Evaluation Report for Large Pilots

Deliverable D2.13

Authors: Ciarán O'Sullivan, Hans-Martin Neumann, Ghazal Etminan (Austrian Institute of Technology)

Co-Authors: Anahi Montalvo-Rojo, Lena Neumayer, Lucia Cvitanic (Austrian Institute of Technology), Mikko Virtanen, Mari Hukkalainen, Aapo Huovila (VTT Technical Research Centre of Finland)

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Abbreviations and acronyms

Acronym	Description
PCP	Pilot Cities Programme
KPI	Key Performance Indicator
NZC	NetZeroCities
GHG Indicators	Greenhouse Gas
MEL	Monitoring, Evaluation and Learning
SECAP	Sustainable Energy Climate Action Plan
CoM	Covenant of Mayors
IPMVP	International Performance Measurement and Verification Protocol
DIP	District Investment Platform
OKR	Objectives and Key Results
RECs	Renewable Energy Communities

Summary

This deliverable (D2.13) evaluates six large pilot projects implemented within the NetZeroCities (NZC) Pilot Cities Programme, spanning 30 cities across Europe and a combined population of over 37 million. The pilots applied diverse strategies—including masterplans, financing toolkits, modular project structures, urban regeneration, and systemic retrofitting—while aligning with the PCP Indicator Framework to track greenhouse gas (GHG) reductions, co-benefits, and governance impacts.

The analysis highlights significant achievements, such as the development of transferable governance and financing models, enhanced citizen engagement, and measurable contributions to energy efficiency and emissions reduction. Best practices, including the Budapest NetZero Masterplan, the Dutch Financing Toolbox, and Istanbul's modular project structure, stand out as replicable models for other cities.

At the same time, the evaluation reveals persistent challenges, particularly inconsistent monitoring methods, gaps in baseline data, and reliance on estimated rather than measured impacts, all of which limit comparability and reduce robustness. Addressing these issues will require more harmonised monitoring frameworks, systematic use of baselines, clearer guidance on indicator selection, and stronger capacity building.

Overall, the findings confirm that systemic urban transformation requires more than technical solutions: inclusive governance, citizen trust, innovative financing, and collaborative learning are essential. By embedding these lessons, the PCP strengthens its role as a foundation for scaling climate-neutral action across Europe and positioning cities at the heart of the transition to net zero.

Keywords

Pilot Cities Programme (PCP); Climate Neutrality; Greenhouse Gas (GHG) Reductions; Monitoring and Evaluation; Baseline Data; Urban Regeneration; Innovative Financing; Governance Innovation; Citizen Engagement; Best Practices; Replication and Scaling; Systemic Urban Transformation.

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1 Introduction

This document presents an evaluation of six large-scale pilot projects implemented within the NetZeroCities (NZC) project. These pilots took place in diverse contexts across Europe, including Italy, Spain, Hungary, Poland, the Netherlands, and Türkiye, covering a total of 30 cities and a combined population of 37,199,374. They represent the largest initiatives within the Pilot Cities Programme (PCP) and therefore provide a valuable sample for assessing impacts, replication potential, and lessons learned. Four of the pilots (Italy, Spain, the Netherlands, and Poland) were multi-city projects, offering additional insights into cross-city collaboration and scaling dynamics. Below you will find a complete list of cities involved in these multi city projects:

- Italy: Bergamo, Bologna, Florence, Milan, Padua, Parma, Prato, Rome, Turin
- Spain: Barcelona, Madrid, Sevilla, Valencia, Valladolid, Vitoria-Gasteiz, Zaragoza.
- Poland: Krakow, Lodz, Wroclaw, Warszawa, Rzeszów
- Netherlands: Hague, Amsterdam, Rotterdam, Utrecht, Groningen, Eindhoven, Helmond.

The pilots were designed to accelerate the transition toward climate neutrality through locally adapted strategies, innovative governance models, and targeted interventions across key sectors such as housing, energy, and urban regeneration. Each project applied objectives aligned with the PCP Indicator Framework (Neumann et al., 2025), with Key Performance Indicators (KPIs) covering direct impacts such as energy consumption and GHG reductions, co-benefits such as social inclusion and health, and process indicators on governance and citizen engagement. This ensured that the evaluation captured both environmental outcomes and the broader systemic changes needed to achieve climate neutrality.

To support comparability, a consistent analytical framework was applied, focusing on project context, GHG indicators, co-benefits, and methodologies. Flexibility was maintained through the use of custom indicators, allowing cities to capture context-specific impacts and objectives. This report therefore aims to support peer learning, highlight best practices, and inform future policy and implementation strategies.

Beyond project-level analysis, the report also distils key lessons. These include best practices such as the Budapest NetZero Masterplan, the Dutch Financing Toolbox, and Istanbul's modular project structure, which provide transferable models for other cities. At the same time, persistent challenges, such as methodological inconsistencies, gaps in baseline data, and reliance on estimated rather than measured impacts, underscore the need for more harmonised monitoring frameworks, systematic baseline collection, and improved indicator design. Together, these findings inform recommendations for strengthening climate-neutral initiatives across Europe.

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2 Objectives of the Evaluation Process

To assess the success of pilot projects in achieving climate-neutral goals.

- Each pilot project was reviewed to determine how effectively it progressed towards its stated targets, particularly in terms of GHG emission reductions.

To identify challenges encountered and solutions applied.

- The structure of the analysis allows to capture key barriers faced during the implementation and assessment/evaluation phase. It should help to reflect on the best methodologies for evaluation and impact assessment.

To determine best practices that can be scaled and replicated.

- By comparing approaches across cities, the evaluation identifies innovative methods, governance models and technical solutions that show potential for replication in other urban contexts.

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3 Methodology

The evaluation is based on a sample of 6 projects from the PCP programme. The 6 projects assessed are the largest within the PCP programme in terms of population, a total of 37,199,374, and are therefore considered representative in terms of the objective of the evaluation. 4 of the 6 projects are multi-city projects, meaning that the total number of cities involved in this evaluation process is 30.

The evaluation is based on the application of the PCP Indicator Framework (Neumann et al., 2025) and considers both Green House Gas (GHG) indicators and Co-Benefit indicators. It should be noted that the assessment methodology applied and described in this document intended to provide a quantitative data analysis and aggregation assessment across large projects. However, this was not always feasible, due to limitations in available data and discrepancies in baseline data used. These limitations are further detailed as appropriate throughout this report. A qualitive analysis in terms of lessons learned and related recommendations is also provide herein.

GHG Indictors

The following provides and overview of the objective and method of analysis related to the GHG indicators.

- Asses the total GHG reductions per pilot project where possible.
- Assess both the use of both standardised and custom GHG indicators.
- Detail any data or methodological gaps in consideration of the each of the pilots applied the PCP Indicator Framework.
- Where possible compare each of the pilots' GHG reductions to their original GHG reductions ambition. This will allow for some commentary on achievements and lessons learned.
- Identify which permitted NZC GHG method was used, whether: 1) Direct GHG Emission reductions 2) Estimated GHG Emission reductions 3) GHG Emissions targeted/ addressed by pilot activities. A definition of each from the PCP Indicator Reporting Template is as follows:
    - **Direct GHG Emission reductions**: These are exact and actual emission reduction achieved through the implementation of specific pilot activities within the project duration (between 2023-2025) – such as retrofit, change in energy systems, change in transport modal share etc.
    - **Estimated GHG Emission reductions:** These are estimated (or approximate) reductions in GHG emissions expected from the implementation of the pilot activities which may not happen within the project duration. This category also includes scenario models, calculated trajectories of emissions, estimates based on downscaled national or regional data and estimated reductions from the eventual scaling up of a pilot activity to a larger scale (e.g. city wide or multi-city scale). These emission reductions may result from future implementation beyond the project duration, i.e., in the short to mid-term in 2025, 2026, 2027.
    - **GHG Emissions targeted/addressed by pilot activities:** For actions that focus on creating enabling conditions (such as governance structures, capacity building, ecosystem development, citizen engagement, policy/regulation etc), you can estimate the approximate figure of emission reductions that the pilot activities might be directly or indirectly targeting (such as emissions reduction from external stakeholders, the emissions under direct influence of a municipality, expected emission reductions from change in specific behavioural trends etc.). If this estimated figure is at the city-wide scale, please use the Comments section to briefly explain how the pilot activities may logically contribute towards these future emission reductions.

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Co Benefit Indicators

The following provides and overview of the objective and method of analysis related to the Co-Benefit indicators:

- Pilot projects often selected a high number of co-benefit indicator. In order to support a valuable assessment in terms of key findings and learnings, the evaluation focuses on the co-benefit indicators the either demonstrate the highest impact achieved or offer value to the other projects in terms of insight and replication potential.
- A statistical analysis was also applied to demonstrate success stories in terms of how pilot projects achieved or put themselves on the path to achieving the climate neutral objectives.

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4 Analysis of Pilot Project Monitoring Frameworks

The following section will provide an analysis of each of the pilot's monitoring frameworks. The projects evaluated include:

- Dutch 100CNSC cities pilot
- Spanish Cities URBANEW - Multi-stakeholder innovative & systemic solutions for urban regeneration
- Budapest CARES - Climate Agency for Renovation of homES
- Italian Cities Let'sGOv - Governing the Transition through Pilot Actions
- Istanbul Build4GreenIST
- Polish Cities NEEST - NetZero Emission and Environmentally Sustainable Territories

Throughout this section and those that follow, full pilot project titles were replaced with simplified labels such as "Italian Cities" or "Polish Cities" for brevity. In general, each individual pilot assessment is presented through a standardised structure as described below. Although, this amended slightly in some case based on need.

Introduction:

- Description of the pilot scope and context.
- Pilot Ambitions.
- Short overview of planned activities and decarbonisation strategy.

GHG Indicators assessment

- Targeted standardised and custom GHG indicators.
- Description of Methodology.
- Final total GHG reduction focus on comparing original GHG reduction target vs. results.

Co-Benefit Assessment

- Stated co-benefit objectives from original proposal if available.
- Contextual explanation of the main indicators demonstrating highest achieved impact.

Summary and Lessons learned/Findings and Recommendations

- Recommendations towards achieving set targets.
- Highlights of successes, shortcomings and challenges.
- Relation to suggested improvements in monitoring methods/framework
- Evaluation of the use of Indicators,
- Scaling up successful approaches.

This consistent structure supported comparability across pilots and provides a solid foundation for identifying best practices, innovative methodologies and basis for applicable recommendations.

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4.1 Dutch Mission Cities 100CNSC

Introduction

Dutch cities are working under growing pressure to cut carbon emissions while improving the quality of life in their districts. Amsterdam, Eindhoven, Groningen, Helmond, Rotterdam, The Hague, and Utrecht all face the challenge of turning climate ambitions into concrete, financed projects. To bridge this gap, the pilot introduces District Investment Platforms (DIPs), where municipalities, companies, residents, and investors co-create joint investment plans. The aim is to reach agreement and begin implementation within the two-year program.

The ambition is to create the financial and organizational conditions for districts to achieve their 2030 climate goals (see table below for an overview of each city's neutrality targets). By developing seven district "plans of action," the pilot tests how public climate finance can leverage private and national resources while preparing for a national scale-up.

Planned activities focus on setting up investment platforms, implementing the seven district plans, and testing financing models that bundle projects into integrated solutions with multiple benefits. One example of this is combining new heating systems with sewage upgrades and green public spaces. The pilot will also make district-level financial flows visible, explore innovative financing mechanisms, and create feedback loops across cities. In this way, it builds a practical framework to accelerate investment, engage citizens, and help Dutch cities deliver on their climate goals for 2030.

Table 1: Dutch Cities Pilot city climate goals

City (Pilot)	Emission Type	Baseline (1990)	Year 2020	Targeted / projected Reductions by 2030	Reduction Compared to Baseline
Hague	GHG Emissions Targeted	2499 kt	1521 kt	0 kt	2499 kt
Amsterdam	GHG Emissions Targeted	3793 kt	3830 kt	2200 kt	1593 kt
Rotterdam	GHG Emissions Targeted	3437 kt	3088 kt	1916 kt	1521 kt
Utrecht	GHG Emissions Targeted	1524 kt	1134 kt	610 kt	914 kt
Groningen	GHG Emissions Targeted	N.A.	1112 kt	0 kt	N.A.
Eindhoven	GHG Emissions Targeted	1200 kt	1188 kt	516 kt	684 kt

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Helmond	GHG Emissions Targeted	548 kt	454 kt	0 kt	548 kt

GHG Indicators Assessment

The pilot tracks both standard and custom greenhouse gas (GHG) indicators to measure emissions reductions across the seven Dutch cities. Standard indicators cover energy use in buildings, district heating, and urban transport. Custom indicators reflect district-specific measures, like integrated energy solutions and replacing natural gas with renewable heating. The pilot aims to support each city in reaching its 2030 climate goals (see Table above).

Methodology

GHG reductions are calculated using a GHG Emissions Targeted methodology by simple means: CO_2 emissions per living equivalent are multiplied by the number of livings in each pilot district. Each city adapts this method slightly, often with help from external engineering firms. Results are reported in a standard format and compared with the national database (Regionale Klimaatmonitor – Klimaatmonitor (databank.nl)). This approach allows for district-level tracking while staying consistent with national reporting.

Results

As is illustrated in the table below, in Year 1 pilot cities Hague, Groningen and Helmond achieved a combined reduction of 579 kt CO_2. Eindhoven's GHG emissions stayed constant, while Amsterdam had an increase of 28 kt CO_2. Meanwhile, data could not be collected for Utrecht or Rotterdam. In Year 2, no data was reported.

Table 2: Dutch Cities Standard GHG reporting

City (Pilot)	Emission Type	Baseline (2022)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions by 2030	Reduction Compared to Baseline
Hague	GHG Emissions Targeted	2147 kt	1908 kt	N.A.	0 kt	239 kt
Amsterdam	GHG Emissions Targeted	980 kt	1008 kt	N.A.	2200 kt	- 28 kt
Rotterdam	GHG Emissions Targeted	5306 kt	N.A.	N.A.	1916 kt	N.A.
Utrecht	GHG Emissions Targeted	1290 kt	N.A.	N.A.	610 kt	N.A.
Groningen	GHG Emissions Targeted	1452	1191 kt	N.A.	0 kt	261 kt

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Eindhoven	GHG Emissions Targeted	1822 kt	1822 kt	N.A.	516 kt	0 kt
Helmond	GHG Emissions Targeted	437 kt	358 kt	N.A.	0 kt	79 kt

It is important to note that the CO_2 reductions targeted by the Dutch cities are intended to extend beyond the two-year duration of the pilot and align with each city's 2030 climate goals. For example, Amsterdam recorded an increase of 28 kt CO_2 from the 2022 baseline to Year 1. However, when comparing the Year 1 results in Table 2 with the 2020 data shown in Table 1, the city achieved a total reduction of 2,822 kt CO_2 between 2020 and Year 1.

Table 3: Dutch Cities Custom GHG reporting

City (Pilot)	Emission Type	Baseline (2022)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions by 2030	Reduction Compared to Baseline
Hague	GHG Emissions Targeted	N.A.	N.A.	N.A.	0 kt	N.A.
Amsterdam	GHG Emissions Targeted	N.A.	N.A.	N.A.	2200 kt	N.A.
Rotterdam	GHG Emissions Targeted	N.A.	N.A.	N.A.	1916 kt	N.A.
Utrecht	GHG Emissions Targeted	N.A.	N.A.	N.A.	610 kt	N.A.
Groningen	GHG Emissions Targeted	N.A.	N.A.	N.A.	0 kt	N.A.
Eindhoven	GHG Emissions Targeted	N.A.	N.A.	N.A.	516 kt	N.A.
Helmond	GHG Emissions Targeted	N.A.	N.A.	N.A.	0 kt	N.A.

The City of Groningen has indicated that reliable calculations of custom GHG reductions at the district level are not feasible within the scope of this pilot. Estimating emissions at the city level is already subject to significant uncertainty, and translating these calculations to the district level increases the margin of error to potentially over 50%. Additionally, it is stated that the two-year pilot timeframe is too short to

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observe net CO_2 reductions, as initial measures such as retrofits and heat grid installation temporarily generate emissions that outweigh short-term savings.

As a result, no quantified results for district-level custom GHG reductions are provided in this report. The focus instead is on establishing the framework and enabling conditions for long-term decarbonization, with meaningful reductions expected over the coming years, for example by 2030 when districts are fully gas-free.

Co-Benefit Assessment

The Dutch pilot cities faced challenges in financing and implementing district-level energy transitions, from fragmented funding streams to regulatory delays. While some outputs were still in progress at the end of the two-year pilot, the projects generated important co-benefits that went beyond the original objectives, building local capacity, practical experience, and lessons for other cities. The original proposal aimed to support replication, foster integrated solutions in districts, and address broader urban issues such as housing quality, social cohesion, and economic opportunities.

Table 4: Dutch Cities Standard Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Unit of measurement	Difference Compared to Baseline
Hague	Stakeholder and citizens engagement	0	310	500	# number of citizens and stakeholders involved	500
Groningen	Stakeholder and citizens engagement	0	3500	7700	# number of citizens and stakeholders involved	7700
Utrecht	Stakeholder and citizens engagement	0	N.A.	N.A.	# number of citizens and stakeholders involved	N.A.
Rotterdam	Stakeholder and citizens engagement	0	N.A.	N.A.	# number of citizens and stakeholders involved	2
Amsterdam	Stakeholder and citizens engagement	0	N.A.	N.A.	# number of citizens and stakeholders involved	N.A.
Eindhoven	Stakeholder and citizens engagement	0	500	1000	# number of citizens and stakeholders involved	1000

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Helmond	Stakeholder and citizens engagement	0	250	300	# number of citizens and stakeholders involved	300

The table above showcases one of the clearest co-benefit successes: citizen and stakeholder engagement. By year two, Groningen had involved more than 7,700 residents in shaping its district heating strategy, while The Hague engaged 500 and Eindhoven reached 1,000. These figures demonstrate the strength of participatory approaches such as local consultations, energy cafés, and coaching models, which not only built trust but also created the social license needed to advance complex transitions. Utrecht, Rotterdam, and Amsterdam tested similar methods, though their reporting is still in progress.

Table 5: Dutch Cites Custom Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Unit of measurement	Difference Compared to Baseline
Dutch Cities	Availability of financing	0	0	1	Availability of toolkit	1
	Availability of financing	0	17	1 7	total # of projects / user cases in development or implementation	17
	Leverage of public funding	0	0	1	Availability of toolkit	1
	Project monitoring	0	0	7	Total # of action plan be implemented	7
	Community of Practice	0	0	2	total # of follow-up projects	2

The results of the custom co-benefits can be seen in the table above. One of the most significant successes is the financing toolbox, which grew out of coaching, peer learning, and collaboration with research institutions. While the investment platform was still being developed, the toolbox captures insights on innovative financial mechanisms, governance models, and creative ways to use existing instruments. It provides a practical resource that other cities can adapt, supporting flexible replication of solutions while sparking innovation.

Another co-benefit emerged from the work on the first funded projects in each district. Most projects were still being prepared at the end of the pilot due to the complexity of business cases and regulatory requirements. Groningen made substantial progress with national support, and Utrecht developed an interactive model to visualize investment needs. These activities generated practical lessons on business case development, stakeholder engagement, and district-level planning, while also linking energy transition measures to broader urban issues.

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Finally, the pilot highlighted the value of national-level collaboration. Cities worked closely with ministries, knowledge institutions, and other programmes, creating networks and shared understanding of financing complexities and integrated district-level approaches. These collaborations provide a strong foundation for national scale-up and ensure lessons from the pilot can inform policy and practice across other cities.

Taken together, these co-benefits show that the pilot delivered more than individual project outputs. Even where activities were still underway, it generated tools, experience, and networks that will help cities advance climate neutrality and provide transferable lessons for other municipalities.

Summary and Lessons Learned

The Dutch pilots set out to test new approaches for accelerating district heating and building stronger financial and governance models for the energy transition. While not every planned output was completed within the project timeframe, the pilots generated strategic lessons that give municipalities a clearer path forward. These include the importance of phased, scalable approaches to heating grids, the need for long-term integrated planning with utilities and housing associations, and the value of basing business cases on reliable data to win the confidence of investors.

Among the major achievements were the development of practical tools such as the financing toolbox and Utrecht's interactive investment model, both of which made complex decisions more transparent and transferable. Strong citizen and stakeholder engagement was also a notable success, helping to build trust and secure support for district-level transition plans. At the same time, several shortcomings became clear. Business cases remained fragile due to fluctuating costs and legal uncertainty, while delays in national regulation, particularly the Heat Act (Wcw), slowed progress on implementation. Work with homeowners' associations also showed how difficult it can be to move from advice to concrete investment decisions without tailored support and innovative financing models.

Looking ahead, strengthening the monitoring framework will be critical. Current approaches focus heavily on intended outputs rather than measurable progress. Moving toward methods that directly capture impacts, such as reductions in CO_2 emissions, efficiency gains in financing streams, or the number of households engaged in decision-making, would give municipalities clearer benchmarks. Better use of digital tools, including visualization and smart metering, can also help cities track outcomes more precisely and link them to broader strategic policies.

The pilots made appropriate use of custom indicators, particularly around finance and governance, though clearer alignment with impact domains such as greenhouse gas emissions and energy consumption would strengthen future reporting. Importantly, the pilots demonstrate that scaling up is feasible: phased "walk-in" solutions for district heating, bundled investment portfolios, and national-level collaboration all provide pathways to replication. Municipalities are advised to advocate for structural reforms at the national level, such as longer depreciation models and a centralized investment institution, while also experimenting with local investment vehicles and blended finance models to unlock private capital. Taken together, the Dutch pilots show that while the road to climate neutrality is complex, combining technical innovation with social engagement and smarter financing offers a powerful route forward.

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4.2 URBANEW - Multi-Stakeholder Innovative & Systemic Solutions for Urban Regeneration: Spain

Introduction

The consortium of this large pilot brings together seven Spanish cities participating in the EU Mission "Climate Neutral and Smart Cities" and the CitiES 2030 group. Collectively, these seven cities (Barcelona, Madrid, Sevilla, Valencia, Valladolid, Vitoria-Gasteiz, Zaragoza) constitute 16% of the nation's total population (7,642,287 inhabitants, according to the 2021 census by the National Statistics Institute [INE]). These cities represent strategic areas in which critical challenges are to be addressed by the pilot project. The consortium is completed with collaborating entities such as CIRCE and Cesefor, both of which bring a considerable amount of experience in knowledge production, sharing and interdisciplinarity to the project.

In response to the fact that buildings account for 40% of the EU's final energy consumption—and in Spain contribute 8% of total GHG emissions, with over half the building stock predating energy efficiency standards—this pilot tackles the urgent need for systemic urban regeneration. URBANEW aims to develop, implement, and scale integrated solutions that combine community participation, technological innovation, nature-based solutions, regulatory reform, and financial instruments to accelerate the transformation toward energy-efficient buildings and climate-neutral cities.

Pilot Ambitions

Recognising that each city operates within unique institutional and cultural contexts, the pilot's overarching ambition is to create **interdisciplinary working groups** capable of co-developing transformation models rooted in a systemic, inclusive approach. In terms of GHG ambitions, the large-scale pilot aims at reducing GHG emissions from residential, commercial, public, and private buildings, improving energy efficiency and developing innovative solutions tailored to cities' needs. Specifically, the objectives are to reduce energy consumption and, consequently, greenhouse gas emissions from buildings through energy rehabilitation.

Main results include the development of innovative construction solutions and processes with high energy efficiency standards, based on the use of local sustainable and energy efficient materials. Additionally, Zaragoza and Madrid are targeting the incorporation of renewable energies in self-consumption models and energy communities.

The large-scale pilot sets out six core ambitions:

1. **Identify levers for decarbonising the built environment**, including renewable integration, through **collaborative stakeholder engagement**.
2. **Improve energy efficiency in housing and public buildings**, using **innovative, bio-based materials** and **local retrofit techniques** to reduce embodied energy.
3. **Increase social awareness** and provide **professional decision-making support** for sustainable rehabilitation, focusing on health and habitability.
4. **Expand renewable energy self-consumption** through **community energy models** and **deep training and awareness-raising** initiatives.
5. **Establish a multi-city governance model** that enables inter-city collaboration, youth engagement, and institutional coordination.
6. **Develop innovative financing models** targeting vulnerable families, including **social guarantee funds**, **refundable advances**, and **low-interest loans**.

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Activities and Strategy

Activities across all seven cities focused on developing and implementing locally tailored solutions, including climate-neutral nodes in Madrid, energy communities in Zaragoza, and new public-private partnership models in Barcelona. The focus of activities laid high importance on fostering shared learnings and on-the-ground innovation. Key outcomes were set to achieve training targets (700 professionals trained), publication of tailored resources (VERD Guide, Barcelona's decarbonisation guide), and clustering activities for knowledge dissemination (e.g., URBNEW Summit). The latter had a focus on improving and enabling replication of models.

Further activities pursuit the development and adoption of innovative governance tools (co-leadership frameworks) and methods (Objectives and Key results methodology OKR), which proved transferable into future projects. Through targeted communication activities the outreach of the project is secured,

GHG Indicators Assessment

The primary goal of the large-scale pilot is to accelerate the sustainable transformation of buildings, through a combination of retrofitting measures, use of sustainable materials, production of renewable energy, and accompanying governance and innovative financing models, with an emphasis on solutions transferability. Standardised GHG indicators were calculated using the a Direct Emissions Reductions approach, for the implementation of the project per se, quantifying emission from worked hours. As such, GHG standardised emissions are reported over the project's implementation timeline (from 10.2023 to 06.2025), covering emissions from city halls of all seven cities, CIRCE, and Cesefor.

The methodology detailed for the calculation of the standardised indicators is as follows: Carbon footprint of the large-scale project represents the total GHG emissions in tons of carbon dioxide equivalent (tCO2e), directly or indirectly generated by the project as a result of implemented activities over the project's lifetime. The GHG emissions considered in the calculations cover all those included in the Kyoto Protocol.[1] The Year 2 report indicates total emissions of **22.65 tCO_2e** from pilot activities.

Table 6: Spanish Cities Standardised GHG Reporting

City (Pilot)	Emission Type	Baseline (2020)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
All	Direct Emissions Reductions	-	-	22.65 t CO_2e	- tCO_2e	- tCO_2e

GHG Custom indicators vary by city and include changes in the total energy consumption per year, the energy efficiency and the total amount of generated energy by renewable sources (for cities like Zaragoza and Madrid. The table below shows a sample of the most notable achievements reported.

Table 7: Spanish Cities Custom GHG Reporting – Increased Energy Efficiency

City (Pilot)	Quantitative indicator name	Indicator Value (Year 1)	Indicator Value (Year 2)
Vitoria-Gasteiz (WP3)	Change in energy efficiency foreseen by the project	NA	55 %

[1] Carbon dioxide, Methane, Nitrous oxide, Hydrofluorocarbons, Perfluorocarbons, Sulphur hexafluoride, Nitrogen trifluoride

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Zaragoza (WP9)	Total amount of generated energy by renewable sources (by city, different scenarios)	NA	28,582,000 KWh/year

Custom indicators mostly show the potential achievements calculated (and to be calculated) for the pilot based on the comparison of actual energy consumption of the pilot with the energy certificate of potential improvement. The calculation uses a model study based on point clouds and 3D modelling in CADWOK for the generation of values, data simulation, and calculation using Ubakus software.

Although the calculated numbers represent progress, the absence of crucial elements in the calculation highlights a significant oversight in the monitoring methodology. There is an absence of data regarding baselines for calculations, targets for reduction, and overall comparative approaches for the measures of achievement or targets. These shortcomings are to be observed both in the long-term (standardised and custom) and the co-benefit indicators.

Co-Benefit Assessment

The co-benefits indicators align closely with the pilot's systemic goals. A number of **standardised co-benefit** indicators have been identified, focusing on three main domains: the engagement of different stakeholders, the enhancement of skills through training, and the impact on democracy and culture. Some of the targets set by the large-scale pilot include the number of professionals to be educated through training (700 professionals from 140 companies and SMEs) and the involvement of stakeholders through awareness actions (7 neighbourhoods reached = 70,000 people in the 7 cities throughout the life of the project). A further aspect that can be related to the awareness actions is the number of activities implemented by the pilot targeting cultural and democracy impact.

The table below presents some of the most notable achievements:

Table 8: Spanish Cities Standardised Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
All	Improved citizen participation	-	2,200	2,230	
All	Total # of people (incl. professionals, public officers and others) trained	-	276	354	
All	# of total participative activities within the stakeholder's groups	-	9	26	

The selection of **custom indicators** is intended to provide a quantitative measurement of the subsequent core ambitions of the pilot project, with regard to the replacement of traditional materials, construction processes, and further solutions that have a direct impact on emissions. In this manner, the following indicators domains are included: social innovation, awareness raising through communication outreach, upscaling and replication, and the transferability of developed solutions and further improved learnings.

The following data presents reported results from all cities (results from all cities):

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Table 9: Spanish Cities Custom Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
All	total # of potential implementable solutions	-	45	72	
All	total # training materials	-	106	408	
All	total # companies engaged in the Project´s activities	-	84	99	

Key outcomes of the pilot:

- Strengthened collaborative dynamics among seven cities, resulting in the development of a new ECT project as the flagship outcome. Additionally, fostering document exchange, sharing of templates and models, and mutual support in day-to-day operational needs. This outcome is highlighted by its impact on breaking down silos, enabling administrations to act collaboratively on a daily basis.
- Establishment of the City Expert Support Facility, a multi-level facility created to jointly advance the decarbonisation process through multigovernance work.
- Wider public, strengthened participation and higher awareness for renovation and regeneration processes has been achieved through complementary activities including open activities and tailored communication materials

Summary and Lessons Learned

All seven Spanish cities identified common challenges and structural barriers to large-scale urban regeneration, including excessive bureaucracy, fragmented regulations, and complex administrative procedures. A lack of professional support, low social awareness, and limited decision-making capacity within diverse building communities (e.g., elderly residents, tenants, multiple owners) limits rehabilitation efforts. City-specific barriers include ageing populations resistant to change (Valladolid), degraded housing stock and energy poverty risks (Vitoria-Gasteiz), high vulnerability in target neighbourhoods (Madrid and Valencia), low awareness of aid procedures (Seville), and challenges in developing energy communities (Zaragoza). Overall, the pilot must address administrative complexity, financial limitations, and cultural and regulatory gaps to enable effective, inclusive, and scalable urban regeneration.

Against this context, the large-scale pilot URBANEW was able to demonstrate the value of coordinated, multi-city action in addressing the complex challenge of urban regeneration and building decarbonisation. The collaboration among seven Spanish cities has enabled peer learning, model replication, and the emergence of a strong governance structures in all seven cities. These represent notable achievements in fostering inter-institutional cooperation and breaking down silos.

However, the pilot faced several critical shortcomings, particularly in its **methodological consistency and data quality**. Despite ambitious goals, the lack of baseline values, clear reduction targets, and standardised calculation methodologies significantly limited the ability to assess GHG reductions and overall quantitative environmental impact. Many indicators were defined without sufficient clarity or were applied inconsistently across cities.

In terms of co-benefits, there was stronger performance, with measurable results in training, stakeholder engagement, and participatory activities. High-impact indicators include the number of participatory activities (from 9 to 26), companies engaged (84 to 99), and training materials developed (106 to 408). However, even here, limited baseline data and gender-disaggregated reporting weaken the comparability and strategic interpretation of outcomes.

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Recommendations:

- **Strengthen baseline definition** and ensure all cities align on initial values and target outcomes for GHG and co-benefit indicators.
- **Standardise methodologies** across all cities to ensure data is comparable and meaningful for evaluation.
- **Improve tracking systems** for both environmental and social indicators to enable real-time monitoring and impact feedback.

Overall, while this large-scale pilot made notable strides in governance innovation and community engagement, stronger data systems and clearer indicator frameworks are essential for achieving and demonstrating progress toward its decarbonisation goals.

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4.3 Budapest CARES – Climate Agency for Renovation of homES

Introduction

In Budapest, homeowners and the housing market face the pressing need for energy efficiency due to rising energy prices. The city's privately owned housing stock is in poor condition, with financially vulnerable owners unable to invest in maintenance. Energy efficiency infrastructure gaps and energy poverty are prevalent, with the housing sector responsible for 40% of greenhouse gas emissions and related poor air quality. Barriers to improvement include the lack of national programs, price caps, and limited municipal resources. To address these challenges, the Municipality of Budapest aimed to establish a comprehensive, sustainable energy efficiency program. The ambition was to create a Climate Agency, collaborate with commercial banks, and deploy smart technical solutions through financial models. The program aimed prioritise intervention areas based on scientific and socio-economic factors while involving communities and shaping public attitudes. It was considered that this pilot project shall offer a replicable model for other cities in Central and Eastern Europe with similar housing and energy efficiency challenges.

GHG Indicators Assessment

In terms of GHG related impacts, the key focus was the reduction of GHG emissions is the housing sector, by institutionalizing the improvement of household energy efficiency within the administration of the City. The pilot activities were expected to:

- Refurbish 200 homes currently using solid fossil fuels for heating. Based on same it was estimated that annual savings of 1,600 tCO_2e emission could be achieved.
- It was expected that approximately 1000 homes (counting the TSDOP Plus projects) would be renovated in the first year (2024), resulting in a decrease of 8,000 tCO_2e emissions.

By 2030 the pilot expects to:

- trigger and increase the energy efficiency renovation of homes up to 2030 with an overall number of 20,000 home renovations completed by 2030.
- Achieve a cumulative of 160,000 tCO_2e direct emissions savings per year amounting to 5% of the residential buildings' emissions.

Methodology

The pilot referred to the city's SECAP and related monitoring inventory for residential energy use and CO_2 data. This data was provided by energy suppliers including MVM Zrt. for both electricity and natural gas, and BKM Zrt. for district heating. The available annual reports of these companies are broken down by user, so that the residential share of total consumption can be obtained. The pilot adopted the 'GHG Emissions Targeted' approach and focused on the enabling conditions related to the establishment of Climate Agency.

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Result

As is illustrated in the table below the pilot achieved a reduction of 294,593 tCO_2e, however had set a targeted reduction of 1,477,999 tCO_2e.

Table 10: Budapest Standardised GHG Reporting

City (Pilot)	Emission Type	Baseline (2020)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
Budapest	GHG Emissions Targeted	2,459,976 tCO_2e	2,361,778 tCO_2e	2,165,383 tCO_2e	1,477,999 tCO_2e	294,593 tCO_2e

Custom GHG reporting

In order to capture the correlated reduction in energy use, the pilot used the 'Long-term GHG Impacts Custom' sheet within the indicators reporting template. As can be seen in the table below a significant impact was achieved in terms of enhanced energy efficiency, with a total reduction of 961,821 MWh/year over the course of the pilot programme. However, the pilot had set a targeted reduction of 7,340,704 MWh/year.

Table 11: Budapest Custom Reporting – Increased Energy Efficiency

City (Pilot)	Unit of Measurement	Baseline (2020)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
Budapest	MWh/year	12,149,809	11,668,899	11,187,988	7,340,704	961,821

Co-Benefit Assessment

The residential sector is responsible for over one-third of Budapest's energy use and CO_2 emissions. Despite this, large-scale energy renovation has been limited due to a lack of coordinated planning, fragmented ownership structures, and financing challenges. Therefore, a key objective for the pilot was to achieve increases in efficiency in terms of its resource use.

A selection of indicators highlighting significant impact achieved by the pilot is presented below. A key achievement is the development of the pilot's masterplan. Another significant achievement relates to the number of policies and related documents developed as part of the pilot project. Furthermore, success was achieved due to number of transformative events and related citizen engagement activities.

Table 12 Budapest Standardised Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Budapest	Improved Citizen Participation	0	0	30,000	30,000

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Table 13 Budapest Custom Co-Benefits

City (Pilot)	Indicator Name	Baseline (2023)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Budapest	District and city level policies making use of survey results	0	0	10	10
	Finalised net zero master plan	0	0	1	1
	Events on transferability of the methodology to other cities in the CEE region	0	0	8	8

The NetZero Masterplan addresses previous issues of municipal inefficiency by providing a coherent strategic framework to guide renovation across different housing types. It supports the city's 2030 and 2050 climate targets, helps prioritise actions where the impact is greatest, and increases Budapest's preparedness to mobilise national and EU funding. It also strengthens collaboration between the municipality, residents, and the private sector. The custom indicator therefore tells the story of a wider impact including the following:

- A completed strategic Masterplan covering the city's entire residential stock.
- Energy typologies and renovation scenarios based on building-level and citywide data.
- Maps and databases visualising building stock characteristics and energy performance.
- Integration with Budapest's SECAP and long-term climate goals.

Of further significance is the fact that 10 new policies and related documents were developed by year 2 of the programme. This essentially captures the achievement of the number of districts that have made a positive decision of joining the Budapest Green Panel Programme.

In addition, by year 2, 8 events were held related to the transferability of the methodology to other cities in the CEE region. 7 international conferences were held, as well as an event related to the twinning programme.

Summary and Lessons Learned

With respect to long term impacts the pilot ultimately aims to refurbish 90% of residential buildings, therefore achieving a net zero carbon target in this domain. The pilot reports that this would have the added benefit of 30% increase in energy saving. To help facilitate this a high quality data driven NetZero Masterplan is suggested as a critical step towards achieving Budapest's 2030 emission reduction targets and its 2050 carbon neutrality goal, while also addressing energy poverty and improving living conditions for residents.

Although the Masterplan is not a regulatory document, it is argued that its strategic clarity, credible evidence base, and alignment with Budapest's SECAP and Climate City Contract give it high policy leverage. Further stating that it will serve as the reference point for future grant applications and municipal planning decisions. However, for this to be achieved further project scoping and related studies should be carried out for further implementation of Renewably Energy Systems and smart technologies that would ensure further sustainable impact. Nonetheless, a major achievement was the integration of research findings from large-scale surveys and technical assessments carried out to date, ensuring that the strategy reflects both residents' attitudes and the city's energy and climate objectives.

Keeping the above in mind, the pilot should consider enhancing its monitoring framework and approach in future, moving away from the emission targeted approach and adopting a method of Direct GHG Emission reductions calculation. This would allow the pilot to more accurately track the exact and actual emission reduction achieved through the implementation of specific pilot activities such as the

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implementation of the Masterplan and related retrofit scheme. It is noted that the pilot achieved sizeable emissions reductions however, the reductions have fallen short of their intended and targeted reductions.

The pilot reported a lack of data availability on the energy renovation status of Budapest's residential buildings, therefore the planned introduction of energy management systems and related smart technologies such as smart metering systems would allow for a clearer picture when benchmarking against strategic policies, the Climate City Contract, as well as the city's Masterplan.

The pilot made appropriate use of the custom GHG indicator section of the template reporting the associated energy savings, however the selection of impact domain and impact subdomain could have been made clearer through selecting Greenhouse Gas Emissions and Energy Consumption, respectively, from the drop down menus.

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4.4 Italian Cities: Let'sGOv - Governing the Transition through Pilot Actions

Cities involved: Bergamo, Bologna, Florence, Milan, Padua, Parma, Prato, Rome, Turin

Introduction

Let'sGOv focuses on reducing energy system-related emissions through the exploration of enhanced governance models to agree on new forms of energy alliances, unlock new financial sources for the energy transition, and define the conditions for energy-enhanced multi-level governance. Thermal and electrical consumption in buildings together with transport and productive sphere accounts for the largest share of energy consumption and CO2eq emissions in cities. The project aims to accelerate climate neutrality and support emissions reduction by 2030 through public and private actions, overcoming criticalities in internal and external governance.

9 Italian mission cities, who haved signed an agreement with the Ministry of Infrastructure to create the Italian Mission network. The objective is to enhance the innovation factor of the transition pathway, work togehter for reaching common objectives and become a driving force for other cities to bring about systemic changes. The main need of these cities is governance innovation, to facilitate the development and accelerate solutions related to energy system efficiency.

Pilot Ambitions

Considering the transition as a common asset, renewable energy communities and collective self-consumption experiences, as well as sharing mobility and modernization of mobility and local services infrastructures are necessary levers to achieve the transition, highly relevant for their direct impacts and co-benefits for cities. However, in Italy and in some of the European Countries, the co-production of energy systems is slowed down by several barriers (constraints of the regulatory framework, lack of data and agile financial resources to support decision-making and detailed monitoring, lack of skills in the public and private sectors, absence of ad hoc protocols, agreements or standardised procedures).

Activities and Strategy

This project is designed to operate on 3 levels: the network, the cluster, and the city levels. The network level brings together the 9 mission cities in a cross-city bench learning approach through exchanges of experience and good practices, agreements and MoUs (i.e. IT Ministry of Mobility and Infrastructures); the cluster level, where cities address governance challenges through three levers: i) enhancing engagement mechanisms (Engagement Cluster); ii) increasing multilevel data-sharing that generates organizational restructuring (Data Cluster); iii) and promoting innovative financial strategies (Finance Cluster); the city level, where specific experimentation will provide punctual solutions.

Let'sGOv aims to produce transferable lessons learned at city-level, governance solutions at cluster level, and methodological insight to work in a national network, connected to the international dimension. Its reference models can be adapted to individual national regulations transposing European directives.

GHG Indicators Assessment

The goal of Let'sGOv implementation is to support direct impact on climate mitigation and adaptation. The pilot states that governance empowerment and the consequent spread of energy communities, energy data access and the experimentation of innovative financial models will directly impact GHG emission by leveraging precise and effective interventions targeting the reduction of the energy demand and widening the access to clean and locally produced energy.

The Italian pilot reports the total GHG Emissions targeted by pilot activities in tons of carbon dioxide equivalent (tCO2e). At the pilot project agreement, the 9 italian mission cities are expecting to decrease their emission profile by an average of 7-10% due to the benefits leveraged by this project (2 years) and to accelerate the reduction of 25-30% within 4 years. As the carbon neutrality is foreseen for 2030, cities have accounted to have 8 years to accomplish this transition from the pilot proposal planning, meaning that, averagely speaking and deliberately disregarding the inherent dynamics of the carbon neutrality process and accomplishment and natural variations among cities, each couple of years they will need

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to decrease CO2eq emissions of around 25% (compared to the present consumption). Thus, a reduction of 7-10% compared with the current situation for the first 2 years seems in line with the acceleration pathway by making the reasonable assumption that Let´s GOV project will enable, on average, about one third of the whole foreseen actions of the 9 MCs. They also have noted that the International Energy Agency, ENEA and ISO-International Standardization Organization, estimate a decrease in CO2eq emission for actions including engagement and behavioural aspects targeting energy efficiency of around 5%, which again makes that target of a reduction of 7-10% reasonable.

Moreover, the pilot project suggests considering that the improvements on internal and external governance impact on climate neutrality will result in emissions reduction also in the other emissions sectors i.e. mobility, land use and water and waste, for the effect of the new acquired capacity to act co-ordinately toward 2030 climate neutrality.

Table 14: Italian Cities Standardised GHG Reporting

City (Pilot)	Emission Type	Baseline	Indicator Value (year 1)	Indicator Value (year 2)	Targeted Reductions - tCO_2e	Data source; emission factors
BERGAMO	GHG Emissions Targeted	465,645	32 595	32 595		SECAP, CoM
BOLOGNA	GHG Emissions Targeted	1,572,816	110 097	110 097		emission inventory from CCC, IPCC GHG (tCO2eq)
FIRENZE	GHG Emissions Targeted	1,569,930	109 895	109 895		Primary collection DSOs, top down data from national databases; IPCC (JRC) for 2019. Same factor (pessimistic) for 2030
MILANO	GHG Emissions Targeted	4,567,402	319 718	319 718		Primary collection*
PADOVA	GHG Emissions Targeted	1,287,985	90 159	90 159		SECAP 2023; CoM
PARMA	GHG Emissions Targeted	1,126,647	78 865	78 865		emission inventory from CCC
PRATO	GHG Emissions Targeted	915,150	64 061	64 061		CCC
ROMA	GHG Emissions Targeted	8,598,003	601 860	601 860		CCC; SECAP emission factor revised by CCC methodology

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TORINO	GHG Emissions Targeted	1,742,434	121 970	121 970		Primary collection, national downscaled data, scenario modelling; Local, IPCC
ALL ITALIAN MISSION CITIES	**GHG Emissions Targeted**	**21,846,012**	**1,529,220**	**1,529,220**		

**Milano: calculated with the exception of GPL and Diesel oil, which are estimated based on total installed power). National emission factors (with a minor correction for electricity for LPT and municipal buildings and local factor for waste.*

Moreover, Italian cities report the targeted impact in terms of the change in the total energy consumption per year by Let'sGOv by 2030, considering a 7%reduction given by the pilot.

Table 15: Italian Cities Custom GHG Reductions

City (Pilot)	Emission Type	Baseline	Indicator Value (year 2)	Targeted Reductions - MWh/year	Baseline year
BERGAMO	(Change in the) total energy consumption (MWh) per year	2,237,217	156605,1697	156605,1697	2021
BOLOGNA	(Change in the) total energy consumption (MWh) per year	6,694,051	468 584	468 584	2018
FIRENZE	(Change in the) total energy consumption (MWh) per year	6,134,452	429 412	429 412	2019
MILANO	(Change in the) total energy consumption (MWh) per year	16,912,715	1 183 890	1 183 890	2021
PADOVA	(Change in the) total energy consumption (MWh) per year	5,150,206	360 514	360 514	2021
PARMA	(Change in the) total energy consumption (MWh) per year	4,170,097	291 907	291 907	2019
PRATO	(Change in the) total energy consumption (MWh) per year	3,515,017	246 051	246 051	2019
ROMA	(Change in the) total energy consumption (MWh) per year	33,923,643	2 374 655	2 374 655	2019
TORINO	(Change in the) total energy consumption (MWh) per year	7,976,148	558 330	558 330	2019
ALL Italian Mission Cities	**(Change in the) total energy consumption (MWh) per year**	**86,713,546**	**6,069,948**	**6,069,948**	

The calculated numbers above represent the targeted impact at the beginning of the project to reach the cities climate neutrality goals by 2030. However, this calculation lacks overall comparative approaches for the measures of achievement, and it does not even try to estimate wheter the

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implementation of the action plans of the CCCs is truly progressing and delivering emission reductions as targeted.

The Italian cities pilot does not include Custom GHG reporting.

Co-Benefit Assessment

At the domain of Social Inclusion, Innovation, Democracy and Cultural Impact, the Italian cities chose as co-benefit indicators to improve the capacity of the public administration, and citizen and stakeholder collaboration. At the capacity building, they contributed to the improvement in skills and awareness, which was tracked by collecting the number of public officers participating in the peer learning and exchange via the pilot activities.

Table 16: Italian Cities Standardised Co-Benefits

City (Pilot)	Indicator Name:	Base line	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Italian Mission & follower cities	Improvement in skills and awareness: number of public officers trained through the Pilot activities	0	67	72	139

Italian Mission cities also aimed to increase the number of new or revised plans, programmes, policies and projects containing innovation in emission domains or climate strategies, including all the plans, programmes, policies or projects that could be developed or improved thanks to the enhanced governance or capacity built through Let'sGOv.

The pilot project increased the number of initiatives/tools to support energy transition at local level. This was done through optimisation of policies and projects based on reliable and refined data, and developing continuously multiple projects to support the transition. Improvement of municipality capacity to support citizens on energy was one of the aims. Italian Mission cities also worked to stabilise collaborations and alliances with stakeholders through the cluster work and the pilot experimentation. They managed to bring in a significant number of protocols, pathways, collaborations, memoranda of understanding involving relevant stakeholders.

Table 17: Italian Cities Customised Co-Benefits

City (Pilot)	Indicator Name:	Base line	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Italian Mission cities	New or revised plans, programmes, policies and projects containing innovation in emission domains or climate strategies	0	25	10	35
Italian Mission cities	Increase in initiatives/ tools to support energy transition at local level	0	49	23	72
Italian Mission cities	Number of citizens/ beneficiaries participating in initiatives for energy and climate transition	0	2714	1568	4282
Italian Mission cities	Number of agreements and collaborations with stakeholders	0	272	27	299

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Summary and Lessons Learned

The pilot project focused largely on enabling conditions to advance the climate and energy strategies and prepare for their implementation at local among the Italian Mission cities. The GHG impacts and energy reductions are targeted estimations, based on the assumptions driven from the GHG emission reduction rate that should be kept on-going in order to reach the climate neutrality target by 2030. However, the pilot project does not report any analysis whether the targeted values correspond to the actual progress of implementing the action plans. Two years is considered a short time frame for a pilot project to realise energy sector related emission reductions, as often the implementation of energy transition projects takes a longer time than what cities had in this pilot project. This is a good example of showing how it is sometimes challenging to track the real progress and impact of enabling conditions and capacity building related activities towards reducing GHG emissions.

The pilot assumes that both the GHG emission reduction as well as the total energy consumption would reduce at the same pace, following the same reduction target of -7% in two project years. However, this is a questionable assumption, as some of the pilot activities focus on increasing the share of renewable production. These include Milano's and Torino's new services and tools within their local one stop shops/energy desks, to support the development of renewable energy sharing configurations across the city; as well as Bergamo, Padova and Prato setting up guidelines and new governance models for the implementation of renewable energy communities. It seems that the choice of the GHG indicators might not cover all the pilot city activities, but it is done only at a very high level.

The successes and the impact of the Italian cities pilot project can be seen much better from the co-benefit indicators. Through these co-benefits indicators, cities can really show their achievements in the field of capacity building, strengthening the Italian Cities Mission network and enhancing the engagement and collaboration both with the citizens and stakeholders. Especially such climate work that targets to improve the enabling conditions to pave the way for direct GHG reductions can be made visible via reporting appropriate co-benefits.

As a learning from the MEL reporting for the Italian pilot, the following can be highlighted:

- it is essential to choose the correct GHG emission reduction indicators, for which the activities of the project contribute to. It can be recommended that projects should have flexibility to update the impact monitoring framework and the chosen indicators during the project, when the project activities are better defined and known. Monitoring is an iterative process often.
- The targeted total GHG emission impact does not show to actual progress of the implementation of action plans of CCCs.
- Co-benefit indicators are much more useful when showing the outcomes of project activities focusing on enabling conditions, such as capacity building and stakeholder and citizen engagement.

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4.5 Istanbul Build4GreenIST

Introduction

Istanbul's pilot "Green and Carbon Neutral Building Transition Guide" focuses on transforming residential buildings through energy-efficient design and reconstruction under the Urban Transformation Plan including upgrades to existing structures. The approach is holistic and moving beyond isolated technologies to foster systemic change and learning for future developments. The project's ambition is to lay the groundwork for Türkiye's first large-scale, fully integrated, low/carbon-neutral buildings and districts, creating a snowball effect for widespread adoption. The pilot sought to demonstrate the feasibility of net-zero energy at the district level, inspire change across Türkiye's construction industry and to develop a comprehensive transition guide. Key activities included co-design and co-planning with diverse stakeholders—residents, professionals, universities, and technology providers. Dialogue events such as "Istanbul Talks the Climate", workshops, and living labs drove engagement and idea-sharing. The project will used sensors and digital tools for energy monitoring, fostering citizen participation and behavioural change.

GHG Indicators Assessment

In terms of GHG related impacts and following up on plans to reconstruct 242 000 dwelling in Istanbul by 2035, the pilot aimed to generate green and carbon-neutral building transition guide. By incorporating low-carbon technologies during building transformation, the pilot estimated 3 693 000 Mt_{CO2} annual reduction in case of full application of the generated guide. The reductions would be a result from improving building insulation, increases electrification (e.g. heat pumps), adapting smart building systems and lighting technologies in natural gas and electricity use. Overall, this would constitute a 12.1 % reduction in all building-related emissions in the city.

Methodology

The pilot applied International Performance Measurement and Verification Protocol (IPMVP) Option D using a simulation model to estimate a pre-retrofit baseline energy consumption. The simulation model was calibrated using monitored data. Pilot's impact was assessed by comparing measured data from 2025 against the calibrated baseline. GHG reductions were calculated utilizing local emission factors for electricity and thermal energy. The pilot adopted the 'Direct GHG emission reductions' approach.

Result

Regarding the impacts of the pilot, GHG emissions reduced were reported as percentage compared to the baseline. For GHG emissions deriving from the consumption of electrical energy an average of 27.4% GHG reduction was stated. For non-electrical energy consumption, the average GHG emission reduction was 18.55%.

Table 18: Istanbul Standardised GHG Reporting

City (Pilot)	Emission Type	GHG emission domain	Quantitative indicator name	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
Istanbul	Direct GHG emission reductions	Consumption of electricity generated for buildings, facilities, & infrastructure	Change in electrical energy efficiency over the lifetime of the project	28 %	26.8 %	25 %	27.4 % (average)

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Istanbul	Direct GHG emission reductions	Consumption of electricity generated for buildings, facilities, & infrastructure	Change in greenhouse gas emissions from electricity consumption	28 %	26.8 %	25 %	27.4 %
Istanbul	Direct GHG emission reductions	Consumption of non-electricity energy for thermal uses in buildings & facilities	Change in thermal energy efficiency over the lifetime of the projects	0	37.1 %	-	18.55 % (average)
Istanbul	Direct GHG emission reduction	Consumption of non-electricity energy for thermal uses in buildings & facilities	Change in greenhouse gas emissions from thermal energy consumption	0	37.1 %	-	18.55 % (average)
Istanbul	Estimated GHG emission reduction	Consumption of non-electricity energy for thermal uses in buildings & facilities	Share of renewable energy in Beykoz	0	13 %	-	6.5 % (average)

Co-Benefit Assessment

Regarding co-benefit objectives of the pilot project, the implementation of the guide in the city was estimated to increase the air quality and accordingly reduce the negative effects on human health. The guide emphasizes participatory planning, workshops, and citizen engagement (e.g., “Istanbul Talks the Climate”), aiming for social cohesion, inclusion, and capacity building. As economic impacts, it was stated that the pilot will have a significant impact on local businesses. The pilot also aimed to foster innovative governance, multi-stakeholder collaboration, and continuous learning through workshops, digital tools, and feedback mechanisms

A selection of indicators highlighting significant impact achieved by the pilot is presented below. A key achievement is the implementation of GreenIST app which enables households to monitor their energy consumption and visualise consumption trends at specific intervals. It also provides users with guidance on how to reduce consumption and maximise utility. A clear increase in the participation of citizens as well as improvement in skills and awareness was also observed. Residents’ engagement in energy and climate conscious actions was increased in the housing pilot area, where the GreenIST application was installed.

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Table 19: Istanbul Standardised Co-Benefits

City (Pilot)	Indicator Name	Baseline (2024)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Istanbul	Improved Citizen Participation	0	0	225	225
	Improvement in skills and awareness	0	0	300	300

Table 20: Istanbul Custom Co-Benefits

City (Pilot)	Indicator Name	Baseline (2024)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Istanbul	Resident engagement in energy and climate conscious actions (Likert 1-5)	1	0	3	2
	Number of digital tools for low-emission district design and applications	0	0	1	1

The observed behavioural change among residents is supported by multiple layers of qualitative and quantitative evidence collected throughout the pilot. One of the key elements was the GreenIST mobile application's intuitive interface, designed to make complex energy data accessible to non-technical users. Screenshots from the app show clearly structured dashboards that allowed residents to track their consumption and receive real-time, personalised energy-saving tips.

Measurable behavioural changes were observed among both residents and the building operations team. Residents actively engaged with the AI-supported app adapted their energy use habits while facility and energy managers began systematically monitoring flat-level energy performance on a weekly basis. The behavioural shifts were evident during the second year of the pilot during January to March 2025, as natural gas consumption decreased significantly compared to the pre-retrofit baseline. The energy savings persisted during the spring. Slight increases in the measured consumption during April and May prompted corrective feedback actions, demonstrating an effective closed-loop control mechanism supported by the application.

Summary and Lessons Learned

The pilot's key three outputs were 1) a mobile application for facilitating the behavioural change of residents on energy conservation, 2) a guide for all stakeholders (building owners, residents, developers, regulators etc), 3) a scenario-based analysis for developers of new buildings in a specific area. A key lesson from the pilot is that technological innovation alone is insufficient without investment in local capacity, particularly within municipalities and housing authorities. Training, co-design workshops, and stakeholder dialogue are instrumental in building the understanding and trust needed for long-term impact. Future projects should allocate resources specifically for institutional learning and community engagement.

One key challenge encountered during the pilot was to persuade citizens to install sensors in their homes and to monitor consumption data. This challenge led to coordination difficulties and slower decision-making processes, which occasionally delayed sensor installations and data integration. Eventually, fewer homes were covered by sensor and monitoring work than planned. This demonstrates that processes that directly involve citizens and require approval can proceed differently than planned.

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Furthermore, the results of the participant survey revealed that many respondents expressed a need for positive incentives to encourage more active engagement. The inclusion of a reward-based system, e.g. gamified features, points accumulation or other tangible benefits was frequently mentioned as a motivating factor that could enhance participation in similar sustainability-focused initiatives.

Given the three specific outputs of the pilot, it could be beneficial in terms of evaluating the impact of the individual results to assign an indicator for each of the elements separately. This would facilitate traceability and transparency and provide a more tangible insight on the measured impact of each output.

The pilot made use of the standard GHG indicator section of the template reporting the associated energy savings and greenhouse gas emissions. However, the impacts could potentially have been reported in absolute values as well as there was evidence of such values in the MEL reporting.

One of the strengths of the pilot design was its modular structure, each component (monitoring infrastructure, app design, scenario modelling, economic analysis) could function independently but also integrate seamlessly. This flexibility made it easier to adapt the pilot to different local contexts and is a critical insight for cities aiming to replicate the model with different starting conditions.

This project has received funding from the H2020 Research and Innovation Programme under the grant agreement n°101036519.

4.6 Polish Cities: NEEST – NetZero Emission and Environmentally Sustainable Territories

Introduction

70% of the 5 million single-family houses in Poland do not meet energy efficiency standards. At the same time, residential urban areas struggle with socio-economic challenges, including the ageing of society, social stratification, energy poverty, migration, and energy crises. Therefore, cities urgently need to improve the quality of life while striving for decarbonisation.

Pilot Ambitions

NEEST project aimed to improve the energy performance of poorly performing buildings in five big Polish cities. The goal was to turn old residential and service buildings (and related districts) into nearly zero-emission buildings while significantly reducing the demand for coal-based electricity and heat and maintaining a high quality of life.

Activities and Strategy

The pilot activities focused on collecting data on pilot buildings in selected districts and developing practical retrofit tools to reduce building emissions. The goal was to adopt holistic planning approaches, opposed to prevailing punctual and sectoral solutions. The cities aimed to develop reliable technological, economic and social solutions for individual buildings, districts and entire cities. The project trained city officers and provided them with recommendations to build a strong mandate for systemic change, grounded in scalable and replicable solutions for Poland.

GHG Indicators Assessment

The pilot project reports estimated total GHG emission reduction and the change in the total energy consumption of electricity generated for buildings, facilities and infrastructure per the whole intervention for a city quarter per year. The estimate is done by scenario modeling. 2024 is set as the baseline year.

Table 21: Polish Cities Standardised GHG Reporting

City (Pilot)	Emission Type	Baseline	Indicator value (year 1)	Indicator Value (year 2)	Target value	Data source; emission factors
Polish cities	Estimated GHG Emission reductions	7050 t CO2-eq / year	7050	0	0	Scenario modelling, estimated; baseline year 2024
Polish cities	Consumption of electricity generated for buildings, facilities, & infrastructure	6500 MWh/year	6500	2200	2200	Change in the total energy consumption per year / per city quarter (scenario modelling); estimated. Baseline year 2024

The pilot project doesn't consider any customised GHG emission reductions.

Co-Benefit Assessment

The Polish cities have chosen one standardised co-benefits indicator in the domain of Social Inclusion, Innovation, Democracy and Cultural Impact. Here, their focus is on the capacity of the public administration to improve its skills and awareness. The pilot has collected data on the number of public officers participating in and trained during the activities and workshops, as well as their engagement with the project, aiming to improve the quality of awareness and increase the number of participants.

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Table 22: Polish Cities Standardised Co-Benefits

City (Pilot)	Indicator Name	Baseline (2024)	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Polish cities	Improvement in skills and awareness (# of public officers participating and trained through the Pilot activities	0	15	25	25

Additionally, the pilot project defined 3 customised co-benefits indicators. The first one follows the number of stakeholders engaged with. Here, stakeholder mapping is based on the identification of stakeholder groups, and therefore, setting a baseline is not possible.

The second co-benefit stems from the project activities, which may lead to the development of new experiences in other cities. Baseline year is 2023. These new cities, which have so far benefited from the results of the project, are the Polish twin cities. The third co-benefit is to strengthen the participation of residents and local actors in decision-making. Both the 2nd and 3rd custom co-benefit indicators have 2023 as the baseline year.

The pilot project has chosen very high values for the baseline of the citizen engagement indicator, setting it at the level of the number of inhabitants of the quarters in the five cities cumulatively for the entire project, which seems rather ambitious.

Table 23: Polish Cities Custom Co-Benefits

City (Pilot)	Indicator Name	Baseline	Indicator Value (Year 1)	Indicator Value (Year 2)	Difference Compared to Baseline
Polish cities	Improvement in skills and awareness: # of representatives of stakeholders engaged	0	0	10	25
Polish cities	Improvement in skills and awareness: # of (new) cities engaged	5	0	6	6
Polish cities	Improved citizen participation per city / district (estimations) (# of citizens engaged	9200	0	50	50 (increase from year 1.)

Summary and Lessons Learned

The project focused on creating enabling conditions for significantly improving the energy performance of poorly performing buildings in selected districts of five big Polish cities. Therefore, the reporting of quantitative environmental indicators relied on estimated future impacts based on simulations and scenarios. The overarching long-term goal was to allow scalable and replicable solutions to be more widely adopted in Polish cities. It should be noted that districts are different and, therefore, the impacts cannot be directly extrapolated to other districts and cities.

The pilot activities revealed significant challenges related to inconsistent and outdated data, which was sometimes available in different formats due to siloed and inconsistent approaches within various city departments, as well as the lack of centralised databases. One of the project's key achievements was

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to improve the harmonisation of approaches through collaboration between city departments and cities. Furthermore, the collaboration between cities has enabled mutual learning and is expected to yield a more impactful systemic energy transition than when only implemented in individual cities.

Besides decarbonisation, a key project objective was to improve citizens' quality of life. However, this was not monitored in the project reporting. In the future, it is recommended to adopt regularly monitored indicators also related to the quality of life to assess the impacts of the adopted interventions.

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5 Key Findings

This evaluation covers 6 pilot projects, representing a total of 30 cities and a population of 37,199,374. In terms of population, these are the largest projects taking part in the Pilot City Programme (PCP) and therefore are considered a representative sample of the programme. The sample of pilot projects includes 4 multi-city projects from the Netherlands, Spain, Italy and Poland, as well as two city specific projects from of Budapest and Istanbul.

5.1 Long-term GHG Impacts Standardised

As mentioned in the methodology, pilot projects could assess their greenhouse gas (GHG) emissions through 3 distinct methodologies including:

- Direct GHG Emissions Reductions
- Estimated GHG Emissions Reductions
- GHG Emissions Targeted/Addressed by Pilot Activities

Out of the 6 pilot projects, 3 projects including the Dutch cities, Italian cities and Budapest opted to assess emissions through the 'GHG emissions targeted/addressed' approach, 2 projects including the Spanish Cities and Istanbul opted for the direct GHG emission reductions' approach, and the Polish Cities project opted for the 'estimated GHG emissions reductions' approach.

5.1.1 Direct GHG Emission reductions

The Spanish Cities and Istanbul implemented the direct GHG emission reductions methodology of accounting methodology. This should have allowed for comparison among projects with respect to exact and actual emission reduction achieved through the implementation of specific pilot activities within the project duration. However, the Spanish Cities project only provided a year 2 value of 22.65 tCO_2e, with no baseline figure included. In addition, Istanbul provided year 1 and year 2 values as percentage and used a baseline figure of 0 in all cases, therefore not allowing for statistical comparison of emission reductions by means of this calculation methodology.

5.1.2 Estimated GHG Emission reductions

The Polish Cities were the only pilot to use the estimated GHG emissions reduction approach among the sample. It is observed that the project used its year 1 data as its baseline figure, amounting to 7050 tCO_2e. The figure is provided by means of scenario modelling, and no year 2 figure is provided. Therefore, no reduction compared to the baseline can be calculated. This can be seen in the table below.

According to the parameters set out as part of the calculation methodology approximate reductions in GHG emissions can be expected from the implementation of pilot activities which may not happen in the project duration. The emission reduction may result from future implementation beyond the project duration, (i.e. in the short to mid-term in 2025, 2026, 2027), however no such figures have been provided.

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Table 24: Estimated GHG Emission reductions

City (Pilot)	Population	Emission Type	Baseline (2024)	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
Polish Cities NEEST	4,194,000	Estimated GHG Emission reductions	7,050 tCO_2e	7050			

5.1.3 GHG Emissions Targeted/Addressed by Pilot Activities

GHG emissions targeted/ addressed by pilot activities was the most commonly utilised approach among the 6 pilot projects. While it is evident that Budapest achieved a reduction of 294,593 tCO_2e during the course of the PCP, discrepancies in how monitoring data has been provided does not allow for comparison among the three projects. In the case of the Dutch Cities, only year 1 monitoring data is available for 5 of 7 cities that participated in the project and no year 2 data is available for any city. It is stated in the documentation submitted by the pilot that "*the two-year pilot timeframe is too short to observe net CO_2 reductions, as initial measures such as retrofits and heat grid installation temporarily generate emissions that outweigh short-term savings*". Nonetheless, the monitoring data provided to date concludes that 551,000 tCO_2e have been reduced so far compared to the baseline year data from 2022. It should be noted that monitoring data provided by Budapest used a baseline year of 2020 so an emissions reduction comparison between the projects is not possible.

A similar situation can also be observed from the Italian Cities project. Indicators and related monitoring data provided used 3 different baseline years of 2018, 2019, and 2021. A reduction of 220,194 tCO_2e, 1,953,302 tCO_2e, and 884,944 tCO_2e, respectively, has been identified across the three years. As stated previously, given the discrepancy in the baseline years used, a comparison across projects would not be appropriate. It should further be noted that these figures based on an estimated 7% reduction per year.

A further observation are the discrepancies in the use of targeted reductions. In the case of Budapest, the pilot achieved a reduction of 294,593 tCO_2e, however the City had set a targeted reduction of 1,477,999 tCO_2e. The Italian Cities did not provide emission reductions targets and only 4 of the 7 Dutch Cities provided reduction targets. With respect to the information described above, please see the table below.

Table 25: GHG Emissions targeted/addresses by pilot activities

City (Pilot)	Population	Emission Type	Baseline	Indicator Value (Year 1)	Indicator Value (Year 2)	Targeted Reductions	Reduction Compared to Baseline
Dutch Cities 100CNSC BL 2022	3,243,000	GHG Emissions Targeted	13,434,000t	6,287,000 t	-	5,242,000 tCO_2e	551,000 tCO_2e
Budapest CARES BL 2020	1,688,000	GHG Emissions Targeted	2,459,976 tCO_2e	2,361,778 tCO_2e	2,156,383 tCO_2e	1,477,999 tCO_2e	294,593 tCO_2e
Italian Cities Let'sGOv	390,734	GHG Emissions Targeted	1,572,816 tCO_2e	-	-	-	220,194 tCO_2e

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BL 2018							
Italian Cities Let'sGOv BL 2019	4.363.394	GHG Emissions Targeted	13,952,164 tCO_2e	-	-	-	1,953,302 tCO_2e
Italian Cities Let'sGOv BL 2021	1.599.009	GHG Emissions Targeted	6,321,032 tCO_2e	-	-	-	884,944 tCO_2e

5.2 Long-term GHG Impacts Custom

In relation to long-term GHG Impacts Custom indicators, Budapest and the Spanish Cities provided indicators and related data. In relation to energy efficiency, a significant impact is noted with respect to Budapest. A total reduction in energy consumption of 961,821 MWh/year is noted over the course of the pilot programme, based on a baseline year of 2020. The pilot aspired to and set a target reduction of 7,340,704 MWh/year. Istanbul, the Italian Cities and the Polish Cities did not provide custom GHG indicators, however, the Polish Cities also provided an Energy Consumption indicator within the standardised set. There it is observed that there has been a change in the total energy consumption per year / per city quarter, from a baseline of 6,500 MWh/year to 2,200 MWh/year in year 2. These figures are based on a scenario modelling approach and a baseline of 2024.

In terms renewable energy production, the Spanish Cities provide an upscaling indicator and identify a potential 28,582,000 a KWh/year of renewable energy generated by a PV facility, should it be installed within the municipality of Zaragoza.

5.3 Co-benefits Standardised

Co-benefit indicators across the 6 pilot projects were also analysed. A trend was noted, in that a the most common types of indicators used were related to 'Capacity Building', 'Training', and 'Citizen Engagement'. Since these calculations provided and methodologies used, mostly applied absolute numbers, it is important to note that the pilot projects differ significantly in terms of scale and scope, which should be considered when interpreting the results and comparing outcomes across cities and pilots.

5.3.1 Social Inclusion, Innovation, Democracy and Cultural Impact

Co-benefits in the 'Social Inclusion, Innovation, Democracy and Cultural Impact' category were addressed by most pilot projects, though the scope and measurement varied significantly. In Italy, the number of public officers trained increased from a baseline of 0 in 2023 to 67 in Year 1 and 72 in Year 2. This shows steady institutional capacity building during the project implementation. Istanbul reported a sharp increase in citizen participation from baseline value of 0 to a Year 2 value of 225 and skill development measured by the number of public officers that were trained during the project from 0 to 300 by Year 2. The Dutch Cities also demonstrated a strong participatory approach, with Groningen engaging 7,700 residents, The Hague 500, and Eindhoven 1,000 by Year 2. Other Dutch cities applied similar methods, but their reporting is still in progress, which is why they are not shown in the comparison table below. The Spanish project URBANEW also set ambitious goals in this sector, aiming to train 700 professionals and reaching 70,000 people throughout the life of the project. In reality, the project facilitated the training of 267 people in Year 1 and 354 in Year 2. Their citizen engagement also had a smaller input than expected, reaching 2,200 in Year 1 and 2,230 inhabitants in Year 2 throughout the project. Polish cities also contributed to institutional strengthening in the NEEST programme, training 25 public officers by Year 2 from a baseline of 0 in 2024. These results highlight the varying degrees of implementation success across the pilot projects, shaped and influenced by local contexts and

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capacities. While direct comparisons are limited, the overall progress and choices to focus on such goals, reflects a strong and growing commitment to inclusive and participatory climate action. The comparison across pilots can be seen in the tables below.

Table 26: Standardised Co-Benefits Total # of people trained through pilot activities

City (Pilot)	Unit of Measurement	Baseline (2020/2024)	Indicator Value (Year 1)	Indicator Value (Year 2)
Italian Cities Let'sGOv	Total # of public officers trained through pilot activities	0	67	72
Spanish Cities URBANEW	Total # of people trained through pilot activities		276	354
Polish Cities NEEST	Total # of public officers trained through pilot activities	0	15	25

Table 27: Standardised Co-Benefits Total # of citizens engaged

City (Pilot)	Unit of Measurement	Baseline (2020/2024)	Indicator Value (Year 1)	Indicator Value (Year 2)
Istanbul Build4GreenIST	Total # of citizens	0	0	225
Spanish Cities URBANEW	Total # of citizens	0	2,200	2,230
BudapestCARES	Total # of citizens	0	0	30,000

5.4 Co-Benefits Custom

In addition to the standardised co-benefits, the pilots also evaluated custom indicators of their design, related to their project ambitions. The indicators can be grouped into the following sections:

- Policy, regulation and masterplans
- Social Inclusion, Innovation, Democracy and Cultural Impact
- Financing and Funding

5.4.1 Policy, Regulation and Masterplans

A main achievement of the pilot project in Budapest was the NetZero Masterplan, that provides a strategic framework to guide renovation across different housing types. In addition to that, 10 new policies and related documents were developed by year 2 of the programme, which reflects the action taken by districts to join the Budapest Green Panel Programme. To further increase the impact of the project, 8 events related to the transferability of the methodology to other cities in the CEE region were held. These combined and diverse efforts reflect Budapest's commitment to the project goals, future climate actions, and scalable impact.

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Italy also concentrated on the implementation of enabling governance framework, increasing the number of climate-related plans and policies by 35 in total. They strengthened stakeholder collaboration and developed a number (72) of tools to support local energy transition.

5.4.2 Social Inclusion, Innovation, Democracy and Cultural Impact

Another area that was also addressed by many pilots in the 'Custom Co-Benefits' section are again related to the domain of Social Inclusion, Innovation, Democracy and Cultural Impact. In Istanbul measurable behavioural change was observed among residents and building managers, supported by the Build4GreenIST AI-driven mobile application. Resident management in energy-conscious actions also increased significantly from a baseline of 1 to 3 (on a Likert-Scale).

In Spain the pilot focused on innovation and stakeholder engagement. They implemented 45 solutions in Year 1 and 72 by Year 2, along with 408 training materials that were developed by Year 2 and 99 companies that were actively engaged in project activities. These figures demonstrate strong progress in capacity building and cross sector participation, including engagement of the private sector.

The Polish pilot programme defined three custom indicators to reflect their local priorities, including the number of stakeholders that were engaged, which increase from 10 in Year 1 to 25 in Year 2, additional cities that were engaged and an increase in citizen engagement which led to almost 10 000 citizens reached.

The results highlight the diversity of approaches and varying degrees of implementation success across the pilots. Direct comparisons are limited due to differing baselines and indicator definitions, but the overall direction reflects a shared commitment to inclusive climate action.

5.4.3 Financing and Funding

The Dutch pilot was the only pilot of the sample to focus on 'Financing and Funding' as a custom co-benefit, reflecting its strategic importance in the particular programme. A key achievement in this regard was the development of a 'financing toolbox', built through coaching, peer learning and collaboration with research institutions. Additionally, 17 projects/user cases along 7 action plans were implemented. These mechanisms and networks offer a practical resource for replication in other cities, which shows the wide scale of the project output.

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6 Lessons Learned

Given the context of the analysis provided above, the following provides an overview of lessons learned in the form on both best practices and common challenges that could be provide insights and learnings to other cities with similar climate neutral endeavors.

6.1 Best Practices

Budapest NetZero Masterplan

This is a prime example of how a city can develop a strategic framework and plan appropriately for the suture in support climate and net zero targets. Such strategies can help prioritise actions where the impact is greatest and increases a project or city's ability to mobile funding and investment. Albeit not strictly considered regulatory documents Masterplans can offer strategic clarity, credible evidence base, and alignment with other urban strategies. Nonetheless, such strategies should always be complimented through the integration of research findings and technical assessments, ensuring that, for instance, the implementation of renewable energy technologies are sensitively integrated.

Dutch Cities Financing Toolbox

The Dutch Cities demonstrated significant innovation through the development of a financial toolbox. The toolbox captures insights on innovative financial mechanisms, governance models, and creative ways to use existing instruments. It provides a practical resource that other cities can adapt, supporting flexible replication of solutions. This was further supported by the development of an interactive model to used to visualize investment needs, which provided synergies in a number of considerations including business case development, stakeholder engagement, and district-level planning, while also linking energy transition measures to broader urban issues. The ultimate goal is to develop District Investment Platforms (DIPs), where municipalities, companies, residents, and investors co-create joint investment plans.

Istanbul Project Structure

Istanbul demonstrated excellent strategic thinking relative to its project ambition through a modular structure, covering key project components of monitoring infrastructure, app design, scenario modelling, and economic analysis. Each project stream was afforded the flexibility it needed to develop independently while at the same time allowed for structured integration of components, where necessary. This flexibility made it easier to adapt the pilot to different local contexts and is a critical insight for cities aiming to replicate the model with different starting conditions.

6.2 Common Challenges

The impact monitoring of the pilot projects has revealed a number of challenges, mainly concerning the methodological approach, the availability and quality of data, the distinction between estimated and measured impacts, and the comparability of results. Together, these aspects significantly influence the robustness and reliability of the overall findings.

A first challenge is related to the wide variety of methodologies used for the accounting of greenhouse gas emissions. The pilot projects differed strongly in scope, ambition, and objectives, which led to the application of different monitoring methods. While this flexibility allowed cities to adapt the monitoring to their local context and the data they had available, it also resulted in outcomes that are difficult to compare. From the perspective of the Climate-Neutral and Smart Cities Mission, this is not an ideal situation, as the ability to aggregate data and draw overarching conclusions is limited. In addition, the scales and system boundaries chosen by the cities varied substantially. In some cases, monitoring

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focused only on specific project activities or administrative operations rather than the entire urban area, which further restricts comparability and the validity of conclusions at city level.

This methodological diversity can be illustrated by the example of the Spanish cities, which calculated emissions based on working hours and project activities rather than city-scale emissions. They developed a calculator that estimated footprints according to the type of work, the characteristics of working centres, and the hours worked. Event-related emissions were added through participant questionnaires collecting information on travel origins and modes. While this approach allowed the cities to quantify a total reduction of 22.65 tonnes of CO_2-equivalent, it essentially reflected the carbon footprint of the project itself rather than the emissions of the cities. As such, the reported figures cannot be interpreted as evidence for city-wide GHG reductions.

A second major difficulty concerns the establishment of baseline data. Several pilot projects did not provide baseline values indicating the level of greenhouse gas emissions before the interventions started. In such cases, the actual reduction cannot be determined with confidence. The same applies to a number of co-benefit indicators, for which baseline values were either missing or set to zero, which in practice equals a lack of meaningful reference. Furthermore, some projects only reported percentages without including absolute numbers, which creates further challenges when trying to assess and compare the magnitude of changes. Without reliable baseline data, it becomes almost impossible to describe the real effect of the measures implemented.

A further issue is the distinction between estimated and measured impacts. Because many projects were implemented within short timeframes, several cities chose to report expected rather than measured effects. Although this approach may be understandable given the duration of the projects, it remains problematic from a scientific point of view. Estimates that have not been validated by empirical data may be inaccurate, and even in the best case, they only provide approximations. Moreover, a mix of estimated and measured data across different projects complicates any attempt to conduct a consistent cross-cutting analysis. Consequently, the combination of both types of data reduces the overall reliability of the aggregated results.

The high degree of flexibility that was given to the cities in selecting their methods and indicators undoubtedly reduced administrative burden and allowed a pragmatic approach. However, it also led to significant trade-offs with regard to data quality and comparability. Because the methodologies and system boundaries differ, the evaluation potential is limited, and it becomes difficult to identify best practices or to derive robust policy recommendations that are valid across the entire group of pilot cities.

Some pilots also faced difficulties in implementing the monitoring process itself. In Istanbul, for instance, the project team struggled to convince citizens to install sensors in their homes and share consumption data. As a result, fewer households were equipped and monitored than originally planned, and the process took longer than expected. This experience shows that when data collection depends on active participation and consent from citizens, more time and effort are required to build trust and ensure adequate coverage. It also highlights the need for monitoring frameworks and indicators that are closely aligned with the specific activities and realities of each pilot.

These challenges illustrate that the current monitoring approaches provide valuable insights at local level but only limited potential for aggregated evaluation across cities. To improve the situation in future initiatives, a more standardised methodological framework, the systematic collection of baseline data, and clearer guidance on the use of indicators would be very important. Only on this basis can the impact of local interventions be measured in a way that is both scientifically sound and comparable across different contexts.

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7 Recommendations

The experiences from the pilot projects give important insights for strengthening future climate-neutral initiatives. While the flexibility granted to cities has allowed them to adapt to local contexts, the lack of methodological coherence has limited comparability and learning across the portfolio. A more balanced approach is therefore required, i.e. one that preserves local relevance but introduces clearer common principles for monitoring, evaluation, and scaling.

Strengthening the monitoring framework will be critical. Current approaches tend to focus too heavily on intended outputs rather than on measurable progress. Future frameworks should place stronger emphasis on methods that directly capture impacts, such as actual reductions in CO_2 emissions, improvements in energy efficiency, or increased participation of households in decision-making processes. These indicators would offer clearer benchmarks for municipalities and enhance the credibility of reported outcomes. The better use of digital tools, for example, smart metering, automated data collection, and visualisation dashboards, can further support cities in tracking their progress in real time and in linking monitoring results with broader strategic policies.

The selection and use of indicators should also be improved. The pilots made appropriate use of customised indicators, particularly in areas such as finance and governance, yet the alignment with core impact domains, especially greenhouse gas emissions and energy consumption, needs to be strengthened. Experience from the Italian pilot shows that it is essential to select indicators that truly reflect the contribution of project activities to emission reductions. Projects should therefore have the flexibility to update their impact monitoring frameworks as implementation progresses and activities become more clearly defined. Monitoring should be understood as an iterative process rather than a static exercise.

Furthermore, the targeted total GHG emission reduction alone does not sufficiently reflect the actual progress in implementing climate action plans. Co-benefit indicators have proven more useful when they capture enabling conditions, such as improved institutional capacity, stakeholder collaboration, and citizen engagement. These elements often determine the long-term success of climate-neutral strategies and should be given greater attention in future monitoring frameworks.

In terms of efficiency and scalability, the pilot experiences demonstrate that scaling up is feasible if supported by suitable frameworks and instruments. Phased “walk-in” solutions for district heating, bundled investment portfolios, and stronger national-level cooperation all offer pathways to replication. Municipalities should also advocate for structural reforms at national level, for example, longer depreciation models or the establishment of a central investment institution, while experimenting locally with blended finance and innovative investment vehicles to attract private capital and reduce financial risk.

Technological innovation alone is not sufficient to achieve lasting impact. The pilots have shown that tools such as mobile applications, stakeholder guides, or scenario-based analyses can be valuable, but only if they are accompanied by investment in local capacity and institutional learning. Training programmes, co-design workshops, and structured stakeholder dialogues are essential to build understanding, ownership, and trust among key actors. Future projects should therefore allocate dedicated resources for capacity building, community engagement, and knowledge exchange between municipalities and other stakeholders.

Finally, harmonisation and capacity support will be key. A common methodological framework with standardised templates, transparent definitions, and clear guidance on system boundaries and indicator selection will improve the quality and comparability of data. Capacity-building measures and technical assistance should help cities to apply these methods consistently and to build the necessary skills for data management and analysis. By doing so, future initiatives can combine methodological rigour with local adaptability and provide more robust evidence of progress towards climate neutrality.

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8 Conclusion

The evaluation of six large-scale pilot projects demonstrates that European cities are advancing meaningfully toward climate neutrality, yet systemic challenges remain. The pilots show that technical innovation alone is insufficient: lasting impact requires integration with social engagement, governance reform, financial experimentation, and citizen participation. Across the portfolio, important achievements include measurable GHG reductions, the development of innovative financing and governance tools, city-level masterplans, and stronger citizen engagement structures.

Best practices stand out as valuable models for replication. Budapest's NetZero Masterplan illustrates how strategic clarity and evidence-based planning can guide long-term action. The Dutch Financing Toolbox demonstrates how cities can unlock investment and strengthen business cases for district-level energy transitions. Istanbul's modular project structure highlights the importance of flexibility in adapting solutions to local contexts. These examples show how pilots, even within short timelines, can create transferable solutions with systemic impact.

However, the evaluation also reveals persistent shortcomings. The diversity of monitoring methods, missing or weak baseline data, and reliance on estimated rather than measured outcomes limited comparability and reduced the robustness of findings. To overcome this, future initiatives should adopt a more standardised methodological framework, strengthen the systematic use of baselines, and treat monitoring as an iterative process. Greater use of digital tools, such as smart metering and visualisation dashboards, can also enhance transparency and provide real-time feedback.

Looking ahead, future PCP activities should focus on balancing local flexibility with clearer common principles for monitoring and evaluation, integrating co-benefits alongside GHG indicators, and investing in capacity building and citizen engagement. National-level reforms, such as longer depreciation models, dedicated investment institutions, and supportive regulatory frameworks, will also be essential to enable scaling and replication.

Ultimately, the pilots confirm that climate-neutral cities cannot be achieved through technology alone but require inclusive governance, citizen trust, and collaborative learning across contexts. By embedding these lessons, the PCP provides a replicable foundation for accelerating climate action across Europe and positioning cities as central drivers of the transition to net zero.

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