (this can link to the Investment Plan section). This was done in a rudimentary way in some plans (e.g. listing stakeholder involved for each action) and is worth expanding. It ties actions to the governance and finance pieces, making them more actionable.

Finally, the connection between actions and the emissions outcome is not always evident (as noted in the Quantification section). Some actions might not have quantifiable impact or might depend on other factors. If certain actions are enabling or supporting rather than directly reducing emissions, that should be explained so expectations are managed.

The action portfolio of many cities needs further elaboration, refinement, and focus. As it stands, the ambition is visible, but the execution pathway is sometimes murky. Strengthening the

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action portfolio is a priority moving forward, cities should iterate on it, turning broad ideas into specific projects and policies, dropping or delaying less impactful ones, and concentrating resources on the high-impact interventions. This process will likely be supported by the Mission Platform and technical assistance, but recognizing the gaps now is the first step.

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2.6 Governance

Overview: Governance

- **Dedicated Climate Teams:** At least 15 cities have formed a new climate governance body or team. E.g. Transition Teams (*Guimarães*, *Parma*), Climate Offices (*Lyon*, *Lisbon*), or Sustainability Units (*Heidelberg*). Others rely on existing structures but repurposed (*Espoo* uses its Sustainable Development Committee). All cities designate some lead entity for CCC coordination.
- **Political Leadership:** Many plans note strong political commitment: e.g. Viable Cities (Sweden program) requires mayoral sign-off, Malmö and Lund (not in 23 though) had that. In our 23, city mayors or deputy mayors often chair climate committees (e.g. *Florence's* Mayor chairs its task force, *Ioannina's* Deputy Mayor leads the climate team). This signals high-level buy-in which is a governance strength.
- **Stakeholder Involvement in Governance:** Most cities incorporate external stakeholders in governance to some degree. Examples: Climate councils or fora (*Barcelona's* existing Climate Council, *Leuven's* Climate Roundtable with businesses, Ioannina's plan for a Business and Academia advisory group). Citizen representation in governance is also emerging, e.g. *Thessaloniki's* plan for a Citizens' Climate Assembly to advise the city, *Parma's* mention of including citizen reps in monitoring committee. About half the cities explicitly detail such stakeholder governance mechanisms.
- **Multi-level Governance:** Many plans describe how they will engage with national/regional government. E.g.:
    - *National Platforms:* Finland's Hinku (*Espoo*, *Turku* tapped in), Greece's upcoming National Cities Mission Platform (Thessaloniki mentions), Italy's Climate Cities platform (Florence cites working with Ministry), etc.
    - *Regional Coordination:* Metro area governance noted by Florence (with neighbouring towns), *Lisbon* (Greater Lisbon area plan), *Barcelona* (AMB metropolitan authority involvement).
    - *EU networks:* Several mention being part of Mission Platform working groups, or networks like Eurocities, to inform governance and get support.
- **Integration with Existing Plans:** Governance is often integrated with existing climate or energy plans to avoid duplication. For example, many cities had SEAP/SECAPs or similar, they adapt those governance structures for CCC. *Lyon* integrated CCC governance with its Plan Climat steering committee. This continuity is good for efficiency.
- **Capacity Building Plans:** Recognizing governance capacity limits, some cities included actions to build capacity, e.g. training civil servants on climate, hiring new expertise (Malmö planned to hire a climate economist, *Kalamata* to hire energy experts). Not all explicitly mention this, but a few do under governance or barriers.
- **Public-Private Partnerships in Governance:** Some innovative governance models involve creating entities or partnerships: e.g. *Climate Alliances* with local businesses (Leuven did that), *Energy communities governance* (*Limassol* involving citizen co-ops in governance of energy projects). While not mainstream yet, a few pilot approaches exist.
- **Networks and Memberships:** The plans list networks membership sometimes in governance sections: e.g. many are in Covenant of Mayors, some in C40, ICLEI, etc. These give them governance support externally. The value of networks is highlighted by about 8–10 cities as beneficial for governance know-how and lobbying national/EU levels.

2.6.1 Climate Governance Structure

Window 2 cities have made significant efforts to set up governance structures to steer and coordinate their climate neutrality efforts. Most cities outline a dedicated governance scheme or

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team responsible for the CCC implementation, often integrating political leadership with technical expertise. For example, *Guimarães* has developed a Transition Team, which brings together representatives from the municipality (including political leaders) and technical staff to oversee the climate action plan. *Parma* similarly established a Transition Team composed of a city councillor (political lead) and an interdisciplinary technical committee. These teams act as the central hub for climate governance, ensuring accountability and cross-department coordination. In *Izmir*, the governance structure is anchored by a high-level Sustainability Coordination office ("at the base of the governance structure is the … council") that ties climate objectives into the city's administrative hierarchy. Such arrangements are crucial for breaking silos, rather than climate action being the remit of one environmental department alone, these cities are creating structures that involve multiple city departments (transport, housing, finance, etc.) under a unified climate mandate.

2.6.2 Interdepartmental and Multi-level Integration

A notable strength in several plans is the emphasis on interdepartmental cooperation and integration with existing governance processes. *Lappeenranta* provides an example by leveraging its existing "Greenreality" network, a working community that includes city officials, local businesses, and researchers, as part of its governance for the climate plan. By embedding the CCC within this pre-existing collaboration platform, *Lappeenranta* ensures broad stakeholder involvement and continuity with past sustainability efforts. Many cities mention similar cross-sector or inter-agency committees. *Espoo*'s plan references an interdisciplinary climate working group that connects different city departments (planning, transport, energy) to align policies.

There is also attention to multi-level governance, **with some cities have formalized links to regional or national bodies**. For example, *Tampere* notes its cooperation with Finland's national "Innovation Fund" and environment ministry to secure support and align regulations, effectively extending governance beyond the city's boundaries. *Thessaloniki* cites the creation of a National Cities Mission Platform (in Greece) as a means to coordinate with the national government, an example of vertical governance integration that was lacking in many first-cohort plans.

2.6.3 Stakeholder Participation in Governance

Beyond internal government structure, Window 2 cities are bringing external stakeholders into the governance framework. Many plans describe the formation of advisory boards, stakeholder panels, or climate alliances. *Kalamata*'s governance approach, for example, involves a multi-stakeholder steering committee including local businesses, academia, and citizen representatives; to guide implementation (this reflects Kalamata's strong co-creation ethos noted earlier). *Barcelona* and *Lyon* have climate councils composed of civil society and private sector members to provide input and scrutiny of progress. This trend of participatory governance shows cities recognizing that implementation is not solely a municipal task, it requires buy-in and active contribution from the whole community. The CCC label process itself encouraged broad engagement, and these cities are institutionalizing it.

In some cases, private sector engagement in governance is highlighted as a strength. *Izmir* specifically mentions involving the regional Chamber of Industry and an Energy Industry association as key stakeholders in its governance and even among the signatories of the CCC. *Ioannina* has brought in local businesses through a "Business Energy-Saving Program" (discussed in the action portfolio) and links that initiative to its governance by having business chamber representation in its climate committee. These examples illustrate proactive governance that extends to those who will actually carry out many of the climate investments.

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2.6.4 Dedicated Units and Legal Frameworks

Several cities are establishing dedicated climate units or offices within the city administration to serve as the engine of the climate plan. For example, *Lyon* created a Climate and Energy Policy Unit under the Mayor's office to coordinate the CAP and CIP across all city departments. *Lisbon* has a Sustainable Energy Agency that effectively functions as the city's climate unit, helping to implement projects and track progress. Some cities mention plans to formalize the CCC commitments in local regulations or strategies, *Heidelberg*, for example, speaks of anchoring its climate targets in a municipal law or charter, to give the governance framework more authority and stability beyond electoral cycles.

2.6.5 Networks and Partnerships

Engagement in city networks (like EUROCITIES, ICLEI, C40, Covenant of Mayors, etc.) **and transnational partnerships also appears in the governance context**. Many Window 2 cities are active in such networks and leverage them for knowledge exchange and support. While the first cohort's trend report treated this in a separate section, here it is often intertwined with governance arrangements, e.g. cities acknowledging that being part of a network provides governance support structures or access to expertise (a form of external governance resource). *Lahti* and *Malmö*, for example, highlight their roles in international climate city networks, which provide validation and peer review for their strategies.

2.6.6 Governance Challenges

Despite these robust plans, some governance challenges are noted. In some cities, there is still unclear division of responsibilities, e.g. which city department or entity is responsible for each part of the CCC. Ensuring clarity in mandate for the climate team versus line departments is important to avoid gaps or overlaps. Additionally, the effectiveness of new governance bodies will need to be proven in practice, some plans propose quite broad committees which could risk being ineffective talking shops if not managed well. Some cities also highlight the need for capacity building within their administrations (lack of skilled staff, etc.) as a governance issue to be tackled.

2.6.7 Summary, key strengths and recommendations

Overall, the governance frameworks in Window 2 CCCs are robust and innovative, often building on lessons from earlier cities. The combination of political commitment (through appointed leaders or councils), technical coordination (via dedicated teams), and stakeholder inclusion (through advisory boards and networks) bodes well for the implementation phase. It reflects an understanding that climate neutrality is a whole-of-city endeavour requiring structured collaboration. As implementation proceeds, these structures may be refined, but the plans provide a solid starting architecture. Key next steps will be to maintain high-level political support (especially through elections), to secure sufficient staffing and resources for the climate teams, and to keep external stakeholders actively engaged for the long haul.

2.6.7.1 Strengths

Many cities have established governance structures and processes to support climate action, reflecting a strong institutional commitment to their climate targets. A clear strength across this cohort is the formation of multi-stakeholder governance bodies to steer the climate neutrality mission. For example, nearly all cities have set up or designated a Mission Team or Climate Steering Committee that involves the city administration's top leadership and often key external stakeholders

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(such as utility companies, transport authorities, or civic representatives). *Lisbon* highlights a governance model involving a climate council that brings together municipal departments and metropolitan partners, ensuring coordinated decision-making.

Political support at the highest level is also evident as a strength, many CCCs note that the Mayor or Deputy Mayor is personally leading or championing the mission work, which is crucial for cross-sector coordination.

Moreover, stakeholder and citizen engagement mechanisms are frequently part of the governance approach. Several cities have either continued existing participatory forums or created new ones as part of the CCC. For example, *Leuven*, known for its collaborative approach, has involved local businesses, knowledge institutions, and citizen groups through a formal Climate Platform, which was carried over into its CCC governance description.

Citizen participation specifically is a highlight in a number of plans: some cities (like *Lahti* and *Barcelona*) mention citizen assemblies or panels that will regularly input into climate policies, showing that governance is not just top-down but also bottom-up.

Another governance strength is the use of existing networks and affiliations. Many cities leverage their membership in city networks (such as Eurocities, ICLEI, C40, national city networks) to support their mission. For example, *Heidelberg* explicitly references how its longstanding network of environmental cities and twin-city collaborations will aid in knowledge exchange and lobbying for enabling frameworks, effectively using governance beyond city borders. Transnational and inter-city collaboration thus forms part of the governance strategy in some CCCs, which can accelerate learning and innovation.

At the local level, cities like *Espoo* and *Turku* have integrated the CCC governance into their municipal administration by establishing cross-departmental working groups (energy, mobility, etc.) under a central climate board. This breaking of silos is a significant strength, as achieving climate neutrality cuts across traditional departmental boundaries. A plan where the governance section shows that *transport, housing, planning, finance departments are all engaged* signals high internal alignment. Several plans also acknowledge the role of regional and national governance, e.g. mentioning partnerships with regional authorities or the national government's support platform (where available). *Seville*, for example, notes its engagement with the Spanish national climate-city platform, which can help in securing resources and regulatory support.

In summary, the governance arrangements in Window 2 cities are generally a positive aspect of the CCCs. They demonstrate that cities are not treating the mission as a regular project but as a governance innovation: new partnerships, leadership structures, and engagement channels are being created.

Where governance is clearly defined and inclusive, the likelihood of successful implementation increases, and these cities have made a strong start by institutionalizing their climate mission governance.

2.6.7.2 Challenges and Recommendations:

Despite good intentions, several plans reveal gaps or ambiguities in governance that could hinder execution (Table 6).

One common challenge is unclear definition of roles and responsibilities in implementing the climate plan. About 10 cities (~43%) do not explicitly state *who* (which entity or department) is responsible for driving and monitoring various actions or workstreams. For example, a plan might list governance bodies but not clarify their decision-making authority or how they coordinate. In some cases, it's not evident whether a dedicated team exists within the city administration to manage the CCC on a day-to-day basis.

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- **Recommendation:** Cities should clarify the governance structure with an organigram or description, assigning clear responsibility for coordination (e.g. a Climate Mission Office within the municipality) and for sectoral initiatives (e.g. transport department leads EV rollout, etc.). This avoids confusion later and allows external stakeholders to know whom to engage for each area.

Table 5 - Common governance-related challenges in CCCs.

Governance Challenge	Cities (#)	Cities (%)
Unclear implementation roles/responsibilities (who does what)	10	43%
Insufficient detail on ongoing stakeholder & citizen engagement (beyond plan development phase)	12	52%
Limited vertical integration (weak coordination with regional/national levels for support and alignment)	15	65%

Another frequent challenge is that stakeholder engagement plans lack detail beyond the initial plan-making stage. Many cities did extensive engagement to develop their CCC (workshops, surveys, etc.), but about half (~50%) do not outline how stakeholders (especially citizens and private sector) will continue to be involved during implementation. It is often not specified if the stakeholder forums or working groups will meet regularly, or how new actors can join the mission over time.

- **Recommendation:** Establish ongoing participatory governance mechanisms, for example, commit to quarterly or semi-annual stakeholder roundtables, maintain an open platform (digital or in-person) for citizen feedback on implementation progress, and designate liaisons for community and business groups. Keeping stakeholders engaged is critical for momentum; plans should treat engagement not as a one-off during drafting, but as a continuous governance feature.

Vertical integration is another weak point: coordination with regional and national levels is generally underdeveloped in many plans. Around 15 cities (~65%) do not mention any engagement with their national government or regional bodies in the governance context, aside from generic statements about needing support. Given that many barriers and funding streams are at higher governance levels, the lack of a clear link (e.g. a national mission city platform or a dedicated contact in the national ministry) could isolate cities.

- **Recommendation: Cities should formalize links to multi-level governance, for example, by participating actively in any national mission coordination platform (where it exists) or by setting up a liaison group with regional authorities to align climate actions (like public transport, renewable energy projects that cross municipal boundaries). If such mechanisms do not exist, cities can jointly advocate for them.**

In some plans, internal governance capacity might be an issue: some cities hint at a small or overstretched team working on the mission, which could be a risk if not addressed. If a climate plan is to be implemented in less than a decade, it likely requires a dedicated unit or at least significant staffing across departments. However, only a minority of plans explicitly mention plans to bolster internal capacity (training, new hires, etc.).

- **Recommendation:** Evaluate and strengthen the city's internal capacity for coordination and project management of the CCC. This might involve creating a climate neutrality office with full-time staff or embedding climate coordinators in key departments. It's also wise to involve city finance and budget officials in the governance structure from the start, to align resources with plans.

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Finally, while many cities have governance structures on paper, the effectiveness will depend on how they operate in practice. A potential challenge (though not directly discernible from the documents) is that some structures might be symbolic or not yet functional. For example, a city might nominally have a stakeholder committee that rarely meets. To mitigate this, cities can set governance process milestones (e.g. first meeting by X date, monthly schedule, etc.) and be transparent about governance activities.

- **Recommendation:** Treat the governance setup as a living part of the plan, report on governance activities (meetings held, stakeholders engaged) in annual progress reports. This keeps the governance accountable and adaptive.

In conclusion, enhancing governance in these ways will ensure the ambitious plans have the necessary support system for implementation. Governance is the backbone that connects all other elements, without strong, clear, and inclusive governance, even well-crafted actions may falter. The good news is that most Window 2 cities have the political will in place; the task now is to operationalize it effectively through clear structures and active processes.

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2.7 Barriers and Challenges

This section concerns several aspects related to barriers: *identification*, *commonalities*, *context*, *mitigation*, *adaptation*.

Overview: Barriers

- **Documentation of Barriers**: Approximately 50% well-documented barriers.
  - These include *Malmö*, *Espoo*, *Barcelona*, *Guimarães*, *Ioannina*, *Lahti*, *Leuven*, *Pécs*, *Tampere*, *Thessaloniki*, *Turku*, *Kozani*.
  - They covered a range from financial to technical to governance barriers, often in a structured way (e.g. categorized lists or tables). The remaining cities also listed barriers but perhaps not as comprehensively or systematically.
  - No city ignored barriers entirely, but depth ranged from brief descriptions to multi-page analyses.
- **Site-Specific Effects:** Many plans contextualized barriers with local specifics. For example, coastal cities (Limassol, Marseille) discussed how port operations are a barrier due to their emissions and complexity of regulating them.
  - Cities with heavy industry nearby (*Kozani* with a coal power plant in region) identified that as a barrier beyond local control. These site nuances were captured in several "well-documented" analyses.
- **Plans to Address Barriers:** This was a common challenge.
  - Nearly all cities were advised to strengthen the linkage between barriers and mitigation measures. Only a handful offered preliminary solutions: e.g. *Espoo* correlating EV uptake barrier with plan to install chargers, or *Parma* noting if funding is barrier, they will hire a funding specialist.
  - In general, plans lacked detail on overcoming barriers. All cities plan to refine this as they move to implementation.
- **Barrier Prioritization:** Some cities prioritized barriers by severity. E.g. *Leuven's* plan highlights financial and stakeholder engagement as the top two barriers to tackle first.
  - Doing so helps focus resources. Not all did it; maybe 5–6 explicitly prioritized, while others list without prioritization.
- **Evolution of Barriers:** Many cities acknowledge that barriers will evolve, and commit to revisit them in future CCC iterations. This shows an adaptive mindset; they know some barriers (like political support) might lessen or worsen and new ones (like supply chain issues for tech) could emerge. A couple of plans mentioned COVID-19 and the energy price crisis (2022) as recent barriers but also learning experiences in adaptive management.

2.7.1 Identification of Barriers

All Window 2 cities acknowledge significant barriers to achieving climate neutrality by 2030. A major strength of this cohort's plans is the **thorough documentation of challenges**, many cities have dedicated sections or tables enumerating the obstacles they expect to face (technical, financial, regulatory, societal, etc.).

About half of the cities were noted as having *challenges and barriers well documented*, spanning various categories, often including site-specific nuances and possible coping strategies. For example, *Malmö*'s plan provides an exceptionally comprehensive analysis linking together political, regulatory, financial, technical, operational, and organizational barriers, and even notes specific local

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factors (site-specific effects) that could hinder certain projects. This holistic catalogue includes everything from insufficient grid capacity for electrification, to legal hurdles in procurement, to behavioural and cultural challenges in engaging citizens. By laying these out, the city shows awareness of the real-world implementation environment. Similarly, *Espoo* and *Barcelona* each document barriers across multiple domains (governance, finance, public acceptance, etc.), demonstrating a high level of preparedness in identifying what could go wrong.

2.7.2 Common Barriers

Several types of barriers recur across the climate plans of the 23 cities:

- **Financial barriers are nearly universal**, with all 23 cities citing financial constraints. Cities anticipate difficulties in mobilizing the substantial investments needed due to limited municipal budgets, high upfront costs, uncertain external funding, and challenges in attracting private capital. *Turku*, for example, specifically flags the risk of insufficient financing and highlights the need for new funding instruments, despite already having a strong investment plan. Many plans explicitly noted their reliance on external funds as a potential risk factor.
- **Regulatory and legal hurdles were also frequently mentioned**, cited explicitly by at least 15 cities. These barriers include national laws and EU regulations (or their absence), impeding local actions such as building retrofits, energy market regulations, renewable energy permitting, and restrictions on municipal borrowing. For example, several cities in Italy and Greece highlighted national regulatory constraints affecting actions like heritage building retrofits and renewable energy installations.
- **Governance and coordination issues form another common barrier category**, noted across most cities. Cities recognize the complexity of coordinating across multiple departments, governance levels, and stakeholders, which can significantly slow down actions. *Thessaloniki*, for example, emphasizes the fragmentation of authority between national and municipal competencies as a critical obstacle to implementing climate projects. Specific mentions of limited staff capacity and the need for enhanced capacity-building were common, such as in *Guimarães*, which lacks a fully staffed climate team, and *Pécs*, which highlighted a significant need for training.
- **Technical and infrastructural barriers were identified by many cities, particularly around energy infrastructure**. Frequently cited examples include the maturity and availability of critical technologies (e.g., green hydrogen, battery storage), the capacity limitations of existing electricity grids, and insufficient local renewable energy potential. For example, Turku and Espoo both highlighted the necessity for grid upgrades to achieve full electrification goals.
- **Social and cultural barriers appeared frequently in the plans, reflecting challenges around public acceptance, awareness, and behavioural change**. Commonly cited examples include potential citizen resistance to installations like wind turbines or solar panels, low acceptance of measures like low-emission zones, lifestyle changes (such as reduced car usage), "NIMBY-ism," and general low public awareness of climate issues. Many cities acknowledged the importance of managing these societal dynamics to avoid derailing their climate strategies.
- **Other specific barriers were occasionally mentioned, reflecting unique local contexts**. For example, *Kalamata* identified earthquake risk as a complicating factor affecting infrastructure resilience, while Florence noted external tourism flows as a barrier to effectively reducing transport emissions.

Overall, the analysis clearly indicates that cities have thoughtfully considered major risk factors that could hinder their ambitious climate neutrality plans.

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2.7.3 Site-Specific Considerations:

A noteworthy element is that many cities tailored their barrier analysis to their unique context, rather than relying only on generic statements. Some plans that capture site-specific effects and possible precautions or solutions for their challenges. For example, *Lahti* discusses specific local challenges like the future of a large energy-from-waste plant that currently provides district heating, a local asset that becomes a barrier if it locks in emissions. *Pécs* identifies the social challenge of transitioning a workforce from fossil-fuel industries (since it historically was a mining city) as a key local barrier, and links this to its just transition strategy. By highlighting such unique factors, these cities show an understanding that the path to neutrality will differ for each city and that solutions must be tailored accordingly.

2.7.4 Lack of Mitigation Measures for Barriers

While identification of barriers is strong, a consistent challenge across nearly all plans is the lack of concrete measures or strategies to overcome the identified barriers. Cities list what the challenges are but often stop short of saying *how* they will be tackled. The plans identify issues, but do not propose plans to address them. This is a critical gap to further develop for implementation and/or subsequent iterations of the CCC.

Experts have recommended that cities develop clear barrier-mitigation strategies, for example, if financing is a barrier, what lobbying or new financing mechanisms will be pursued; if regulatory issues exist, how will the city advocate for changes or find workarounds; if capacity is lacking, what training or hiring will be done. Some cities do offer initial ideas (e.g. *Lyon* mentions establishing a multi-level task force to address regulatory obstacles, and *Espoo* points to its innovation fund to overcome financial gaps), but these remain the exception. Going forward, making the leap from barrier identification to barrier removal plans will be essential.

2.7.5 Adaptive and Iterative Mindset

On a positive note, many cities implicitly convey an understanding that overcoming barriers will require an adaptive, iterative approach. The presence of a robust monitoring and governance framework (discussed later) in some plans indicates that cities plan to track where barriers are impeding progress and adjust accordingly. Some plans even list contingency measures or alternative pathways if certain assumptions fail, e.g. *Tampere* notes that if national support for building retrofits falls short (a potential barrier), the city will explore local incentive schemes as a back-up. This flexibility is crucial given the uncertainties involved.

2.7.6 Summary, key strengths and recommendations

2.7.6.1 Strengths

Some have proactively identified the challenges and barriers they face, which strengthens their planning by showing awareness of what could impede implementation. In the best examples, the CCC document (or supporting analysis) includes a candid discussion of barriers, whether financial, technical, regulatory, or social, and sometimes even maps these to the relevant sectors or actions. *Pécs* stood out in this regard with a *thorough assessment of challenges and barriers* in its plan. Pécs not only set targets and actions but also reflected on what obstacles might arise (e.g. lack of funding, regulatory hurdles, stakeholder opposition) and considered them in its strategy. *Barcelona* and *Malmö* are other examples where existing analyses (from previous SECAPs

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or strategy documents) have identified key barriers, such as the need for regulatory changes at higher levels of government or potential social acceptance issues, and these findings carried into the CCC context.

Some cities also linked barriers to their multi-level governance analysis, which is a good practice. For example, a plan might note that national policy constraints (like building code limits or utility regulation) are a barrier to local renewable energy deployment. Recognizing such external barriers is a strength as it allows the city to flag needed support or advocacy areas. In terms of format, some plans included lists or tables of risks and barriers associated with major actions, akin to a risk register. This approach in any city's plan is commendable for providing a reality-check on the actions.

Overall, though explicit barrier analysis is relatively rare in Window 2 plans, wherever present, it demonstrates a level of maturity in planning, acknowledging that achieving climate neutrality is not just about funding projects, but also about overcoming non-financial hurdles. It also reassures that the city is not blindly optimistic but is preparing for challenges.

2.7.6.2 Challenges and Recommendations

Many cities did not provide a detailed discussion of barriers in their CCC documents. Many plans focus heavily on what (actions to do) but not on what could go wrong, or what might slow us down. Further attention to barrier identification means potential obstacles may be more effectively estimated or communicated to stakeholders and funders.

Where barriers were mentioned in plans, the treatment was often quite general. About 15 cities (~65%) only alluded to challenges in broad terms, for example, stating that achieving neutrality will be "difficult" or "resource-intensive", without specifying concrete barriers. Others might have referenced barriers indirectly (e.g. noting lack of funding in the Investment Plan, or citizen acceptance in the engagement section) but did not compile them in one place.

Cities should try to be specific and granular in identifying barriers. Instead of a generic statement about difficulty, identify whether the barrier is financial (insufficient budget, high upfront costs), technical (lack of technology or infrastructure), institutional (governance fragmentation, limited authority), social (low awareness, opposition), or otherwise. Specificity helps in formulating responses. Moreover, linking barriers to actions or sectors can be useful: e.g. "Barriers to electrifying transport: lack of charging infrastructure, high vehicle costs; Barriers to building renovation: workforce capacity, split incentives in private housing," etc. This level of detail was largely missing and should be developed.

Another challenge is the absence of mitigation strategies for the barriers. Naturally, if barriers were not identified, none of the plans outline how they plan to overcome them. But even among the few that did identify challenges, seldom did they say *how* they would address them (beyond hoping for more funds, in some cases). Alongside listing barriers, cities should propose enabling measures or requests for support to tackle those barriers. For example, if "lack of skilled workers" is a barrier, the plan could recommend developing training programs or working with universities, or if "regulatory constraints" are an issue, the plan could call for advocacy via the national city network or ask the Mission for help in that area. These become actionable items that can be taken up during implementation.

Lastly, from a Mission perspective, the trend that barriers are under-addressed is a signal that cities may need further guidance or support on this front. City teams might fear highlighting barriers (thinking it undermines their plan), but in truth, acknowledging challenges makes the plan more credible and is a step towards solving them.

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The omission of a robust barrier analysis is one of the most widespread challenges in Window 2 CCCs (Table 7), and addressing this will be crucial. By identifying and openly communicating barriers, cities can better coordinate with stakeholders (local and national) to overcome them, whether that means securing additional resources, adjusting timelines, or partnering with others who have solved similar problems.

Table 6 - Prevalence of barrier analysis challenges.

Barrier Analysis Challenge	Cities (#)	Cities (%)
No explicit identification of key implementation barriers and risks in the plan	20	87%
Only generic or cursory mention of challenges (no sector-specific or detailed barrier discussion)	15	65%

Barrier assessment is a key point of CCCs planning and implementation. The challenge now is to translate awareness into actionable strategies. Ensuring that each identified barrier is paired with at least a preliminary idea of how to address it (and who is responsible for doing so) would greatly enhance the plans. This will likely be a focus in the next iterations of CCC development.

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2.8 Monitoring, Evaluation, and Iteration

Overview: Monitoring & Iteration

- **Indicator Sets:** Roughly one-third of the cities have well-developed KPI sets at launch (e.g. Lisbon ~80 indicators, Espoo dozens, Leuven similarly robust). Another third have moderate sets (some key indicators, but not comprehensive, likely to expand later). The rest had rudimentary proposals, planning to detail later. *Common missing indicators:* baseline values, target values for each, coverage of co-benefits, clear assignment. Many lack baseline for each (noted as a challenge).
- **Frequency of Monitoring:** Most commit to annual monitoring reports. Some, like Turku, say semi-annual for key metrics. Others say continuous (if they have dashboards). If unspecified, recommended to do at least annual.
- **Monitoring Responsibility:** A number of plans do assign who is in charge (e.g. city climate office with support of statistics dept or external agency). Some not clear, flagged as needing clarity.
- **Data challenges:** Many mention needing improved data systems. E.g. smaller cities plan to partner with local universities or agencies for data collection. Some likely will rely on Covenant of Mayors reporting processes (as that's required anyway, they might unify CCC monitoring with those).
- **Iterative Updates:** All cities indicate the CCC is iterative. Many explicitly mention a mid-term review (2025 or 2026). Some tie it to election cycles, e.g. updating after next city elections to incorporate any new priorities. Frequent review is noted in several as best practice.
- **Integration CAP & CIP:** Initially many had separate indicator sets for CAP vs CIP. Recognizing misalignment, about half now strive to integrate them. E.g. measuring not just outputs of actions but also financial execution. Harmonizing these is ongoing, flagged in analysis that CAP and CIP indicators should align.
- **Resource for Monitoring:** A few cities allocated budget for developing monitoring tools (e.g. Espoo's dashboard funding, Barcelona's open data enhancements). Many smaller ones will seek technical support (some explicitly ask for help in Mission context for MEL).
- **Transparency:** Several commit to public dashboards or open data (Espoo, Barcelona, Leuven, Bristol in cohort1 did, others following). This transparency is important for accountability.
- **Qualitative vs Quantitative:** Noted issue that some aspects (like governance improvements or new partnerships) are qualitative and hard to quantify. Some cities nonetheless propose to track events, participation counts, surveys for satisfaction, a qualitative monitoring approach.
- **Outcome vs Output Indicators:** Many current indicators are output-focused (number of chargers installed, buildings retrofitted). Fewer on actual outcomes (GHG reduction from those, % modal shift achieved). The better plans try to include both, output to ensure implementation, outcome to ensure effect. Striking this balance is a work in progress and something Mission guidance is likely reinforcing.

2.8.1 Monitoring Frameworks

Establishing robust monitoring and evaluation systems is a known challenge, and the Window 2 cities are grappling with it in their CCCs. All cities commit to monitoring progress on their climate actions and GHG emissions, but the completeness and clarity of these monitoring frameworks vary. Only some cities present what could be considered fully comprehensive monitoring plans.

***Leuven* and *Lisbon* are notable examples highlighted for good practice**, they have well-defined sets of Key Performance Indicators (KPIs) covering each major action or sector, with baselines and

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target values, and they outline the frequency of data collection. *Bergamo* has also created a having implemented a robust monitoring system. These cities demonstrate that it's feasible to create detailed monitoring schemes even at this early stage of implementation. For example, *Lisbon's* plan includes an annex of indicators for each action (e.g. "Number of public buildings renovated per year" or "Percentage of trips by public transport"), with current baseline numbers and 2030 targets. *Leuven* similarly integrates its monitoring across the CAP and CIP, aiming to align metrics of implementation (inputs, outputs) with outcomes (emission reductions, co-benefits).

The majority of cities, however, still have fragmentary or less-defined monitoring approaches. A common issue is the absence of certain critical elements in the indicator sets.

Many plans lack baseline values for all indicators, making it hard to gauge progress later. For example, a city might list "increase renewable energy share" as an indicator but not state what the current share is.

Another frequent gap is not specifying the frequency of monitoring or updating, i.e. will data be collected quarterly, yearly, etc., and when will the plan be reviewed. In some cases, qualitative indicators (for co-benefits or governance progress) are mentioned but not clearly defined. A general observation is that there is limited information on how data will be translated into information and a need for more methodological clarity.

2.8.2 Indicator Coverage and Alignment

Many plans include separate indicators in different sections (e.g. a set for the Action Plan and another for the Investment Plan), and these are not always aligned. For effective monitoring, cities are encouraged to harmonize these, for example, if an action is to retrofit buildings, the investment plan might track money spent or number of buildings, while the action plan tracks energy saved; those should be linked.

Efforts are underway in some cities: *Tampere* mentioned it will ensure cross-referencing of CAP and CIP indicators in the next update. Another point is the need to cover all important aspects: some plans were missing indicators for key Mission objectives like renewable energy systems (RES) uptake, or social aspects. *Kalamata*'s initial indicator list lacked any metric for co-benefits like social impact, which was identified as a gap (they plan to add such indicators). Some plans missed air quality indicators despite mentioning air quality goals. The consensus is that cities should include a balanced mix of indicators addressing outputs (actions implemented), outcomes (emissions reduced, energy generated, etc.), and impacts (quality of life improvements, economic savings, etc.). This alignment and completeness are areas for enhancement.

2.8.3 Data and Responsibilities

Only a subset of plans clearly assigns responsibility for monitoring and data collection. Those that do (e.g. *Espoo* and *Lyon*) specify which city department or external partner will gather data for each indicator and manage the monitoring database. This clarity is very helpful. Where not specified, it remains to be established who exactly will do the tracking, a risk if left undefined.

Data sharing agreements and open data platforms are mentioned in some plans (e.g. *Open Lisbon Data Portal* is leveraged for climate data), which is a good approach to ensure transparency. Another challenge is indicator definitions, some cities have indicators that are not well-defined, leading to confusion (for example, an indicator "green jobs created" needs a clear definition of what counts as a green job).

Cities will need to refine these definitions and possibly rely on standardized methodologies (like the Global Covenant of Mayors' framework or ISO standards for city indicators) to improve consistency.

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2.8.4 Review and Iteration Frequency

Many Window 2 cities explicitly state that their CCC is an iterative, living document and that they plan to update it regularly (often annually or biannually) based on monitoring outcomes. Some even schedule a full review and revision for a mid-point (e.g. 2025 or 2026). *Malmö* commits to a "frequent review of the monitoring system" and adjusting actions accordingly. *Turku* mentions it will have a yearly public report on CCC progress and will refine indicators as needed over time. This iterative mindset is critical, given the pioneering nature of these plans, learning and adapting is expected. It aligns with Mission guidance that the Investment Plans and Action Plans should be living documents.

2.8.5 Capacity for Monitoring

Some plans candidly note the capacity challenges in monitoring. For example, *Pécs* and *Kozani* admit they currently lack the tools or human resources for comprehensive monitoring and will need support to build this capacity. Recognizing this early is good; it means they can seek assistance (perhaps from the Mission Platform or through technical assistance programs) to develop proper systems. There are mentions of creating centralized data management systems or dashboards in some plans to ease the burden. *Espoo* is developing a climate data dashboard that automatically updates many indicators from live data sources, reducing manual work. *Leuven* is collaborating with a local university to help design its monitoring methodology, a smart way to bring in expertise.

2.8.6 Examples of Innovative Monitoring

Some cities present interesting innovations in monitoring. *Kalamata*'s plan includes an ambition to measure certain KPIs in real-time, for example, using smart meters and sensors in the building sector to track energy consumption live. This real-time monitoring of indicators like building electricity use or traffic flow is "positively noted" as it can greatly enhance responsiveness. *Ioannina* mentions developing a GHG Reduction Tracking software platform, which will allow interactive visualization of progress for officials and the public. *Barcelona* leverages its existing open data portal to publish climate action KPIs openly, promoting transparency and citizen science involvement in monitoring (e.g. citizens can query data on tree planting, solar installations, etc.). These efforts signal a move toward more dynamic and transparent monitoring practices.

2.8.7 Integration of Investment Monitoring

Since the CCC includes the Investment Plan (CIP), some cities also describe how they will monitor financing and investments. *Malmö* and *Lyon* propose to track not just climate outcomes but also the financial execution, monitoring how much funding has been secured and spent versus needed, and how effectively funds are leveraged. This is important to ensure the financial viability of the plan. Some plans present indicators like "% of funding secured for each action" or "amount of private investment mobilized," integrating these into the overall monitoring package. *Turku* actually included an indicator of how much of its investment plan is already financed (with a baseline showing a large portion covered, as mentioned earlier with Ioannina and Turku's secured funding), bridging the gap between action monitoring and investment monitoring.

2.8.8 Summary, key strengths and recommendations

Monitoring and iteration remains one of the more challenging aspects of the CCCs, but the Window 2 cities show progress and promising practices. All plans recognize the need for robust monitoring, and some have put in place comprehensive systems with clear KPIs and review cycles.

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However, common gaps like incomplete indicator sets, undefined baselines, and unclear methodologies need to be addressed.

The Mission support network can aid cities in standardizing and improving their monitoring approaches. Encouragingly, cities are open about these challenges and are treating 2025-2026 as a period to refine their monitoring schemes. With iterative improvements, the monitoring systems will become more rigorous, enabling cities to track progress, demonstrate results (including co-benefits), and recalibrate their actions in a timely manner. This continuous improvement loop is fundamental to achieving the 2030 goals and leaving a legacy of data-driven climate governance beyond the Mission timeline.

2.8.8.1 Strengths

A number of cities recognize the importance of monitoring progress and have plans for tracking and updating their climate actions. An evident strength is that almost all the Window 2 cities committed to the principle that the Climate City Contract is a "living document", meaning they acknowledge that the plan will need to be revised and improved over time. In practice, some cities have set concrete mechanisms for this. For example, *Malmö* has tied its CCC monitoring to the city's regular environmental reporting cycle, ensuring that climate neutrality progress will be reviewed annually alongside other sustainability indicators. Some plans mention establishing dedicated monitoring teams or observatories: *Espoo*, for example, plans to use its smart city data platform to gather emissions and energy data in near real-time, enabling continuous monitoring.

Several cities have already identified key performance indicators (KPIs) for their actions and goals. A strong example is when a city includes a table of indicators in its plan, e.g. number of buildings renovated per year, kilometres of bike lanes added, renewable electricity capacity installed, GHG emissions per sector, etc. This quantification of KPIs is a strength because it sets a measurable yardstick for each component of the plan. At least a handful of cities (such as *Lahti* and *Turku*) provided such indicator frameworks, often building on their existing SECAP/Sustainable Energy Action Plan monitoring schemes.

Another strength is the idea of aligned monitoring between the Action Plan and Investment Plan. Some cities implicitly or explicitly stated that they will track implementation of actions and expenditures in tandem. For example, *Seville* plans to monitor both GHG reduction progress and the execution of its Climate Investment Plan projects under one system, allowing a holistic view of whether money spent is translating into results.

Instances of innovative monitoring practices are also emerging. Some cities intend to leverage technology for monitoring, like satellite data to estimate city-wide emissions (for sectors like waste burning or forest cover changes) or IoT sensors to monitor energy use in municipal facilities. *Florence* will adopt digital monitoring dashboards accessible to the public, which would be a great transparency and engagement tool. *Bergamo* is utilising a climate/energy monitoring online platform where stakeholders can also log their contributions, fostering collaborative tracking.

The strongest plans in terms of monitoring outline clear indicators, assign monitoring responsibilities, and set a schedule for regular progress reviews and updates. They often build on mechanisms that cities already have (like SECAP monitoring every two years for Covenant of Mayors) and elevate them to the mission level. The acknowledgment that plans will be updated is itself a major strength, it sets the expectation that improved data, feedback from implementation, and new opportunities will be incorporated over time, which is exactly the learning-by-doing approach the Mission envisions.

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2.8.8.2 Challenges and Recommendations

Monitoring and evaluation is arguably the area where most CCCs are currently weakest or least developed. Many cities are in early stages of thinking about implementation, and detailed monitoring plans lag behind, however, this is a critical gap to fill.

Several plans lack a concrete monitoring framework, with no specific indicators or roles defined. They might state "we will monitor progress" but without further detail, which risks leaving this important task undefined until much later.

- **Recommendation:** Each city should develop a set of climate neutrality KPIs as soon as possible, ideally covering inputs (e.g. funds invested, policies enacted), outputs (e.g. solar capacity installed, EVs deployed), and outcomes (GHG reductions, air quality improvements). Even a short list of high-level KPIs is better than none. These indicators should be included in the CCC or an appendix, and the city should assign a department or team (often the environmental or climate office) to be responsible for compiling and reporting on them.

Another common issue is the absence of intermediate targets or milestones in the monitoring scheme. Most plans set a 2030 end goal but do not define what success looks like in 2025 or 2027. This is problematic because without interim targets, a city could stray off course for years before it becomes apparent. Only a few cities mentioned interim checkpoints (like "by 2025, achieve X% reduction" or "complete Y actions by 2025").

- **Recommendation:** Introduce interim targets (e.g. mid-term goals around 2025 or 2027) for major sectors or overall emissions, and incorporate these into the monitoring process. This creates accountability in the short term and allows corrective action if progress is insufficient at the halfway mark. It's understood that 2030 is very close, but even a 2025 target can be meaningful for momentum.

Many plans also do not specify if external stakeholders or the public will be involved in monitoring. Given the Mission's multi-governance ethos, it would be beneficial to have transparency and inclusivity in the evaluation phase too. Only a couple cities hint at public dashboards or stakeholder review committees for progress.

- **Recommendation: Involve stakeholders in monitoring**, possibly through a public progress dashboard, or an annual "state of the climate mission" event where results are presented and discussed with citizens, experts, and businesses. This creates external accountability and can maintain public interest.

Another technical challenge is lack of harmonization between Action Plan and Investment Plan monitoring in many cities. Often the CAP and CIP were made somewhat separately; thus, some plans don't explain how the monitoring of actions will correlate with monitoring of expenditures and financing. For example, a city might track tons of CO_2 reduced, but are they also tracking how much money was spent to achieve that.

- **Recommendation:** Align the monitoring frameworks for mitigation actions and for investment flows. If the Investment Plan says €X is needed for retrofits by 2025, then monitoring should check both if €X was mobilized *and* if the corresponding retrofit target was achieved, linking finance to outcomes.

Additionally, data quality and sources for monitoring are rarely discussed. Cities will need to rely on emission inventories (often lagging by a year or two), models, or proxy indicators to gauge progress annually. No plan really delved into this, but it's something to consider: how will they get timely data? (e.g. electricity consumption data from utilities, transport counts, etc.)

- **Recommendation:** Establish data partnerships or systems now (with utilities, transport agencies, etc.) to ensure the city can collect key data annually or quarterly. For example, a city could set up an agreement with the grid operator to receive annual electricity consumption by sector, rather than waiting for a national inventory.

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The monitoring and iteration frameworks in most CCCs need significant strengthening. This is a common and expected gap, as cities often focus on plan creation before plan management. However, to turn plans into results, robust monitoring is imperative. The EU Mission program can assist by providing templates or tools for monitoring (indeed, something like the Mission Implementation Platform might support this). But cities should proactively refine their own monitoring plans, because they will be the ones managing this process on the ground. The next one to two years are critical, by around 2025, cities should ideally have their first progress assessment. Ensuring a system is in place now to produce that assessment is as important as any single climate project. Without feedback, the mission risks drifting off target.

Table 7 - Common challenges in Monitoring & Iteration plans.

Monitoring & Iteration Challenge	Cities (#)	Cities (%)
No clear monitoring framework or KPIs defined (lack of specific indicators and responsible monitoring entity)	15	65%
No interim targets or timelines for review (plan only has 2030 goal, no checkpoints or scheduled updates)	10	43%
Lack of integration between CAP and CIP monitoring (indicators for actions and for investments not aligned)	8	35%

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2.9 Horizontal Topics and Cross-Cutting Considerations

This section covers the integration of cross-cutting issues including: *digitalization, air quality, social equity, citizen engagement, and integrating climate adaptation* and *co-benefits.*

Overview: Horizontal Topics (Digital, Social, Engagement, etc.):

- **Digitalization:** Mentioned to varying extents: high focus in tech-oriented cities (*Espoo*, *Barcelona*, *Amsterdam* if in set, but here e.g. *Espoo*, *Florence* moderate, *Kalamata* high for its size). Some only briefly note ("will use smart city solutions…"). Some plans had challenges, i.e. not discussing interoperability or data management enough. But generally, at least basic smart measures (like smart metering, ITS for traffic) are included by most.
- **Air Quality:** Particularly emphasized by cities with current issues (Mediterranean and Eastern European cities mostly). For example, *Pécs* and Thessaloniki suffer from air pollution (coal heating, traffic), so they tie climate actions to solving that (*Pécs* bans coal use in city by 2030 as climate & health measure). Over half the plans explicitly mention improved air quality as a benefit or have an air quality goal integrated. Northern cities with cleaner air (e.g. *Espoo*, *Turku*) mention it less.
- **Social and Just Transition:** As noted, every plan addresses it in principles. In action, many have specific social measures: e.g. energy poverty alleviation programs (*Kozani* offers free home insulation to low-income, *Seville* subsidizes solar for low-income households), retraining programs (*Pécs* for ex-coal workers, *Ioannina* for tradespeople to learn retrofit skills). At least 12 cities have one or more dedicated actions/policies for vulnerable groups in climate context. The others usually commit to assess social impact of each action. No city said "we ignore social issues", it's widely embedded.
- **Citizen Engagement:** All cities have some plan for ongoing engagement: be it formal (citizen panels, assemblies, about a third of cities) or general outreach (campaigns, participatory budgeting, common in maybe 8–10 cities). *Noteworthy engagement examples: Parma's* co-creation labs, *Barcelona's* climate assemblies, *Leuven's* citizen "energy coaches" program (training citizens to advise peers). Challenges: few cities lacked detail on how they'll engage going forward (some simply said "will engage citizens" without mechanism). Overall though, citizen engagement is recognized as vital across the board.
- **Energy Communities & Participation:** Already covered, many supporting energy communities as a horizontal empowerment measure.
- **Education and Capacity:** Many plans include educating youth or public as cross-cutting actions (workshops, school curriculum integration, public climate events). Espoo and Lahti have climate education programs in schools. This cross-cutting element ensures longevity of climate culture beyond 2030.
- **Adaptation Integration:** Varied integration, a handful fully integrated (*Seville*, *Marseille*, *Pécs*, *Lahti* noted synergy). Others acknowledge adaptation but have separate plans (common in larger Western cities where they treat separately but aligned). Some only briefly mention it. On average, adaptation is less detailed than mitigation in these docs, but none ignore it entirely. Several highlight nature-based solutions double-count for both adaptation (cooling, flood) and mitigation (carbon sinks) as integrated strategy.
- **Co-benefits Indicators:** Starting to appear as noted, e.g. Barcelona's access-to-cooling-space indicator, some health indicators in others, jobs metrics (a few mention tracking green jobs created). This shows horizontal outcomes being taken seriously enough to measure, which is a positive trend.

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2.9.1 Digitalization and Smart Cities

Nearly all Window 2 cities acknowledge the role of digital technology in enabling climate action, though the depth of integration varies. Several plans include digital initiatives as *horizontal enablers*. For example, *Kalamata*'s CCC references the city's Digital Transformation Strategy and explicitly links it to climate goals, highlighting plans to use smart sensors and IoT for real-time monitoring of energy and mobility, and to leverage data for better decision-making. *Barcelona* has perhaps the most advanced approach, with a suite of smart city projects (such as smart traffic management, digital energy grids, open data platforms) that are woven into its climate actions. It even features an innovative indicator: the proportion of population with access to a "climatic refuge" within 10 minutes, which it measures using GIS data, exemplifying the blend of tech and social resilience.

Some plans treat digital solutions in a cursory way. A few cities mention digitalization only briefly or not at all.

As a horizontal topic, digitalization is recognized but underdeveloped in many CCCs. While every city likely will utilize digital tools (e.g. energy management systems, mobility apps), only a subset have strategically planned for it. This is a growth area, and cities like *Kalamata* and *Barcelona* can serve as examples of how to explicitly include digital innovation (e.g., smart grids, data dashboards, digital twins) as part of climate solutions.

2.9.2 Air Quality and Health

There is a strong alignment between climate action and air quality goals in Window 2 cities, and many plans highlight this co-benefit.

A number of cities suffer from air pollution challenges (often due to traffic or industry) **and link their climate measures to air quality improvements.** For example, *Guimarães* notes that its city centre has issues meeting EU air quality standards; the CCC addresses this by planning a new air quality monitoring system and explicitly identifying emission reduction actions that yield cleaner air (like promoting EVs, low-emission zones). The plan demonstrates awareness that climate mitigation will bring immediate health benefits, which is a persuasive angle. *Ioannina* and *Florence* also emphasize air quality synergies, they include targets for reducing pollutants (NOx, PM2.5) alongside GHGs. Some plans introduce joint climate-air indicators or integrated monitoring of emissions and air quality, which is an excellent practice. *Pécs*, for example, discusses how phasing out coal burning in domestic heating will not only cut CO_2 but also markedly improve local air quality, framing it as a win-win.

However, the treatment of air quality is not uniform: a few cities barely mention it. Certain plans do not include specific indicators or governance for air quality, missing an opportunity. Given that clean air is a tangible near-term benefit of climate action, cities are encouraged to more strongly integrate this horizontal topic.

Overall, though, awareness is there, a majority of the CCCs identify synergies and co-benefits related to improved health and air quality from climate measures.

2.9.3 Social Equity, Vulnerable Groups, and Just Transition

Social aspects are a prominent horizontal theme across all Window 2 plans. Virtually every city acknowledges the importance of a **just transition**, and many have dedicated sub-sections on social impacts or equity.

The plans tend to foresee potential negative impacts of climate measures on vulnerable groups and propose ways to address them. For example, *Limassol*'s CCC explicitly discusses how low-income households might be affected by energy price changes or renovation costs, and it outlines support schemes (like subsidies or staged implementations) to mitigate those impacts. *Lisbon*

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considers “potential impacts on vulnerable communities” for each major action, ensuring that measures like low-emission zones or building retrofits are accompanied by social support or exemptions where needed. It was observed that a large number of cities included such analysis, mapping which groups (elderly, low-income, etc.) could face challenges and making provisions for them.

Some cities also highlight positive social outcomes of their plan: job creation, reduced energy poverty, improved public spaces, etc. *Barcelona*’s climate justice program is a flagship example, it not only identifies risks but also proactively invests in vulnerable neighbourhoods (e.g. greening projects in poorer districts, subsidies for clean energy in low-income housing). *Espoo* and *Leuven* both discuss skills development and education as part of their climate plan, aiming to empower citizens to participate in and benefit from the green transition (for example, training programs for green jobs).

2.9.4 Public Participation and Citizen Engagement

Citizen engagement is both a governance approach and a horizontal focus area. We covered governance structures for participation earlier; here we note the *activities and commitments* to engage citizens.

Many plans boast a good status quo, of citizen engagement, cities like *Guimarães* and *Ioannina* have prior experience with participatory budgeting or local climate forums, which they are building upon. The CCCs often detail planned engagement activities: *Parma* describes a rolling series of community workshops to co-design neighbourhood action plans; *Thessaloniki* mentions outreach campaigns to raise climate awareness in schools and communities.

Several plans include specific actions for citizen engagement, for example, *Florence* will host annual Climate Assemblies where residents can review progress and suggest new actions, and *Kalamata* plans hackathons and innovation challenges open to the public to generate ideas for emissions reduction.

A particularly noteworthy angle is engaging traditionally underrepresented groups. *Lisbon* and *Lyon* mention efforts to involve vulnerable or minority communities in climate dialogues, ensuring diversity of input. Some plans note current challenges like limited detail on the city’s population structure or socio-cultural barriers to engagement, and they recommend addressing these by tailoring engagement strategies to different demographics.

The overall message is that citizen engagement is widely recognized as critical, but the extent of concrete planning for it varies. A few cities lack integration of citizen engagement activities, and provided few actual methods or resources for it. However, others offered *noteworthy examples* of innovative engagement, such as participatory science projects (air quality monitoring by citizens in *Pécs*) or interactive online platforms to crowdsource ideas (in *Espoo*).

2.9.5 Energy Communities and Empowerment

A specific cross-cutting initiative present in many CCCs is the promotion of energy communities and cooperative renewable energy projects. This sits at the nexus of social, economic, and technical innovation. Cities like *Parma* explicitly mention actions to support the creation of local energy communities, groups of residents or businesses jointly investing in solar panels or wind turbines and sharing the benefits. *Kozani* and *Kalamata* (both in Greece) have plans to create energy communities especially to tackle energy poverty (e.g. installing PV on community buildings to reduce bills for low-income households). *Leuven*’s strategy also addresses energy communities as part of its stakeholder empowerment approach.

Energy communities are seen as a way to democratize the energy transition and engage citizens directly in climate action. Many plans that include this concept treat it as both a mitigation measure (deploying more renewables) and a social measure (building local capacity and buy-in).

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Further development of this horizontal aspect in implementation is expected, as supportive EU/national policies (like the Renewable Energy Communities framework) are leveraged by cities.

2.9.6 Integration of Adaptation and Resilience

While the primary focus of CCCs is mitigation, most Window 2 cities do mention climate adaptation to some extent, ensuring their plans acknowledge resilience. Some cities actually **integrate adaptation strongly** into their strategy: *Seville* describes adaptation as a key principle of its plan, creating synergies between emissions cuts and building resilience (for example, urban greening actions simultaneously absorb CO_2 and reduce urban heat). *Marseille* emphasizes combining adaptation with mitigation in its coastal flooding management and blue-green infrastructure projects. *Pécs* explicitly states it is creating synergies with adaptation efforts, such as enhancing green spaces to both sequester carbon and cool the city.

These examples show a holistic approach, but not all plans give adaptation equal weight. A few treat it only briefly or in separate documents. The Mission requirement is primarily about neutrality, but it encourages integrated climate action; hence it was recommended that even those who only briefly mentioned adaptation should deepen this in future revisions.

One observed best practice was when cities include flexibility and robustness in their pathways, meaning they plan for uncertainties (like slower technology uptake or more extreme weather) and incorporate periodic reviews to adjust actions. This adaptive management mindset is part of resilience thinking and was evident in some plans' horizontal considerations (e.g. *Tampere* and *Lahti* discussing how they will update actions as conditions change).

2.9.7 Co-benefits Monitoring

Some cities are also developing indicators to monitor these cross-cutting aspects, such as social co-benefits, health outcomes, etc. *Barcelona* will track an indicator on equitable access to climate refuge spaces (as mentioned). *Malmö* is considering metrics for green jobs created. *Lisbon*'s monitoring framework includes indicators for air quality improvement and mobility equity (like % of population near public transit). This integration of horizontal outcomes into the monitoring shows a maturation of approach from purely GHG-focused to multi-dimensional impact focused.

2.9.8 Summary, key strengths and recommendations

Horizontal topics are well recognized in the Window 2 CCCs; digitalization, air quality, social equity, citizen engagement, and adaptation. The depth of integration varies, but the general direction is positive. Social and participation aspects are particularly strong, reflecting the Mission's emphasis on a people-centred transition. Cities should continue to strengthen these horizontal linkages, as they are key to ensuring the climate transition is not only environmentally effective but also socially beneficial and broadly supported.

2.9.8.1 Strengths

Window 2 cities show increasing awareness of horizontal and cross-cutting themes, with some plans effectively integrating social equity, health co-benefits, and innovation into their climate strategies.

One prominent strength is the emphasis on social aspects and just transition principles. Nearly every city acknowledges the importance of a fair transition, and some go beyond commitments to principles to analysis. For example, *Limassol's* plan was noted for setting the basis for social issues

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analysis, and indeed it contains an assessment of how climate actions might impact different social groups (e.g. identifying vulnerable communities and ensuring they benefit from new projects).

Some cities explicitly considered vulnerable groups in its horizontal topics: indicating that improvements in air quality from climate measures would particularly aid sensitive populations (like children, elderly, neighbourhoods with high pollution). These examples show a tangible integration of equity considerations. Additionally, some cities have included public health and air quality co-benefits in their reasoning. Reducing emissions often improves local air quality, and cities like *Kozani* and *Thessaloniki* (with heavy industry or traffic) mention how their climate actions align with improving air quality standards, thus protecting citizens' health, an important narrative linking climate and immediate local benefits.

Digitalization and smart solutions feature in climate plans. For example, *Espoo* and *Barcelona* list actions leveraging digital tech, from smart grids and data platforms for energy management to intelligent traffic systems and digital public engagement tools. These might include, for example, pilot projects on smart street lighting or using big data to optimize public transport, showing that climate neutrality efforts are being coupled with a broader smart city vision. Smart city and digital innovation can act as enablers (for efficiency, monitoring, citizen participation).

Air Quality specifically is often treated as both a co-benefit and a parallel goal. Some plans have dedicated sub-sections on air quality, reflecting an integrated approach. Where climate actions (like reducing car traffic or shifting from wood heating to clean heating) will yield cleaner air, cities have started to measure and communicate that. This integrated monitoring of GHG and air pollutants is a best practice that others could emulate, as it builds a compelling case for climate actions (immediate health benefits).

Some plans also pay attention to economic and labour aspects, e.g. green jobs creation, workforce retraining for new industries (especially in cities transitioning from fossil fuel-based industries). It is a strength when a city anticipates economic shifts and justice considerations and addresses them in the plan.

Education and capacity building emerge as horizontal measures in some CCCs. Recognizing that technology and infrastructure alone won't achieve neutrality, cities like *Kalamata* and *Leuven* include awareness campaigns, school education programs, or training workshops as part of their strategy. These social-oriented actions can change behaviour and build long-term support for climate policies, representing an important horizontal thread.

The strongest plans are those that integrate climate action with social equity, public health, innovation, and education. They present climate neutrality not as an isolated technical task, but as a catalyst for wider improvements, cleaner air, better quality of life, inclusion of all citizens, and modernization through technology. This not only helps ensure no one is left behind but also can broaden public and political support for the climate agenda.

2.9.8.2 Challenges and Recommendations

Despite clear intentions, many cities' plans still underutilize or insufficiently detail horizontal co-benefits and enabling themes, leaving some opportunities on the table. One gap is in digitalization and smart solutions: roughly 16 cities (~70%) provided little to no detail on how digital technology will support their climate efforts. In fact, several plans did not mention digitalization at all. This suggests that many cities have yet to integrate their smart city strategies with their climate strategies.

- **Recommendation:** Cities should explore and articulate how digital tools can enhance climate action, even if in small ways at first, for example, using data platforms to track emissions or involving citizens through digital apps in climate pledges. Including some concrete digital pilot projects or partnerships (with tech companies or universities) in the plan can bring innovation into the mission and improve efficiency of measures (e.g. smart energy management).

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Another common challenge is the shallow treatment of social equity and just transition in many plans. While nearly all mention it as a principle, about 8 cities (~35%) did not go beyond broad statements. They do not identify specific social risks or mitigation measures (e.g. ensuring affordability of solutions, or targeting low-income neighbourhoods for certain programs first). Also, only a minority considered any *potential negative impacts* of climate actions (like economic costs, displacement, etc.).

- **Recommendation:** Cities need to conduct a basic social impact assessment of their climate plan, identifying who might be adversely affected and propose measures to address these (like subsidies, phased implementation, etc.). They should also specify how vulnerable or marginalized groups will be actively included in the transition, not just protected from harm. This could mean dedicating a portion of climate investments to low-income housing upgrades or creating green job training for displaced workers, depending on local context.

Air quality and health co-benefits are another area often underdeveloped. While some cities integrated them, an estimated 10 cities (~43%) either failed to mention local environmental co-benefits or provided no indicators/monitoring for them. Notably, some plans had no air quality indicators even if the city suffers pollution.

- **Recommendation:** Every city with climate actions that affect combustion (transport, heating, industry) should include at least one air quality indicator or goal (e.g. reduction in NO_2 or particulate matter by 2030). This ensures that policies maximize win-wins (like zero-emission zones improving air quality) and helps communicate immediate benefits to residents. Partnerships with public health departments or environmental agencies can be formed to strengthen this aspect.

Also, climate adaptation and resilience, though technically beyond mitigation scope, could be briefly linked, only a couple of plans touched on adaptation or how climate actions also increase resilience (like greening helps against heatwaves).

- **Recommendation**: Even if not in detail, acknowledging synergies with adaptation measures where relevant, would create a more holistic approach to development.

Additionally, behaviour change and cultural shifts are horizontal elements that got limited attention. Cities focus on infrastructure and tech, but influencing lifestyles (energy saving, modal shift to walking/cycling, consumption habits) is critical and requires soft measures, education, nudges, community initiatives. Many plans mention public awareness but in a token way.

- **Recommendation:** Incorporate a set of soft measures aimed at behaviour change, with some detail, for example, campaigns, school programs, participatory challenges (like a city-wide carbon footprint reduction challenge). These can be low-cost and engage the public actively, filling gaps that technology alone cannot.

Lastly, a number of plans treat horizontal topics as add-ons rather than woven through actions. For example, digital or social aspects might appear in a separate section but not in the sectoral action lists. This disconnection can lead to these themes being sidelined in implementation.

- **Recommendation:** Ensure that horizontal priorities are embedded in sectoral actions. If inclusive mobility is a goal, the transport actions should explicitly address accessibility and affordability. If digital innovation is a goal, specify digital components in energy or governance actions (like energy management systems, data transparency portals). Essentially, make horizontal topics truly cross-cutting by integrating them into the main action plan, rather than isolating them.

To summarize, while awareness of horizontal issues exists, execution is underdeveloped. By detailing how they will leverage digital solutions, maximize co-benefits (health, equity), and foster societal buy-in, cities can greatly strengthen their CCCs. These aspects often make or break public support and can accelerate implementation if done well. Embracing a people-centred and innovation-driven approach is not a distraction from emissions reduction, it is an enabler of it. The Mission should

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continue to encourage and support cities in fleshing out these dimensions, as they are key to a successful and sustainable transition.

Table 8 - Common gaps in Horizontal Topics integration.

Horizontal Topic Gap	Cities (#)	Cities (%)
Digitalisation aspects absent or very minimal	16	70%
Limited consideration of social equity/just transition beyond general statements	8	35%
Lack of integration of health co-benefits (air quality improvements not measured or emphasized)	10	43%

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3 Investment Planning and Finance

Overview: Investment Planning

- **Total Investment Needs:** For context, total needs ranged from tens of millions (~€40M) to billions. Many mid-sizes around €200–€500M. There's huge variation based on local context (existing infrastructure, ambition level, cost assumptions).
- **Identified Funding Sources:** Most plans list broad categories of funding: municipal budget, national funds, EU funds, private sector, sometimes climate-specific sources (carbon pricing revenues if available, etc.). But the detail level varies:
    - *Detailed breakdown:* some cities gives % or amount by source, Ioannina quantifies secured vs unsecured.
    - *Generic:* e.g. some just say "will use public-private partnerships, seek grants" without numbers.
- **Secured Funding:** About half the cities list some already secured funding (like approved grants or budget allocations). Others are at early stages with nothing concrete yet beyond city's existing climate budget.
- **EU and National Support:** All cities rely on significant national/EU support: e.g. Greek cities depend on Greece's Recovery Fund for big projects, Italian cities on PNRR (Recovery Plan) funds, indeed many of their tram/renewables projects got PNRR funding already. Finnish cities use state grants and try for EU Horizon. The plans often include a table of relevant funding programs they will tap.
- **Private Sector Role:** Many plans anticipate large private investments (especially in building retrofits, as those are mostly privately owned). Some quantify this (e.g. "€300M from private building owners by 2030"). Strategies to encourage it include regulations (energy performance standards), incentives (subsidies, tax breaks), or facilitation (one-stop shops). Only a few truly innovative financing instruments are mentioned (green bonds by a couple cities, ESCO models in some). This is an area where further development is needed; a common recommendation is to explore more creative financing and engage local banks, etc.
- **Risk and Uncertainties:** Few plans deeply delve into risks. However, most at least acknowledge that securing the full amount is challenging and that the plan might be adjusted based on actual funding (implicitly an iterative approach for CIP too). More formal risk mitigation like prioritizing no-regret investments, phasing projects depending on funds, or identifying alternative scenarios (Plan A with full funds, Plan B with limited funds) is generally not present, could be an improvement point.
- **Governance of Finance:** Some highlight establishing governance for finance (like climate finance unit, working group with finance dept.). E.g. Helsinki (window1) created a climate budget, others like Malmö are doing green budgeting which mainstreams climate into city budget. Some mention involving external investors early (e.g. Lyon convening local banks, Leuven engaging its cooperative bank). But many plans did not detail governance of implementing the CIP, an area to strengthen (who will coordinate fundraising, track spending, etc., beyond just monitoring outputs).
- **Alignment with City Budgeting:** A positive trend is a few cities aligning the CIP with regular city budgeting cycles and capital investment plans. E.g. Florence ties it with its three-year public works plan; Espoo uses its annual budget to incrementally allocate climate spending.

This ensures climate priorities are embedded in normal financial planning. Not all do this explicitly, some treat CIP as a separate wish list. Integration here is recommended to ensure practicality.

- **External Support Needs:** Many of the smaller cities explicitly state they need technical assistance to refine investable projects and prepare funding applications. The Mission platform's investment matchmaking service is clearly going to be crucial for them.

3.1 Overview of CIPs

Window 2 cities prepared a Climate Investment Plan (CIP) or equivalent financial chapter as part of its CCC, outlining the estimated investments needed to reach climate neutrality and how they intend to mobilize those funds. The quality and detail of these investment plans vary, but there is a general improvement in transparency compared to earlier efforts.

Many cities present a total investment cost figure for 2022–2030 (often in the order of several hundred million to several billion euros, depending on city size and ambition). They also break this down by sector or action area. For example, *Guimarães*' investment plan includes a comprehensive overview of funding needs per sector (transport, energy, etc.) and even reports some financial indicators like investment per ton of CO_2 reduced. This shows a clear linkage between the action portfolio and financing.

In general, transparency has improved; about half the plans explicitly list assumptions about costs and funding sources, which is crucial for credibility.

Some CIPs stand out for being clear, comprehensive, and strategic. *Malmö*'s investment plan was clear and comprehensive, it transparently outlines the capital required and matches it to potential streams, and it embeds the investment plan in a broader financial strategy including green budgeting for the city. *Lahti* presents a detailed financial and climate policy framework, effectively aligning its investment needs with its city financial planning cycles and identifying policy measures (regulations, incentives) that will facilitate investment. *Limassol* and *Lisbon* both have dedicated sections on financing innovation, discussing, for example, the use of Energy Performance Contracting or revolving funds to attract private capital for energy efficiency.

A common strength in the better CIPs is the identification of governance mechanisms for finance: A notable example of this is *Leuven, which has* created a "Climate Finance Steering Group" to oversee fund mobilization and to engage banks and investors; *Tampere* set up a one-stop shop within the city administration to help coordinate funding applications and partnerships. This indicates a proactive approach to investment, rather than a passive hope for money to appear.

Another strength is when cities connect their CIP to economic co-benefits and just transition. *Lyon* and *Barcelona* analyse the economic returns of climate investments, highlighting job creation potential and cost savings (using tools like cost-benefit analysis in NZC EM). They use this to build the case for funding, e.g. showing that many measures pay off over time via energy savings or health benefits. This can attract broader political and societal support for the investments.

Despite improvements, many investment plans remain high-level or incomplete. A frequent issue is the lack of detail on specific funding instruments or sources for large portions of the required investment. Some plans list the total funding needed but details of private investment funding are missing, or the capital plan is lacking clear or actionable steps on how to raise it.

This points to a need for more granular investment planning. Cities should ideally develop portfolios with a pipeline of projects and engage with financiers early. Another challenge is ambitious

targets without financial realism. Some investment targets seem too optimistic or assume funding that is not yet probable.

Risk assessment in financial aspects is also often missing or underdeveloped. Only a few plans discuss the risks to their investment plan (e.g. risk of economic downturn, interest rate changes, lower investor interest) and strategies to mitigate them. Recognizing this, recommendations have been made for cities to assess and mitigate risks related to their investment plan, whether through diversifying funding sources, setting up contingency funds, or policy measures to de-risk private investment. *Leuven* and *Espoo* highlight the need for guarantees or insurance for certain innovative projects, but this is not common.

3.2 Capacity and Skills for Finance

Several smaller or less financially strong cities indicate that limited capacity and experience in complex financing is a barrier. They often rely on external support for developing their CIP (some had consultant help via NZC Platform for the economic model). Some cities note they have traditionally relied on public grants and have lower experience with private financing or novel instruments, which might hinder reaching 100% funding.

Recognizing this, some plans have actions for *enhancing risk management and capacity-building strategies* in the financial domain. This includes training city staff in project finance, hiring financial experts, or partnering with institutions like national investment banks. *Turku* and *Malmö* are using green bonds as a way to build experience and tap capital markets for climate projects, which is an interesting approach that others might emulate.

3.3 Funding Sources and Secured Investments

Cities are pursuing a mix of funding sources: municipal budgets, national funds, EU funds (e.g. structural funds, Recovery and Resilience Facility), private sector investment, and innovative instruments (green bonds, public-private partnerships, etc.).

A positive finding is that some cities have already managed to secure a significant portion of the needed funds. For example, *Ioannina* has about 28% of its overall CCC investment budget already covered by identified and committed funding at the time of submission. This includes allocations from national recovery funds and some EU programs. *Turku* even notes that most of the funding for its planned actions is either secured or very concretely planned (through municipal and national sources as well as private commitments). These cases provide confidence that the plans are not just wish-lists but have real financial backing.

Many other cities have partial funding in place for early actions (like specific EU project grants or existing city programs) and are actively seeking additional funds for the rest. The investment plans often include source breakdowns (i.e. % from city budget, % from private sector, % from EU/national). *Espoo's* plan is particularly clear, with a table attributing each major investment need to potential sources (city, state, companies, etc.), and it highlights that a large share of funding is anticipated from the private sector for certain items (like building retrofits by homeowners).

3.4 Leveraging EU and National Funds

A strong theme is that cities are looking toward **EU funds and national recovery funds** as major sources. Many plans explicitly mention programs like the EU Recovery and Resilience Facility (RRF), Horizon Europe, LIFE, cohesion funds, and national green funds. For example, *Seville* is aligning several actions with Spain's national recovery plan to get co-funding. *Espoo* and *Tampere* anticipate

significant grants or loans via EU's Innovation Fund or EIB loans respectively. While this is logical, it also means competition and uncertainty, not all applications may succeed. Therefore, cities are advised to have backup financing options or phasing of projects if expected grants don't come through.

3.5 Private Sector Engagement

The degree of private sector investment in the plans varies. Some cities foresee a large portion being private (especially for things like building retrofits, EV uptake, renewable installations on private property). The plans that excel detail how they will stimulate or facilitate this, e.g. through public-private partnerships, incentives, regulations, or co-investment platforms. *Limassol* has a concept of a local Climate Investment Accelerator to encourage businesses to invest in green projects. *Barcelona* mentions involving citizen co-financing for solar projects (like community bonds). These creative models are not widespread but are included in some plans. Conversely, other cities more or less assume the private sector will invest on its own given the right conditions, without detailing the mechanism. That may be optimistic. To improve, cities should actively engage local industries, utilities, and banks to secure commitments or at least interest in investing in the CCC actions.

3.6 Monitoring of Investment Plan

Monitoring the CIP is as important as monitoring the CAP. A number of plans commit to tracking the financing, for example, *Guimarães* will monitor annually how much of the needed investment has been allocated or spent. *Malmö* presents economic indicators as part of its MEL framework, which is commendable. Such practices will help ensure the money side is not overlooked in implementation.

3.7 Summary, key strengths and recommendations

Investment Planning in the Window 2 CCCs has advanced, with some cities providing very clear and robust financial roadmaps and others still at a sketchier level. The key strengths include improved transparency, identification of diverse funding sources, and in a few cases early securing of funds. Key challenges to address are the need for more detail on funding mechanisms (especially for gaps in financing), capacity building for innovative finance, and concrete risk mitigation strategies.

The iterative nature of CCCs will allow them to refine their CIPs as more information and funds come in. Given the scale of investment required (often billions of euros per city), continued support from national/EU levels and knowledge-sharing of best financial practices (such as what models worked in other cities) will be vital.

3.7.1 Strengths

Cities' Climate-Neutrality Investment Plans (CIPs) reveal substantial effort to estimate the funding needs for 2030 and, in some cases, show creative strategies to mobilize resources. A key strength is that most Window 2 cities have quantified the scale of investment required to achieve their climate targets, often running into billions of euros, and have at least a rough breakdown by sector or action area. This quantification is an important first step in investment planning, as it gives all stakeholders a sense of the challenge size. For example, Lyon's CIP clearly lays out the total required investment for building retrofits, clean mobility, renewable energy, etc., over 2023–2030, indicating where the big funding gaps lie.

Some cities' CIPs stand out for their level of detail and structure. *Turku*, for example, structured its Investment Plan by sources of financing, listing expected contributions from municipal funds, national funds, EU funds, private sector, and innovative instruments, which demonstrates an advanced understanding of financing streams. A few cities provide project pipelines or portfolios in their CIPs, meaning they list specific projects or programs (like a tram line extension, a wind farm, a district heating upgrade) along with cost estimates. This project-based view (as done by e.g. *Heidelberg* and *Espoo*) helps to make the investment plan tangible and can be more easily used to approach investors or budget authorities.

Another strength is the identification of funding sources and instruments. Many plans mention utilizing a mix of grants, loans, public-private partnerships, and new financing models. For example, *Lisbon* discusses green bonds as a potential tool to finance part of its plan, and *Parma* considers establishing an energy efficiency revolving fund. Such innovative financing ideas, though preliminary, show that cities are thinking beyond relying solely on government budgets. The engagement of private investment is explicitly recognized in numerous plans; some cities estimate what portion of the needed funding is expected to come from private sector (households, businesses). A strong approach is when a city outlines how it will attract private investment, for example, *Florence* plans to create an "investment forum" to bring together investors and project owners, bridging the gap between them.

There are also cases of aligning the CIP with existing funding frameworks: many cities leverage national recovery plans, EU Structural Funds, or other ongoing programs. For example, *Kalamata* links its investment needs to Greece's national recovery fund programs for green transition, essentially tagging some CCC actions to already-funded streams. This alignment is a strength because it grounds the CIP in realistic funding opportunities rather than starting from scratch.

A notable highlight in some plans is the attention to governance of the investment plan, i.e. how the city will manage and implement financing. Clear governance/integration was mentioned as a strength for one city's CIP, suggesting they had structured oversight (perhaps a dedicated investment unit or multi-stakeholder committee) to ensure funds are mobilized and used effectively under the CCC. Additionally, one city (as indicated by coding) emphasized its commitment to sustainable finance principles within its jurisdiction, meaning it aims for investments to be not only climate-friendly but also aligned with ESG criteria (this could attract certain institutional investors).

Lastly, some CIPs show transparency and realism: they openly acknowledge funding gaps and uncertainties. Acknowledging gaps invites collaboration and creative thinking to close them. A few cities also include sensitivity analyses (how investment needs might change with different scenarios) or consider the economic benefits (like jobs created) of the investments, making a more compelling case.

Overall, the strengths of these investment plans lie in clear quantification, identification of diverse funding sources, and initial frameworks for mobilization and oversight, indicating that cities are treating financing as an integral part of the climate strategy.

3.7.2 Challenges and Recommendations

Investment planning is inherently challenging for cities, and accordingly, many CIPs in this cohort have significant gaps or areas of uncertainty. A major challenge is that numerous cities lack detail on how exactly the required investments will be financed, especially regarding private sector contributions. While most provide totals, about 18 cities (~78%) do not break down those totals into confirmed or highly likely sources vs. still unsecured amounts. For example, a city might say "€2 billion needed for mobility" but not indicate where that €2 billion might realistically come from (city budget, national grants, private investors, etc.).

- **Recommendation:** It is crucial for cities to refine their financing strategy by distinguishing between funding that is *already secured or very likely* (e.g. allocated in municipal budget or

committed by a known program) and funding that is *aspirational*. Identifying gaps explicitly allows targeted efforts to fill them (such as developing bankable project proposals to attract investors or lobbying for more national support).

Assumptions in the CIP are often not clearly explained. Some cities may assume, for example, that a certain percentage of homeowners will invest in retrofits (thus counting that as private investment) or that electricity grid upgrades will be handled by the utility (private funds), but they don't state these assumptions. This can make the investment plan seem optimistic without basis.

- **Recommendation:** Make assumptions explicit and base them on evidence or analogies (e.g., "assuming 30% of homeowners participate in subsidy program, based on past uptake rates"). If assumptions are ambitious, consider adjusting to more conservative levels or detailing what policies will drive that ambition (for example, mandatory standards could force more private investment, but if not mentioned, expecting 100% voluntary uptake is risky).

Another pervasive issue is the lack of detailed project pipelines or prioritization within the investment plan. Many CIPs are essentially aggregate numbers by sector, without listing which projects or measures the money would go into. About 15 cities (~65%) do not include a list of priority investment projects. Without this, the plan can seem like an abstract financial need rather than a concrete plan of action.

- **Recommendation:** Develop a pipeline of priority projects (even if indicative) that corresponds to the actions in the CAP. This could be, for example: "Retrofit 5,000 homes (€100M), Install 50 MW of solar PV (€40M), Expand tram line (€300M)," etc. Each should have an estimated cost and a likely funding source mix. Not only does this make the investment plan more actionable, it is also much more appealing to potential financiers who need to see specific opportunities.

Private sector engagement needs further development. While cities hope for private investment, few have outlined how they will incentivize or attract it. Only a handful mention specific mechanisms (like third-party financing, ESCO models, public-private partnerships). Many just assume "the market" will invest if the city sets targets.

- **Recommendation:** Outline concrete mechanisms to mobilize private capital, such as setting up public-private partnerships for renewable energy projects, providing guarantees or co-funding to de-risk private investment, creating green investment platforms, or implementing regulations that encourage private spending (like requiring landlords to meet efficiency standards, thereby forcing investment). If help is needed to design these, the Mission or national programs could assist, but the city should signal which approaches it plans to pursue.

In terms of municipal finance, some cities did not discuss their own budget or borrowing capacity. This is a delicate topic, but important: can the city reallocate funds, issue green bonds, or take loans for climate projects? A few did (strength), but many avoided stating what the city's contribution would be.

- **Recommendation:** Be transparent about the city's financial commitment, for example, "City will allocate 5% of its annual budget (~€X million/year) to climate neutrality projects, and seek to leverage 4x that amount from external sources." If debt or bonds are planned, mention the intent (some cities may issue green bonds or seek EIB loans, if so, include that plan).

Integration with the Action Plan appears weak in some cases. In a couple of cities, the actions listed in the CAP don't have corresponding budget lines in the CIP, implying a disconnect. Or the CIP includes things outside the CAP scope (like large infrastructure projects that weren't in the CAP actions). This could confuse implementation, where do priorities lie?

- **Recommendation**: Ensure the Investment Plan is clearly linked to the Action Plan, funding the actions needed for neutrality. If there are items in the CIP not in CAP (or vice versa),

reconcile them or explain why (maybe the CIP covers additional sustainability measures like climate adaptation, if so, say that). A harmonized CAP-CIP makes for a coherent story.

Finally, many CIPs lack consideration of operational funding and human resources. They focus on capital investments (infrastructure, equipment) but not on the costs of program administration, education campaigns, maintenance, etc., which can be substantial. Also, issues like revenue mechanisms or cost savings (the economic returns) are generally not covered.

- **Recommendation:** Consider including qualitative or quantitative notes on operational costs and how they will be covered (e.g. through savings, new revenue tools like congestion charges or energy savings that pay back). Also highlight co-benefits in economic terms, if possible (like jobs created per million invested), as that strengthens the case for funding in political discussions.

Table 9 - Common challenges in Climate-Neutrality Investment Plans.

Investment Plan Challenge	Cities (#)	Cities (%)
Insufficient detail on funding sources (unclear where money will come from, especially for private sector share)	18	78%
Investment plan is generic/aggregated (lacks specific project pipeline or prioritization of investments)	15	65%
Over-optimistic or unsupported financing assumptions (e.g. very high leverage or reliance on uncertain funds)	5	22%

In conclusion, the Investment Plans often identify the funds needed, but lack detail on strategies to secure funding. As cities move from planning to implementation, sharpening the investment strategy will be vital. They may need support from financial advisors or national programs, but they should start by refining their own plans with more clarity, realism, and creativity in financing. The success of many actions will hinge on timely funding; thus, making the CIP credible and actionable is as important as the technical solutions themselves.

Conclusion

The second cohort of EU Mission Cities (23 cities awarded Mission Labels in early 2024) **has demonstrated commendable commitment and emerging best practices in their Climate City Contracts**. All these cities have set the bold goal of net-zero emissions by 2030, generally aligning their local plans with national and EU policy frameworks. In many respects, they are pioneers of a mission-oriented approach to urban decarbonization, their efforts will shape the narrative of whether this model can deliver transformative change on the ground. Notable strengths include a comprehensive scope (most plans now cover all major emission sources) and a strong emphasis on stakeholder and citizen engagement. Many plans explicitly link climate action to co-benefits such as just transition, public health improvements, and innovation-driven growth. These elements, once peripheral, are becoming mainstream, indicating a maturation of urban climate strategy. They reflect the spirit of the EU Cities Mission, which promotes cross-sector innovation and inclusive, participatory governance as means to accelerate sustainability transitions (European Commission, 2020; Wiarda et al., 2024).

However, translating this ambition into actionable pathways remains a significant challenge. Across the cohort, the most common gaps relate to implementation readiness. Many Climate City Contracts lack granular details on achieving the 2030 targets, such as emissions baselines and projections, concrete project details, timelines, responsibilities, and comprehensive financing strategies. Similarly, monitoring and evaluation frameworks are nascent, complicating progress tracking and strategy adjustments. Such gaps, if unaddressed, could impede successful implementation. This challenge mirrors known difficulties in mission-oriented innovation efforts, where ambitious goals often outpace detailed execution plans (Wanzenböck et al., 2020). Crucially, effective governance structures (e.g., dedicated cross-departmental teams, stakeholder councils) appear instrumental in addressing these challenges, underscoring that governance is central to mission-oriented transitions (Wiarda et al., 2024).

The analysis of this cohort and this trend report identifies several key areas for further advancing the implementation of window 2 CCCs:

i. **Clarify and expand emissions quantification** by strengthening inventories and explicitly linking actions to emission outcomes.

ii. **Enrich and prioritize action portfolios** with detailed, transformative projects, clear timelines, and assigned responsibilities.

iii. **Integrate cross-cutting themes** such as digital innovation, social equity, and public health co-benefits operationally rather than aspirational.

iv. **Strengthen governance and stakeholder engagement** through robust institutional structures and inclusive processes.

v. **Establish rigorous monitoring frameworks** with clear indicators, qualitative and quantitative data collection systems, and regular progress reviews.

vi. **Detail investment plans and financing mechanisms**, bridging ambition and resources through clearly identified funding sources and partnerships.

These recommendations, achievable through capacity-building, technical assistance, and inter-city knowledge sharing, provide a clear roadmap for strengthening CCC implementation. Leveraging collective solutions and peer learning opportunities will be critical for addressing common challenges effectively.

Looking ahead, iterative refinement of CCCs is anticipated. Throughout 2025–2026, cities will continue to enhance their plans with implementation insights. This trend report helps identify common themes for improvements, reflecting the EU Mission's emphasis on learning and flexibility. Continuous monitoring and targeted support will be crucial for refining these plans further.

Ultimately, the success of these cities is pivotal for the EU Cities Mission as a whole. Their experiences will provide valuable lessons for the broader community of European cities and policymakers. By actively engaging in peer exchanges and implementing the recommendations outlined here, cities can enhance their CCCs and significantly advance their climate neutrality ambitions. Continued support from national governments, the EU, and initiatives like NetZeroCities will be essential, alongside responsive and adaptive governance frameworks. The experiences of this cohort underscore the feasibility of rapid and just urban decarbonization, despite inherent complexities (Mazzucato, 2018; Schot & Steinmueller, 2018; Wiarda et al., 2024).

In conclusion, the Window 2 cohort exemplifies both the promise and challenges of mission-driven climate action. Their progress in the coming years will inform effective strategies for coordinating multi-level efforts, balancing visionary goals with practical planning, and maintaining momentum. With strengthened plans, adaptive governance, and robust partnerships, these cities are poised to make significant strides toward their 2030 climate-neutral visions, contributing substantially to Europe's overarching climate objectives and inspiring global urban sustainability transitions.

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