URBAN AGENDA FOR THE EU

Building Decarbonisation

GOVERNANCE MODELS FOR BUILDING DECARBONISATION: A REGIONAL COMPARATIVE ANALYSIS ACROSS EUROPEAN CITIES

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URBAN AGENDA FOR THE EU

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List of acronyms and abbreviations

- **AADE** – Independent Authority for Public Revenue (Greece)
- **ANNEX 2** – Annex 2 Indicators under the National Building Renovation Plan
- **Athena Program** – Greek schools retrofit program
- **BEMS** – Building Energy Management System
- **CAES** – Certificados de Ahorro Energético (Energy Savings Certificates, Spain)
- **CECs** – Citizen Energy Communities
- **CLP** – Climate and Local Planning
- **Covenant** – Covenant of Mayors for Climate & Energy
- **CSRD** – Corporate Sustainability Reporting Directive
- **DH** – District Heating
- **DENA** – Deutsche Energie-Agentur (German Energy Agency)
- **EAA** – Ex-Ante Assessment
- **EED** – Energy Efficiency Directive
- **ELECTRA Program** – Greek public building retrofit program
- **Energy House** – Belgium municipal/regional energy advisory hubs
- **EPBD** – Energy Performance of Buildings Directive
- **EPC** – Energy Performance Certificate
- **ESG** – Environmental, Social, and Governance (criteria)
- **EU** – European Union
- **Expo 2015** – Milan Expo legacy and related urban energy initiatives
- **Flanders Woningpas** – Digital building passport (Flanders)
- **FUA** – Functional Urban Area
- **GBCE** – Green Building Council España (e.g., URBANEW/BuildUpon)
- **GBER** – General Block Exemption Regulation
- **GDPR** – General Data Protection Regulation
- **Gijón Agreement** – Urban Agenda Partnership agreement expanding thematic areas
- **Green Deal** – European Green Deal (EU climate strategy)
- **HDB** – Hellenic Development Bank (Greece)
- **ICT** – Information and Communication Technologies
- **IES** – Institute for Energy Studies (generic)
- **ISO** – International Organization for Standardization
- **ITeC** – Institute of Construction Technology (Spain)
- **ITES** – Energy training & skills certification (generic)
- **LHCP** – Local Heating and Cooling Plan
- **MARS** – Municipal restructuring & planning platform (Denmark/LHP)
- **MOE** – Ministry of Environment (or Margin of Error in surveys)
- **NECP** – National Energy and Climate Plan
- **NPLW** – Nationaal Programma Lokale Warmtetransitie (Netherlands local heat transition program)

- **NREAP** – National Renewable Energy Action Plan (previous EU planning framework)
- **NREPP** – National Renovation and Energy Performance Plan (generic)
- **NRC** – National Renovation Coalition (generic)
- **NTR** – National Technical Regulation (generic)
- **nZEB** – Nearly Zero Energy Building
- **Opengela** – Vitoria-Gasteiz energy renovation platform and governance initiative
- **PAES/SEAP** – Sustainable Energy Action Plan (e.g., Milan)
- **PDE** – Public Investment Program (Greece)
- **PEC** – Primary Energy Consumption
- **PES** – Primary Energy Savings
- **PPPs** – Public-Private Partnerships
- **RRF** – Recovery and Resilience Facility (EU financing)
- **RECs** – Renewable Energy Communities
- **REF** – Renovation Energy Fund (generic)
- **RegEd** – Regulatory and Energy Directorate (generic)
- **REN** – Renewable Energy Networks
- **RenewEU** – EU initiative to accelerate fossil fuel phase-out
- **REPowerEU** – EU plan to accelerate renewable deployment
- **ROC** – Renewable Obligation Certificate (generic)
- **RPL** – Regional Planning Legislation (generic)
- **S3** – Smart Specialisation Strategies
- **SRI** – Smart Readiness Indicator
- **SWLB** – Stadtwerke Ludwigsburg-Kornwestheim (utility)
- **TCFD** – Task Force on Climate-related Financial Disclosures
- **TCO** – Total Cost of Ownership
- **UEA** – Urban Energy Assessment (generic)
- **UAEU** – Urban Agenda for the European Union
- **UIC** – Union de Crédito Inmobiliario (Spain)
- **UI** – Urban Intermediary / Urban Agenda Partnership interface
- **UN** – United Nations
- **UNEP** – United Nations Environment Programme
- **URBANEW** – EU project on urban building renovation (GBCE-led)
- **WPG** – Wärmeplanungsgesetz (German Heat Planning Law)
- **ZEB** – Zero Emission Building

1. A brief introduction

In the context of the European Union's commitment to climate neutrality by 2050, building decarbonisation has emerged as one of the most urgent and complex transitions. Buildings account for approximately 40% of energy consumption and 36% of greenhouse gas emissions in the EU, making them central to achieving the objectives of the European Green Deal and the Fit for 55 package. While technological solutions for energy efficiency, electrification, renewable heating, and district systems are increasingly available, the pace and scale of transformation depend fundamentally on the governance models that enable implementation at local level.

Cities play a decisive role in this transition. They are the level of government closest to citizens, building owners, utilities, and local stakeholders. However, their capacity to deliver decarbonisation outcomes is shaped by national regulatory frameworks, financing mechanisms, data availability, and institutional coordination structures. Governance models — including legal mandates, stakeholder ecosystems, data systems, financial instruments, and multi-level cooperation — determine whether Local Heat & Cooling Plans (LHCPs), building renovation strategies, and energy community initiatives translate into measurable emission reductions.

This report, *"Governance Models for Building Decarbonisation: A Regional Comparative Analysis Across European Cities,"* examines how 18 European cities are structuring and implementing governance frameworks to support building decarbonisation. It identifies patterns, best practices, gaps, and quick wins across different city sizes and national contexts, with particular attention to how local actions align with EU-level objectives and national policy instruments.

The analysis supports **Working Group 3: Collaboration for Local Ecosystems**, which explores how cities can lead building decarbonisation through dynamic, place-based ecosystems. The Working Group focuses on:

- Stakeholder engagement and quadruple helix collaboration
- Data-driven decision-making
- Multi-level governance alignment
- Capacity building and system mapping
- Co-created, scalable strategies rooted in local realities

By examining governance structures behind implementation — rather than only technical measures — this report contributes to understanding how local ecosystems can effectively deliver EU climate objectives.

2. Purpose of this report

This report responds to three central needs:

1. Understanding governance diversity

Although EU legislation sets common objectives, implementation varies significantly across Member States and cities. Governance capacity, financial models, institutional culture, and data systems shape outcomes.

2. Mapping city-level decarbonisation maturity

By analysing 18 representative European cities, the study identifies varying levels of decarbonisation advancement — from pilot-based approaches to advanced, mandatory integrated systems.

3. Strengthening alignment between city and national frameworks

A core challenge identified is the misalignment between ambitious national targets and local implementation capacity. This report begins to unpack where these gaps occur, why they exist, and how governance models can be refined.

Building decarbonisation is not solely a technical or regulatory challenge — it is an ecosystem challenge.

Working Group 3 focuses on how cities can orchestrate local ecosystems that include:

- Municipal departments
- Energy utilities and district heating operators
- Financial institutions
- SMEs and renovation supply chains
- Citizens and housing cooperatives
- Regional and national authorities
- Academic and research institutions

Effective governance models enable these actors to collaborate through participatory planning processes and coordinated platforms.

The findings of this report directly inform the Working Group's objectives by identifying practical governance mechanisms that facilitate ecosystem-based decarbonisation.

3. Why *Governance* matters in building decarbonisation

Technological solutions are available. Funding mechanisms are expanding. EU legislation is increasingly ambitious.

Yet implementation gaps persist because:

- Responsibilities are fragmented across levels of government.
- Data is incomplete, inaccessible, or non-standardised.
- Financial risks are unevenly distributed.
- Citizens face complexity and limited incentives.
- Municipalities lack technical capacity.

Governance models determine whether:

- Decarbonisation and energy transition policy frameworks (such as Local Heat & Cooling Plans) are actionable or merely strategic documents.
- Renovation strategies translate into measurable emission reductions.
- Energy communities scale beyond pilots.
- Public-private partnerships align with long-term climate goals.

This comparative regional analysis therefore focuses not only on *what* cities are doing, but *how* they are structuring decision-making, coordination, financing, and accountability systems.

4. Methodological approach

This section outlines the methodological process followed to identify, screen, and select 18 case studies reflecting diverse governance models for building decarbonisation across European cities.

The approach builds upon parallel analytical work conducted under Working Group 1 on the integration between Local Heating and Cooling Plans (LHCPs) and National Building Renovation Plans (NBRPs).

3.1 Guiding principles and rationale

The selection of the 18 case studies was guided by a clear analytical objective: to understand how different European cities are structuring governance models to implement building decarbonisation in the context of evolving EU legislation — particularly while Member States are still transposing the revised Energy Efficiency Directive (EED) and Renewable Energy Directive (RED), and operationalising Local Heating and Cooling Plans (LHCPs) alongside National Building Renovation Plans (NBRPs).

The process began with an initial mapping of cities grouped by size (metropolises/large, medium-sized, and small towns) to reflect differences in administrative capacity, governance complexity, and implementation potential. In parallel, work under Working Group 1 assessed the degree of integration between LHCPs and NBRPs at national level, allowing for a preliminary identification of maturity patterns across countries. However, rather than relying solely on national-level assumptions, cities were selected to validate how these frameworks translate into practice on the ground.

The final selection therefore intentionally combines different **city sizes, EU regions, climate conditions, and socio-economic contexts, as well as varying levels of policy maturity and regulatory obligation.** The aim was to build a comparative and policy-relevant sample that reflects the diversity of governance realities across Europe and enables analysis of how local ecosystems respond to EU decarbonisation requirements during this transitional phase of directive transposition and implementation.

3.2 Case Studies identification process

The identification of the 18 case studies followed a structured step process:

Step 1 – Preliminary mapping and categorisation

An initial mapping exercise classified cities according to population thresholds to ensure balanced representation across urban scales:

Category	Population Threshold	Notes
Metropolises	**≥ 1,000,000**	Major urban centres, often capitals or economic hubs, complex multi-level governance, high decarbonisation capacity
Large Cities	**250,000 – 999,999**	Regional centres with structured climate plans and district heating potential
Medium-Sized Cities	**50,000 – 249,999**	Secondary urban centres with moderate administrative capacity and pilot-driven approaches
Small Cities / Towns	**< 50,000**	Limited scale, often reliant on community initiatives or regional support

This classification allowed for systematic comparison across governance capacities and structural conditions.

*You can find the complete initial Mapping as **ANNEX 1 (excel file)**.*

Step 2 – Parallel national maturity screening

In parallel with the city mapping, analytical work under Working Group 1 assessed:

- The integration of LHCPs within national frameworks.
- Alignment between NBRPs and local implementation.
- Degree of regulatory obligation versus voluntary adoption.
- National support mechanisms (financial, technical, data infrastructure).

This preliminary **maturity assessment** served as an orientation tool to guide city selection and ensure representation across different governance maturity levels.

Step 3 – Geographic and contextual balancing

A proposed list of cities was developed to ensure:

- Coverage across EU regions and climate zones.
- Inclusion of both district heating-intensive contexts and electrification-based systems.
- Representation of coastal, insular, continental, and Nordic climates.
- Mix of high-capacity and emerging governance environments.

The list was subsequently refined in consultation with the Partnership, incorporating suggestions from Eurocities and Urban Initiative representatives to ensure political relevance and ecosystem representation.

Step 4 – Validation and final selection

Following outreach to a broader pool of pre-identified municipalities, invitations were extended to a larger number of candidate cities across the defined categories. The final set of 18 case studies reflects those cities that confirmed their availability to participate in in-depth interviews and share detailed information on their governance models. Their engagement enabled a deeper qualitative analysis, and therefore determined the final composition of the comparative sample.

The final distribution of Case Studies is:

Metropolises and Large Cities
Vienna (AT)
Milan (IT)
Barcelona (ES)
Brno (CZ)
Espoo (FI)
The Hague (NL)

Medium-Sized Cities
Ludwigsburg (DE)
Mechelen (BE)
Oostende (BE)
Vaasa (FI)
Kladno (CZ)
Nicosia (CY)
Vitoria-Gasteiz (ES)
Pécs (HU)

Small Cities / Towns
Soria (ES)
Samsø (DK)
Rethymno (GR)
Santa Perpetua de Mogoda (ES)

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Step 5 – Interview deepening

Once participating cities were confirmed, structured interviews were conducted using a common analytical framework focused specifically on understanding the governance model underpinning building decarbonisation.

The interview guide was organised around the following core dimensions:

- **Maturity level of building decarbonisation**, including the scope and scale of decarbonisation actions adopted (e.g. district heating expansion, building renovation programmes, pilot projects).
- **Governance model in practice**, examining how the quadruple helix (public authorities, private sector, academia, civil society) operates locally, how actors interact, and which communication channels, coordination platforms, and support mechanisms (e.g. one-stop shops, energy agencies, partnerships) are in place.
- **Decision-making processes and coordination structures**, including vertical integration (local–regional–national alignment), horizontal cooperation across departments, and multilevel governance dynamics.
- **Implementation results and performance**, alongside barriers encountered and lessons learned.
- **Funding and financial governance**, covering funding sources, investment structures, public-private arrangements, and access to EU or national financial instruments.
- **Transferability potential**, identifying which elements are highly context-specific and which governance mechanisms, tools, or coordination models could be replicated or adapted in other European cities.

This structured approach ensured consistency across cases while enabling a qualitative understanding of how governance ecosystems shape implementation outcomes across different territorial and regulatory contexts.

3.3 Limitations of the research analysis

Although the study provides a robust comparative foundation, some limitations should be considered:

- The selection is illustrative rather than exhaustive.
- Governance maturity assessments are partly qualitative.
- Some cities are in early implementation stages, limiting long-term performance data.
- Rapid regulatory changes at EU and national levels may alter governance dynamics.

Nevertheless, the methodology provides a structured and replicable framework for analysing governance models across diverse European urban contexts.

5. Case Studies

The following section presents the 18 selected case studies using a common template designed to ensure clarity, coherence, and comparability across diverse urban contexts. The structure of the template was agreed with the Partnership and reflects the shared objective of systematically analysing governance models for building decarbonisation.

Each case study follows the same framework, beginning with a concise contextual overview and an assessment of the **maturity level of building decarbonisation**, both at city and country level. This includes a justification of the maturity assessment based on adopted strategies, implemented actions, and structural conditions influencing progress.

The core of each case then examines the **governance model in practice**. A dedicated multi-level governance table maps the different institutional layers (local, regional, national, EU where relevant), identifying key actors, their roles and responsibilities, as well as the main constraints and enabling factors shaping implementation. Complementing this, a decision-making flow analysis clarifies who acts as the core decision-maker, who performs the integrator function, and which entity leads operational delivery.

A specific section is devoted to the **quadruple helix ecosystem**, identifying which helixes are actively engaged (public sector, private sector, academia, civil society), their respective contributions, the main communication and coordination channels, and the practical tools deployed (e.g. one-stop shops, energy agencies, partnerships, digital platforms). Where relevant, tools that are still missing or under development are also highlighted.

Financial governance is analysed to clarify the **funding structure underpinning implementation**, including public financing sources, EU instruments, private capital mobilisation, risk allocation mechanisms, and the broader investment logic supporting building decarbonisation efforts.

Each case concludes with:

- **Key implementation results**,
- **Main barriers encountered**, structured across legal, financial, technical, social, and governance-capacity dimensions, identifying the primary bottleneck limiting implementation.
- **Lessons learned and elements of transferability** that could be adapted by other European cities.
- Relevant references and sources.

This harmonised structure enables a robust comparative reading of the 18 cases and provides the analytical basis for the cross-cutting conclusions presented in the final section of this report.

VAASA

ESPOO

SAMSØ

THE HAGUE

OOSTENDE

MECHELEN

KLADNO

BRNO

LUDWIGSBURG

VIENNA

PÉCS

MILAN

VITORIA-GASTEIZ

SORIA

SANTA PERPÈTUA DE MOGODA

BARCELONA

RETHYMNO

NICOSIA

CASE STUDIES

Vienna (Austria)

Population: 2,028,499 **> 1M → Metropolis** (& Large cities)

Maturity

City level 🟢

Country level
(LHCP/NBRP integration) 🟢

Context

Vienna is both municipality and federal province, operating under split competences (national gas law; provincial building code). Strong political backing since the 2020 Climate Pact and 2022 gas phase-out targets (3 City Councils). Dense historic building stock, large social housing sector, strong district heating legacy, and municipal ownership of the DSO.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented (operational for 3 years)	Not yet (EED threshold pending)	City-wide	Municipality, Climate & Energy Innovation Agency, utilities	Heating & Cooling Concept implemented for 3 years; structured transition pathways developed via DECAPCITYPIPES
District heating expansion	On-going (area-based roll-out)	Strategic	4 priority areas (area-based)	Municipality, city-owned DSO, housing companies	Infrastructure-first model: network built, then connection window opened
Building renovation	On-going	Mandatory if >95% renovation	City-wide	Province (building code), social housing, private owners	Adapted building code; strong social housing engagement; free technical assistance
Renewable heating	Implemented and scaling	Partially regulatory-driven	Building/district	Utilities, housing, private owners	Linked to gas phase-out; biomass discouraged
Energy communities	Emerging-partial	Voluntary	Building level	Citizens, housing companies	PV communities active; no heating communities yet
Pilot projects	Implemented	Strategic	100 pilots	Municipality, social housing	100 gas phase-out pilots; learning-by-doing approach
Citizen engagement	On-going	Voluntary	City-wide	Municipality, NGOs	Participatory budget; limited linkage to heating transition

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Federal Ministry for Climate Action (BMK); national regulator	Gas framework; attempted Renewable Heating Act	No binding Renewable Heating Act; no mandatory heat planning	Working groups with provinces
Regional (Province/Vienna)	Provincial administration (building authority)	Defines building code & heating system requirements	Legal complexity of dual city-province status	Strong administrative capacity (~30,000 staff)
Municipal	City departments; Climate & Energy Innovation Agency	Planning, coordination, implementation leadership	Budget exposure	Political backing; DSO ownership
Utilities	City-owned DSO	Network expansion; gas & electricity management	National regulatory framework	Municipal ownership

● Decision making process

Lead actor:	*Municipality of Vienna*
Core decision-maker	Municipal political leadership (3 City Councils)
Integrator	Permanent interdepartmental governance body

Decision flow: *Planning → Political validation → Budget allocation → Utility implementation → Building-level connection*

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- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City departments; Province authority; Climate & Energy Innovation Agency	Planning, coordination, technical assistance	Interdepartmental governance body; working groups	Yes	Permanent
Private Sector	Housing companies; SMEs; financial actors; DSO	Implementation; investment; building-level decisions	Information events; advisory board; technical assistance hub	Yes	Regular / project-based
Academia / Research	Universities; EU project partners	Knowledge & pathway modelling	EU projects (e.g. DECAPCITYPIPES)	Partial	Project-based
Citizens / Civil society	Homeowners; NGOs; cooperatives	Approval decision	Participatory budget; consultation processes	Partial	Ad hoc

Key tools:
☑ **One-stop shop** / renovation hub - Vienna's free renovation advisory service
☑ **Formal consultation processes**

Quadruple helix status:
Partial but operational

- ## Funding structure

Main sources:	Municipal budget; national subsidies; EU funds (Horizon 2020); private co-financing
Role of financial actors:	Advisory board participation; dialogue with EIB; limited structured risk-sharing
Blending capacity:	Medium
Investment logic:	Area-based (DH expansion zones)
Financial risk exposure:	Primarily borne by municipality

📊 Implementation results & barriers

Key Results:
- ✓ **Heating & Cooling Concept operational (3 years)**
- ✓ **100 gas phase-out projects (strong social housing role)**
- ✓ **4 DH expansion zones**

Barriers

Legal	Missing Renewable Heating Act; no binding heat planning obligation
Financial	Municipal risk exposure; blending complexity
Technical	DH expansion in dense urban fabric
Social	DH perceived as expensive; multi-owner approval (2–3 years)
Governance capacity	High coordination demand across levels

Main bottleneck   *Legal uncertainty at national level*

🌍 Key lessons for other cities

- Strong and explicit political backing is critical to move from planning to implementation.
- Permanent interdepartmental governance structures improve coordination and speed.
- Area-based DH expansion is more effective than demand-led connection models.
- Municipal ownership of the DSO significantly strengthens implementation capacity.

References: Heating and cooling Viena 2040; Heating Plan 2040 – City of Vienna ; Vienna Energy Planning (MA20); Wien Energie (Municipal Utility); H2020 DECARBCITYPIPES Project

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Milan (Italy)

Population: 1,380,000 > 1M → **Metropolis** (& Large cities)

Maturity

City level ●

Country level ●
(LHCP/NBRP integration)

Context

Milan's decarbonisation pathway is framed under the Air and Climate Plan (PAC) and the forthcoming Municipal Energy Strategy (2026–2027), intended as the operational LHCP. Actions are currently voluntary (LHCP/EED not yet transposed nationally). The city adopts a neighbourhood-based ("*molecola*") approach and collaborates with the Metropolitan City of Milan. High private property fragmentation and strong multi-utility presence shape implementation dynamics.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Planned	No (voluntary)	City-wide	Municipality; AMAT; Metropolitan City	Municipal Energy Strategy under development as LHCP implementation (EED aligned).
District heating expansion	Planned/ Ongoing	Strategic	Neighbourhood	Municipality; multi-utility (operator-led); DSO	Expansion embedded in operator business plan.
Building renovation	Ongoing; Renovation rate ~1%.	Mandatory for new/deep renovations	City-wide	Municipality; social housing; private owners; ANACI; Region	Supported by national incentives (Superbonus; Conto Termico 3.0); PNRR & ERDF funds for public stock.
Renewable heating	Implemented	Building standards	Building to city-scale	Utility; Municipality; private owners; Region	Waste treatment plant in DH; data centre integration under regulatory definition.
Energy communities	Implemented	Voluntary	Neighbourhood (national rule)	Municipality; academia; NGOs; citizens	CER.ca.MI solidarity REC operating city-wide.
Pilot projects	Implemented	Strategic	Pilot / district	Municipality; academia; utility	Wastewater & sewage heat recovery demonstrators.
Citizen engagement	Implemented	Voluntary	City-wide	Municipality; AMAT; citizens	Citizens General Assembly; OSS Energy Desk; Milano Cambia Aria platform.

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministries; ENEA; RSE	Defining the regulatory framework / incentives	No structured LHCP; policy uncertainty	NRRP funding; TA support
Regional	Regione Lombardia	Building regulation; dialogue; coordination	Limited financial autonomy at city level	Direct political/technical interlocutor
Metropolitan	Città Metropolitana di Milano	Energy roadmap coordination	Overlapping competences	Strategic alignment
Municipal	City departments; AMAT	Planning, coordination, stakeholder engagement	Limited internal coordination; staff capacity	Strong planning culture
Utilities	Multi-utility (gas, DH, electricity DSO)	Infrastructure investment; network management	National regulation constraints	Multi-year agreements with municipality

● Decision making process

Lead actor:	***Municipality of Milan***
Core decision-maker	Municipal political leadership + multi-utility
Integrator	AMAT (Municipal Agency for Environment, Mobility & Territory)

Decision flow: *Strategic planning (PAC / Energy Strategy) → Political approval → Budget allocation → Utility agreement / project-based implementation → Building-level uptake (owners)*

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- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City departments; Regione Lombardia; AMAT; Metropolitan City	Strategic planning; regulatory alignment; coordination	Interdepartmental working groups; formal agreements; institutional meetings	Yes	Permanent
Private Sector	Multi-utility; housing managers (ANACI); SMEs; real estate operators	Infrastructure investment; network management; building-level implementation; condominium coordination	Multi-year service agreements; advisory meetings; technical workshops	Yes (except finance, still limited)	Regular / project-based
Academia / Research	Milan universities; RSE	Modelling; studies; energy mapping; innovation pilots; technical studies (groundwater HP potential)	Climate City Contract; EU projects; technical working groups	Yes	Project-based
Citizens / Civil society	Citizens Assembly; NGOs; CER.ca.MI	Participation; energy sharing; consultation; behavioural uptake	Digital platform; public assemblies; Energy Desk	Yes	Regular / ad hoc

Key tools:
☑ **One-stop shop / OSS Energy Desk**
☑ **Digital stakeholder platform (Milano Cambia Aria)**
☑ **Formal consultation processes**

Quadruple helix status:
Emerging (financial sector not yet structurally engaged)

- ## Funding structure

Main sources:	Municipal budget (limited); National subsidies (Superbonus, Conto Termico 3.0); NRRP; ERDF; EU funds; Private finance
Role of financial actors:	Limited structured involvement; private finance fragile
Blending capacity:	Medium–Low
Investment logic:	Mixed: infrastructure-led (utility); incentive-driven (private retrofit)
Financial risk exposure:	Public budget constraints; private owners face long payback periods

📊 Implementation results & barriers

Key Results:
- ✓ **Municipal Energy Strategy under development (LHCP)**
- ✓ **Waste heat integrated into DH (WTP + pilot sewage recovery)**
- ✓ **Active Renewable Energy Community (CER.ca.MI)**

Barriers

Legal	No structured national LHCP framework; regulatory uncertainty
Financial	Non-structural incentives; limited municipal budget; private finance fragility
Technical	Grid upgrade needs; integration of new data centers
Social	Fragmented private ownership; slow condominium decision-making
Governance capacity	Weak interdepartmental coordination; limited financial sector engagement

Main bottleneck *Lack of stable and structured national decarbonisation framework.*

🌍 Key lessons for other cities

- Permanent governance bodies support continuity beyond political cycles.
- Municipal technical agencies strengthen cross-department coordination.
- Neighbourhood-based planning improves territorial targeting.
- Early engagement of building administrators is critical in fragmented ownership contexts.

References: Milan Air and Climate Plan (PAC) / Milano Cambia Aria platform / CER.ca.MI Renewable Energy Community

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L3 Barcelona (Spain)

Population: 1,732,066 **> 1M → Metropolis** (& Large cities)

Context

Barcelona has strong political backing for decarbonisation, including participation in EU Missions, Covenant of Mayors, and IURC. The city has a history of public-private partnerships in district heating and cooling (DHC) networks, including ECOENERGÍAS and District Clima. Key municipal departments coordinate energy strategies, with collaboration from utilities (TERSA/VEOLIA), regional authorities (ICAEN), and academic partners.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	On-going	Voluntary	District	Municipality, ECOENERGÍAS, utilities	Municipal area mapped for energy demand; planning guided by PP concessions.
District heating expansion	Implemented / On-going	Strategic	District	Municipality, ECOENERGÍAS, VEOLIA, TERSA	Two operational networks + one in development. Expansion via PP concessions.
Building renovation	On-going	Partially mandatory (CTE)	Municipal	Municipality, COFELY/ENGIE, district managers	PEMEEM plan monitors 1,000+ installations; retrofits include EE, lighting, aerothermal, geothermal.
Renewable heating	Implemented	Voluntary / partly regulatory	District / Building	Municipality, ECOENERGÍAS, utilities	Incinerator heat recovery, biomass, cogeneration; used in district networks; pilots with renewable cooling.
Energy communities	Implemented	Voluntary	Neigh-borhood	Citizens, Municipality, local NGOs	District Clima supports citizen access to renewable energy via public installations; contracts for two communities active.
Pilot projects	Implemented	Strategic	Pilot	Municipality, private partners	Mini wind turbines, innovative cooling/heating solutions.
Citizen engagement	Partial	Voluntary	City-wide	Municipality, Citizens' Climate Assembly, NGOs	Participatory processes exist but limited co-creation; assembly reports, mainly informational.

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	MITECO, national research agencies (ENEA, RSE)	Technical guidance; policy alignment	Limited direct mandate; slow legislation	Knowledge support; national subsidies
Regional	ICAEN	Technical supervision; energy policy coordination	Lack of formal framework for concessions	Ongoing technical collaboration
Municipal	City departments, Agencia de Energia Barcelona	Planning, coordination, budget, public engagement	Budget constraints; departmental coordination fragile	Strong political backing
Utilities	ECOENERGÍAS (VEOLIA, Municipality, COPISA), District Clima	Network operation; DH expansion; energy production	Investment risk; dependence on customer uptake	Concession agreements

● Decision making process

Lead actor:	Municipality of Milan
Core decision-maker	Municipality: delegates to PP partners for implementation.
Integrator	Municipal energy agency and department coordinators.

Decision flow: *Planning → Political validation → Budget allocation → Utility/concessionaire implementation → Building-level connection → Monitoring.*

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- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipal departments, Energy Agency, ICAEN	Planning, coordination, technical assistance	Steering committees, working groups	Central decision-maker	Permanent / regular
Private Sector	ECOENERGÍAS, VEOLIA, TERSA, COFELY/ENGIE	DH implementation, investment, building-level connections	Technical meetings, project reports	Yes	Regular / project-based
Academia / Research	Universities, research spin-offs	Technical studies, feasibility, pilots	Project-based reports	Partial	Project-based
Citizens / Civil society	NGOs, Citizens' Climate Assembly, energy communities	End-users, support renewable adoption	Participatory processes, limited consultation	Partial	Ad hoc

Key tools:
☑ **One-stop-shop / municipal energy desk (information + support for retrofits)**
☑ **Digital engagement platforms (Decidim)**
☑ **Steering committees, concession contracts for DH expansion**

Quadruple helix status:
Partially operational

- ## Funding structure

Main sources:	Municipal budget (civil works, concessions), private financing
Role of financial actors:	Private concessionaires carry technical and financial risk; limited municipal exposure beyond upfront investments
Blending capacity:	Medium–Low; complex due to private-heavy investment model
Investment logic:	Area-based, tied to DH concession areas and public infrastructure support
Financial risk exposure:	Shared via concession agreements

Implementation results & barriers

Key Results:
- ✓ **Operational DHC infrastructure (District Clima, ECOENERGÍAS, Sagrera under development)**
- ✓ **EE improvements across ~1,000 monitored municipal buildings**
- ✓ **Implementation of renewable HC technologies in PP pilot projects**

Barriers

Legal	Lack of formal legislation for DH concessions, national fiscal incentives absent
Financial	High upfront investment (DH + retrofits); dependence on private partners
Technical	Integration with existing urban infrastructure; scaling DH to new districts
Social	Residential citizen uptake limited; low awareness for individual connections
Governance capacity	Complex coordination across municipal departments & with regional/national actors

Main bottleneck *Upfront investment risk and lack of national regulatory clarity.*

Key lessons for other cities

- Strong municipal leadership and political backing are critical for DH and energy network expansion.
- PP concession model allows scaling DH while sharing financial and technical risk.
- Citizen engagement and participatory processes require dedicated channels for meaningful co-creation.
- Early integration with municipal urban planning and infrastructure permits optimize DH network placement.

References: ECOENERGÍAS Barcelona / District Clima / Agencia de Energia de Barcelona – PEMEEM & Municipal Energy Plans

URBAN AGENDA for the EU

Building Decarbonisation

L4 **Brno** (Czech Republic)

Population: 400,000 **> 250,000 → Large cities**

Maturity

City level 🟢

Country level 🟠
(LHCP/NBRP integration)

Context

Brno is a large Czech city with a long-standing district heating tradition and a strong municipal role in energy management. The city operates a certified ISO 50001 energy management system and monitors approximately 250,000 buildings through a centralised data structure, supported by municipal involvement in energy supply. While national LHCP/NBRP integration remains mid-stage, Brno is often more advanced in implementation, transitioning from gas-based heating toward electrification and nuclear heat supply.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented	Yes (LHCP framework)	City-wide	Municipality; municipal utility	LHP aligned with EU standards; regulatory milestones every 4 years
District heating expansion	Implemented (expanding)	Strategic	City-wide	Municipality; private heat operator; national gov.; EU	Large-scale infrastructure project (Horkovod Brno–Dukovany); transition from gas
Building renovation	Implemented	Partially (national NBRP driven)	City-wide (progressive)	Municipality; private owners; housing sector	Gradual renovation starting from largest buildings; TA programmes
Renewable heating	Partial / expanding	Strategic	Pilot + district scale	Municipality; utilities; private actors	Electrification trend; hydrogen cluster under development; renewables increasing but cost-sensitive
Energy communities	Partial	Voluntary	Building level (limited)	Citizens; cooperatives; municipality	Early-stage; no large-scale heating communities yet
Pilot projects	Yes	Strategic	Cluster-based / pilot scale	Municipality; universities; utilities	Hydrogen cluster (early stage); learning-by-doing approach
Citizen engagement	Yes	Voluntary	City-wide	Municipality; NGOs; cooperatives	Subsidies for green roofs & EE; participatory programmes; behavioural change focus

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraints	Enablers
National Government	Ministries of: Industry and Trade; Environment; Regional Development	Define national LHCP / NBRP, building codes, EE targets, funding frameworks	Complex coordination; legal rigidity	Clear national targets
Regional	Regional Energy Office; regional building authority	Oversight of regional energy infrastructure, guidance for building renovation projects	Limited budget; varying technical capacity	Inter-municipal cooperation; provides regional data
Municipal	Departments of: Energy Management; Urban Planning; Environment	City-level planning, coordination, technical implementation, monitoring, citizen engagement	Staff limitations and budget constraints	Political support from city council; municipal ownership of utilities
Utilities	Brno City Utilities (district heating, electricity, gas)	Operates and maintains energy infrastructure, pilot projects, collects energy data	Existing DH system limits flexibility; investment-intensive	Full municipal ownership; technical expertise

● Decision making process

Lead actor:	*Municipality of Brno*
Core decision-maker	Municipal political leadership
Integrator	Energy Management Department (ISO 50001 certified)

Decision flow: *Planning → Political validation → Budget allocation → Utility coordination → Infrastructure / building implementation → Monitoring & reporting*

URBAN AGENDA FOR THE EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality; regional; national authorities	Planning; regulation; monitoring	Workshops; annual reporting	Yes	Permanent
Private Sector	Utilities; private companies; Chamber of Commerce; financial actors	Infrastructure; implementation; financing	Project agreements; coordination via Chamber	Yes	Regular / project-based
Academia / Research	4 universities	Pilot cooperation; modelling	Research agreements	Yes	Project-based
Citizens / Civil society	Homeowners; cooperatives; NGOs	Participation; behavioural change; project selection	Subsidy platforms; participatory programmes	Yes	Regular

Key tools:
☑ **Formal consultation processes**
☑ **Digital monitoring platform (building-level data system)**

Quadruple helix status:
Operational (project-based, not structurally institutionalised)

- ## Funding structure

Main sources:	Municipal budget; national subsidies; EU funds; private co-financing
Role of financial actors:	Project-based participation; agreements for infrastructure projects
Blending capacity:	Medium
Investment logic:	Infrastructure-first (DH backbone; nuclear-linked heat supply)
Financial risk exposure:	Shared but largely municipal exposure

Implementation results & barriers

Key Results:
✓ **City-wide monitoring system covering ~250,000 buildings (digital + sensors)**
✓ **Large-scale DH transition project (Horkovod Brno–Dukovany) under development**
✓ **Strong behavioural and citizen subsidy programmes (green roofs, EE schemes)**

Barriers

Legal	National legal complexity; regulatory interpretation delays
Financial	High infrastructure costs; limited subsidies; price sensitivity
Technical	Integration of new technologies in old buildings (some 200+ years old)
Social	Balancing affordability vs investment needs
Governance capacity	Limited specialised staff in energy management

Main bottleneck   Financial constraints combined with technical retrofitting complexity.

Key lessons for other cities

- Strong municipal data systems allow adaptive implementation, help detect inefficiencies early, and support evidence-based decision-making.
- Prioritizing DH networks and key infrastructure enables a scalable pathway for decarbonization.
- Continuous monitoring (building-level) accelerates learning and leak detection.
- Targeted subsidies and participatory programs encourage building owners and residents to adopt energy-efficient measures, enhancing local impact.

References: Municipal subsidy programme (green roofs & EE) / City participatory platform

URBAN AGENDA FOR THE EU
Building Decarbonisation

L 5 Espoo (Finland)

Population: 300,000 **> 250,000 → Large cities**

Context

Part of the Helsinki metropolitan area, the city is highly connected to DH (80% of buildings) and is rapidly advancing toward carbon neutrality by 2030. The city collaborates closely with Fortum, the private DH provider, regional authorities, and research partners, implementing renewable heat from wastewater, bioenergy, and electric boilers. Strong strategic frameworks such as the 100 Neutral Climate Cities platform and municipal EE agreements guide city-wide decarbonisation, though building renovations remain constrained by private ownership and permit-based regulations.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented	Voluntary / strategic	City-wide	Municipality, Fortum	Detailed mapping to support carbon neutrality planning; integrated with regional planning tools
District heating expansion	Implemented	Strategic	City-wide	Municipality, Fortum	Focus on renewable DH supply, including wastewater heat and bioenergy; collaborative investment and operation model
Building renovation	Partial	Voluntary	Pilot / district	Municipality, housing coops, private owners	Energy efficiency and sustainable retrofits; limited by building ownership and permit procedures
Renewable heating	Yes	Voluntary / strategic	Building / district	Municipality, Fortum, private owners	Waste heat from data centers, heat pumps, electric boilers; small-scale bioheating; strategy to replace remaining gas units with biogas
Energy communities	Partial	Voluntary	Building level	Municipality, tenants	Legal restrictions in Finland, but implemented as interoperable building solutions
Pilot projects	Yes	Strategic	City-wide	Municipality, EU project partners	EU-Horizon funded pilots (SPARKS) + national co-funding
Citizen engagement	Partial	Voluntary	City-wide	Municipality, NGOs, citizens	Events and campaigns to guide retrofitting and energy efficiency; learning focused rather than enforcement

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministries of Economic Affairs and Employment; Environment	Climate goals, national EE agreements, legal frameworks	Limited enforcement for local building actions	Strategic guidance; access to funding
Regional	Helsinki Metropolitan Area / HSY (Helsinki Region Environmental Services)	Provides climate data, supports HP, coordinates regional energy flows	Limited authority on private building retrofits	Technical and data support; integrated regional infrastructure
Municipal	City Board; Urban Planning & Environment Department; Strategic Department	Planning, budgeting, policy approval, coordination with DH providers and citizens	Limited control over private buildings; need for coops participation	Strong strategic planning culture
Utilities	Fortum (District Heating provider)	Investment, DH operations, renewable heat integration	Privately owned, limiting direct municipal control	Long-term collaboration agreements

● Decision making process

Lead actor:	*Municipality of Milan*
Core decision-maker	Municipal political leadership + coordination with Fortum
Integrator	Municipality coordinates with key partners through formal

Decision flow: *Planning → Political approval (City Board / EE Agreement) → Budget allocation → Utility & service provider implementation → Building-level actions (permits / coops)*

URBAN AGENDA for the EU — **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City Board; Urban Planning & Environment Dep; Strategic Department; Climate Watch	Planning, coordination, policy guidance	EE Agreements; strategic meetings	Yes	Permanent
Private Sector	Fortum (DH provider), private building owners, SMEs	Implementation of DH projects, building-level retrofits	Strategic agreements; permit procedures	Yes	Regular / project-based
Academia / Research	Local universities, research centres	Data analysis, pilot projects, monitoring support	Collaboration under EU projects and 100 Neutral Cities	Partial	Project-based
Citizens / Civil society	NGOs, tenant coops	Participation in EE and retrofitting programs	Events, campaigns, citizen workshops	Partial	Ad hoc

Key tools:
☑ **Climate Watch digital platform**
☑ **Regional climate & DH guidelines**

Quadruple helix status:
Partial but operational, with strong collaboration on district-level projects

- ## Funding structure

Main sources:	Municipal budget; EU funds (Horizon, INTERREG); national agencies
Role of financial actors:	Facilitate project co-funding, provide investment guarantees; Fortum invests in DH upgrades; limited participation from financial sector
Blending capacity:	Medium
Investment logic:	Strategic / district-based
Financial risk exposure:	Shared between municipality and Fortum

📊 Implementation results & barriers

Key Results:
- ✓ **~70% of city's heating now carbon neutral, integrating waste heat, bioenergy, and electric boilers.**
- ✓ **EE agreements have achieved 7.5% reduction in municipal buildings' energy use, exceeding targets.**

Barriers

Legal	Energy communities limited by legislation; building permit-based constraints
Financial	Investment gaps for smaller buildings; subsidy reliance
Technical	Integration of diverse renewable heat sources into DH network
Social	Citizen engagement limited for small private houses; coops easier to retrofit than private owners
Governance capacity	Coordination across multiple municipal departments, regional authorities, and DH provider

Main bottleneck *Legal constraints on energy communities and building retrofits*

🌍 Key lessons for other cities

- Digital platforms like Climate Watch enable adaptive planning and tracking of decarbonisation progress.
- Collaboration with private DH providers accelerates renewable energy integration.
- A well-established DH network allows structured, scalable decarbonisation of urban heating.
- Targeted subsidies and participatory events encourage behavioural alignment.

References: Espoo Climate Watch / Helsinki Region Environmental Services / Finnish Ministry of Economic Affairs and Employment

URBAN AGENDA for the EU
Building Decarbonisation

The Hague (Netherlands)

Population: 549,160 **> 250,000 → Large cities**

Maturity

City level ●

Country level
(LHCP/NBRP integration) ●

Context | The Hague is actively preparing a municipal Heat Company and district heating strategy. The city combines data-driven planning, neighbourhood engagement, and alignment with national climate policies. Geothermal energy and social housing connections are central to the strategy. The city faces challenges with grid congestion, affordability, and engaging fragmented private homeowners.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Planned / In progress	Mandatory (Heat Act & Environmental Law)	City-wide / neighbourhood	Municipality, regional/national authorities, housing corporations	Preliminary HC Programme identifies neighborhood-level solutions based on building insulation, vulnerability, and infrastructure. Participatory stage.
District heating expansion	Pilot / Strategic	Mandatory for social housing connections	Inner city / District	Municipality, utilities, social housing corporations	Thermal heating operational for ~200 households (expanding to 400); future expansion plans link neighborhoods to geothermal heat sources.
Building renovation	Partial / Strategic	Voluntary (national subsidies)	Neighbourhood / City-wide	Social housing corporations, private owners, municipality	Insulation programs for homes with priority on vulnerable citizens; agreements with social housing corporations for DH connections.
Renewable heating	Pilot / Emerging	Voluntary / Strategic	Neighbourhood / District	Utilities, citizens, municipality, private investors	Leyweg geothermal plant operational (~2,000 households). Solar panels over parking lots. Mini DH grids for sports fields.
Energy communities	Yes / Strategic	Voluntary	District / Pilot scale	Municipality, utilities, social housing, SMEs, citizens	Pilot geothermal and DH connections; neighborhood energy hubs.
Pilot projects	Pilot / Emerging	Voluntary	Neighbourhood / Building	Utilities, citizens, housing corporations, energy service providers	Citizens and housing associations involved in mini heat grids and geothermal projects. Energy hubs for SMEs collaborative energy production.
Citizen engagement	Partial / Strategic	Voluntary	City-wide / neighbourhood	Municipality, NGOs, associations, citizens	18 neighborhood sessions, energy festivals, school programs, living labs, social media campaigns, multi-language information.

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Economic Affairs & Climate, national regulator	Heat Act, Environmental Law, subsidies	Subsidy dependence; limited financial flexibility	Provides legal framework, guidance, and funding
Regional	Provinces	Coordination and support for planning/development	Limited influence on city-level DH	Moderate technical assistance, data sharing
Municipal	City departments, Sustainability The Hague, Energy Transition Office	Planning, coordination, implementation, citizen engagement	Budget limitations; grid congestion	Political mandate; municipal energy fund; stakeholder convening
Utilities	Electricity & heat networks, Leyweg Geothermal, DH operators	Infras. implementation, maintenance, connections	Grid capacity, technical limits	Experience, collaboration with municipality

● Decision making process

Lead actor: *Municipality of the Hague*

Core decision-maker	Municipality, utilities, social housing corporations, national government
Integrator	Municipality, utility, energy service providers

Decision flow: *Planning → Neighbourhood consultation & technical assessment → Pilot design & funding application → Implementation via municipality/utility → Monitoring & feedback to national policy*

URBAN AGENDA for the EU

Building Decarbonisation

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City departments, social housing, Energy Transition Office	Planning, technical support, pilot facilitation	Interdepartmental governance, neighbourhood meetings	Yes	Permanent / ongoing
Private Sector	Utilities, energy service providers, SMEs	Implementation, investment, building-level decisions	Technical assistance, advisory boards	Yes	Project-based
Academia / Research	Universities (Rotterdam Applied Sciences, TNO), EU project partners	Data analysis, pilot evaluation, modeling	Project workshops, technical reports	Partial	Project-based
Citizens / Civil society	Homeowners, NGOs, cooperatives	End-user approval, engagement, feedback	Sustainability The Hague platform, festivals, capacity-building	Partial	Ad hoc / project-based

Key tools:
☑ **One-stop-shop / renovation hub: Sustainability The Hague**
☑ **Formal consultation processes via Climate Agreement & neighborhood meetings**
☐ **CRM platform not specified**

Quadruple helix status:
Partially operational, collaboration still resource intensive

- ## Funding structure

Main sources:	Municipal budget; National subsidies (critical), EU funds (ERDF, Horizon Europe for innovation and pilots
Role of financial actors:	advisory board participation, project-based guidance
Blending capacity:	Medium – still developing innovative financing mechanisms
Investment logic:	Pilot-based, neighborhood-focused deployment
Financial risk exposure:	Mainly municipal and utility-led

Implementation results & barriers

Key Results:
- ✓ Operational Leyweg geothermal plant supplying 2,000 households; additional capacity prepared for 2,000 more.
- ✓ Neighbourhood pilots mapping technical, social, and building conditions; 18 consultation meetings completed.

Barriers

Legal	Heat Act postponed previously; national coordination required
Financial	Insufficient municipal budget; dependence on national subsidies
Technical	Grid congestion, limited DH coverage, integration of new heat sources
Social	Multi-owner consent (75%) delays retrofit; awareness/acceptance challenges
Governance capacity	Coordination of energy communities, utilities, municipal projects resource-intensive

Main bottleneck Financing and grid constraints at neighbourhood scale

Key lessons for other cities

- Early integration of municipal planning with neighbourhood data ensures practical applicability.
- Energy communities require strong facilitation and support (multilingual and culturally aware).
- Pilot-based deployment with feedback loops strengthens decision-making for full-scale.
- Dedicated municipal energy funds can bridge initial investment gaps and leverage private capital.

References: The Hague Climate City Contract / Aardgasvrij – Sustainable Heating Transition / Duurzame energie opwekken en gebruiken / Municipality of The Hague. (2025). Betaalbare stadsverwarming: Den Haag werkt aan publiek warmtebedrijf

Building Decarbonisation

M1 Ludwigsburg (Germany)

Population: 94,860 **> 50,000** → **Medium-size cities**

Context

Ludwigsburg is a compact, innovative city with strong green policies historically promoted by Baden-Württemberg. It relies on a district-level energy agency for technical support and coordination with utilities, municipalities, and stakeholders. The city is transitioning from gas-based district heating to renewable options (solar thermal, biomass) while also promoting envelope retrofits in buildings.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Yes	Mandatory	City-wide / district	Municipality, Energy Agency, Utilities	DH plans developed in 2020; steering committees coordinate technical analysis and stakeholder input. National legislation now requires DH planning.
District heating expansion	Yes	Strategic	Priority DH areas	Utilities, Municipality	Expansion based on DH planning; decentralized systems identified; collective understanding of actors ensured via steering committees.
Building renovation	Yes	Voluntary but strongly encouraged	City-wide	Municipality, Housing companies, SMEs, Energy Agency	Annual advisory campaigns in 3 districts; increasing acceptance; data collection mechanisms still developing.
Renewable heating	Yes	Partially regulatory	Building / district	Utilities, Municipality, Energy Agency	Solar thermal plant (9.8 GW) – second of its kind in Germany; biomass plant in river proximity; CHP mostly fossil fueled.
Energy communities	Partial	Voluntary	Building level	Citizens, housing companies	No heating communities yet; PV communities exist nearby.
Pilot projects	Yes	Strategic	Selected pilot locations	Municipality, Utilities, Energy Agency	Solar thermal demonstration plant; scenario analyses and internal discussions included in legal framework.
Citizen engagement	Partial	Voluntary	City-wide	Citizens, NGOs, Craftsmen	Environmental topic groups; structured coordination with city; advisory campaigns integrated in DH planning.

🏛️ Governance model

• Multilevel governance

Level	Key actors	Role	Constraint	Enabler
Federal Government	Ministries: Economic Affairs & Climate Action (BMWK); Housing, Urban Dev. & Building (BMWSB); BMUV (Environment); KfW; Federal Network Agency (Bundesnetzgentur)	Provides subsidies, legal background, EE mandates	Legal changes every 2 years create uncertainty	National DH legislation; structured subsidies
Regional *(State / Baden-Württemberg)*	State ministries; green executive government	Historical green policies, DH planning promotion	Complex regulatory landscape	Strong early policy backing; technical guidance
District	Landreis Ludwigsburg	Permits, technical support / intermediary	Capacity gaps for small municipalities	Energy Agency association (39)
Municipal	Municipality, city departments	Decision-making, coordinating, implementing	Budget exposure	Steering committees, Energy Agency support
Utilities	SWLB (Ludwigsburg + Kornwestheim)	DH implementation, energy management	Complex business model	Municipal ownership; technical expertise

• Decision making process

Lead actor:	**Municipality of Ludwigsburg**
Core decision-maker	Municipal political leadership
Integrator	City administration + Energy Agency + Utilities

Decision flow: *Planning → Steering committee validation → Budget allocation → Implementation (DH, retrofits) → Building-level execution → Advisory campaigns*

URBAN AGENDA for the EU | Building Decarbonisation

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality; District Government; State authorities	Planning, permitting, technical support	Steering committees; DH platform (waerme-swlb.de)	Yes	Permanent / regular
Private Sector	Utilities (SWLB); Housing companies; SMEs; Craftsmen	Implementation, building-level retrofit, DH expansion	Technical workshops; advisory events; network of actors	Yes	Regular / project-based
Academia / Research	HFT Stuttgart (University of Applied Science)	Smart city approaches; scenario modelling; technical advice	Research reports; pilot analyses	Partial	Project-based
Citizens / Civil society	Citizens, cooperatives, NGOs	Environmental input; participation in consultations; acceptance of DH & retrofits	Advisory campaigns; public meetings; participatory processes	Partial	Ad hoc

Key tools:
☑ **Steering committees & DH platform**
☑ **Advisory campaigns & consultation meetings for citizens**
☐ Dedicated CRM / one-stop-shop for retrofits not identified

Quadruple helix status:
Partial but operational via DH planning steering committees.

- ## Funding structure

Main sources:	Municipal budget, national subsidies, private co-financing for household retrofits; small-scale renewable installations
Role of financial actors:	Kreissparkasse Ludwigsburg collaborates with municipalities and utilities for plant financing; focus on business-economic model rather than risk sharing.
Blending capacity:	Medium – projects combine municipal funds, national subsidies, and private investment.
Investment logic:	Area-based DH expansion; strategic pilot demonstrations; retrofits in high-visibility districts.
Financial risk exposure:	Primarily borne by municipalities; household participation limited by capacity.

Implementation results & barriers

Key Results:
- ✓ **District Heating (DH) plans developed and operational**
- ✓ **Solar thermal plant (9.8 GW) – second in Germany; biomass plant implemented**

Barriers

Legal	Frequent changes in legislation; absence of stable long-term frameworks
Financial	Budget exposure for municipalities; household co-financing challenges
Technical	Complex DH expansion; integration of renewable heating options
Social	Multi-owner approvals; slow adoption of new technologies
Governance capacity	High coordination demand; smaller municipalities limited expertise

Main bottleneck *Legal uncertainty and evolving national/federal policies*

Key lessons for other cities

- Early and continuous multi-stakeholder engagement ensures collective understanding.
- Energy agencies acting as technical integrators improve implementation quality and capacity.
- Clear legal frameworks and predictable subsidies are crucial for long-term planning.
- Municipal ownership of utilities simplifies implementation and aligns incentives.

References: KWP Ludwigsburg DH & heat planning report / Solar Thermal Plant & Renewable Energy Projects / District Heating platform & steering committees / German DH law – §17/18 Wärmeplanung

URBAN AGENDA for the EU

Building Decarbonisation

M² Mechelen (Belgium)

Population: 86,920 **> 50,000 → Medium-size cities**

Context

Mechelen is part of Flanders, one of three regions in Belgium, with separate regional energy policies (Walloon, Brussels, Flanders). Heat Plans are voluntary in Flanders, with pilot integration of LHCP and NBRP only at neighbourhood level. Key collaborations involve local municipality, Flemish Energy Agency, and environmental departments. Historic city centre and multi-family buildings create additional complexity.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Pilot	Voluntary	neighbourhood	Municipality, Flemish Energy Agency, Covenant of Mayors	Heat Plan developed in Climate Neighborhood pilot integrating local energy demand mapping and feasibility for heat networks.
District heating expansion	Pilot	Voluntary	neighbourhood	Municipality, private operators	Feasibility study for ring road DH network; integrated with underground space planning.
Building renovation	Pilot	Voluntary	District / building	Municipality, property owners, condominium associations	Pilot combines LHCP and NBRP goals; technical assistance provided to multi-family buildings.
Renewable heating	Pilot	Voluntary	District / building	Municipality, private installers, building owners	Integration tested in pilot district; focus on feasibility and fossil-fuel-free readiness.
Energy communities	Not yet	Voluntary	—	Citizens, NGOs	No heating communities yet; PV communities at limited scale.
Pilot projects	Yes	Voluntary	3 pilots	Municipality, Flemish Environmental Department	Climate Neighborhood pilot integrating heat planning and building renovation; testing multi-sector integration.
Citizen engagement	Partial	Voluntary	Pilot area	Citizens, businesses, municipality	Transition arena workshops, circular engagement approach, networking events to collect stakeholder input.

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government *(Federal)*	Federal Ministry of Energy & Environment	Funding guidance, policy frameworks, data provision	Limited coordination mechanisms	Strong technical expertise; Covenant of Mayors support
Regional *(Flanders)*	Flemish Energy Agency; Env. Department	Heat Plan support; technical advice; partial financing	Voluntary HPs; low mandatory compliance; cultural separation	Pilot support; technical expertise
Municipal	Climate Team, Policy Advisors	Planning, coordination, pilot implementation, local data collection	Limited municipal technical and financial capacity	Close interaction with local stakeholders; pilot-driven learning
Utilities	VEKA, private installers	Feasibility studies, implementation heat infrastructure	Coordination with multiple levels; fragmented projects	Technical expertise

● Decision making process

Lead actor: *Municipality of Mechelen*

Core decision-maker	City's Climate Team and municipal political leadership
Integrator	Climate Team with Flemish Energy Agency and environmental departments

Decision flow: *Pilot conception → Feasibility & mapping (technical study) → Stakeholder engagement → Pilot implementation (district-level) → Evaluation & learning for scaling → Feedback to regional and national levels*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Climate Team, municipal departments, Flemish Energy Agency, Environmental Dept	Planning, coordination, technical assistance	Workshops, Transition Arena, pilot briefings	Yes	Pilot-based
Private Sector	VEKA, installers, real estate developers	Implementation, technical advice, feasibility	Workshops, pilot events, technical consultations	Yes	Pilot-based / project-based
Academia / Research	Universities, consultants	Data analysis, modeling, technical assessment	Masterclasses, research collaboration	Partial	Ad hoc
Citizens / Civil society	Homeowners, NGOs, condominium associations	End-user input, approval for renovations	Transition Arena, networking events, surveys	Partial	Ad hoc

Key tools:
☑ **Transition Arena workshops:** Stakeholder engagement for Heat Plan and pilot
☑ **District / neighbourhood panels -** Pilot-based panels to integrate LHCP/NBRP measures
☑ **Area-based engagement -** focused on neighbourhood-level pilots.
☐ **City Market Place / financing platform;** under development.
☐ **One-stop shop / renovation hub –** planned

Quadruple helix status:
Emerging (financial sector not yet structurally engaged)

- ## Funding structure

Main sources:	Municipal budget (limited), Flanders regional support, EU funds via Covenant of Mayors or LIFE/Horizon programs, private co-financing (real estate developers)
Role of financial actors:	Advisory input, co-financing pilots, support for technical assistance
Blending capacity:	Medium – pilots combine EU funds and regional support
Investment logic:	Area-based: district-level pilot feasibility before scaling
Financial risk exposure:	Mostly borne by private actors in pilots; limited municipal risk

Implementation results & barriers

Key Results:
- ✓ **Climate neighbourhood pilot successfully integrated heat planning and renovation in one district (mobility, water, energy).**
- ✓ **Feasibility study for DH and renewable heating solutions.**

Barriers

Legal	Voluntary HPs; lack of binding integration between LHCPs and NBRPs
Financial	Limited municipal budget; complex blending of funds for pilot implementation
Technical	Multi-family building complexity: limited installers trained for low-temperature/fossil-free systems
Social	Condominium owner engagement; multi-owner decision-making slow
Governance capacity	Fragmentation across municipal, regional, and national levels; weak intermediary / coordination structures

Main bottleneck   *Lack of structured collaboration between regional agencies and local municipality.*

Key lessons for other cities

- Pilots at neighbourhood scale are effective to integrate LHCPs and NBRPs.
- Clear roles for each governance level are critical.
- Circular stakeholder engagement improves design relevance and buy-in.
- Integration depends on context; replication requires local capacity + flexible policy framework.

References: Climate neighbourhood project – Mechelen / Covenant of Mayors Flanders / Heat mapping-energy dashboards

URBAN AGENDA FOR THE EU

Building Decarbonisation

M³ **Oostende** (Belgium)

Population: 71,560 **> 50,000** → **Medium-size cities**

Maturity

City level ●

Country level ●
(LHCP/NBRP integration)

Context

Oostende operates within Belgium's federal structure where climate, renovation, spatial planning and grid planning responsibilities are divided between the Flemish Government, municipalities and independent utilities. While the city has developed advanced district-level heat master planning and bankable transition projects, structural integration between LHCPs and NBRPs remains weak due to institutional fragmentation and parallel planning systems.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Yes	Not mandatory	District-based zoning	Municipality (Energy & Spatial Planning Depts.), consultants	Technical Heating Plan with zoning for collective solutions; prioritisation based on cost-benefit and vulnerability
District heating expansion	Yes	Strategic	3 priority districts	Municipality; DH operator (waste incinerator-linked); DSO	Infrastructure-first approach in selected districts; third-generation system development
Building renovation	Yes (regional driver)	Mandatory (regional)	Building level	Flemish Government; homeowners	Flemish renovation obligation: renovation required within 5 years after property purchase
Renewable heating	Partial	Market-driven + obligation-linked	Building/district	DSO; private owners	Electricity network planning for heat pumps and solar; limited coordination with heat zoning
Energy communities	Partial	Voluntary	District/building	Energy cooperatives; citizens	Cooperative engagement in DH network and ownership discussions
Pilot projects	Yes	Strategic	3 districts	Municipality; private sector; citizens	District masterplans; pilot implementation to test regulation & finance models
Citizen engagement	Yes	Strategic	District level	Municipality; citizens; volunteers	District panels; "District University" masterclasses; participatory reorganisation workshops

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government *(Federal Belgium)*	Federal Public Services (FPS) Economy, Energy, Health, Environment; CREG (Commission for Electricity & Gas Regulation)	Energy market regulation; policies; tariff regulation; energy pricing framework	No competence over building renovation or DH planning	Federal fiscal instruments (e.g. VAT reductions on renovation/heating)
Regional *(Flemish Government)*	Ministry of Environment & Spatial Planning; Flemish Energy and Climate Agency (VEKA); Flemish Energy Regulator (VREG)	Building renovation standards; EPC obligations; DH framework & targets; subsidies; Local Energy & Climate Pact	Complex subsidy landscape	Strong regulatory push (EPC requirements); Binding local climate agreements
Municipal	Departments: Environment & Climate; Urban Planning; Energy Desk; City Council	Local heat mapping; SECAP implementation; stakeholder coordination; pilot development	Limited fiscal autonomy; dependency on regional funding	Participation in EU projects
Utilities	Distribution System Operator (electricity grid); DH operator	Investment planning; grid upgrades	Limited alignment	Infrastructure capacity

● Decision making process

Lead actor:	**Municipality of Oostende**
Core decision-maker	Municipal Council (district masterplans)
Integrator	Energy & Spatial Planning Departments

Decision flow: *Heat zoning & technical modelling → Cost-benefit & vulnerability analysis → District masterplan development → Political validation → Financing structuring (City Marketplace / EU facility) → Pilot execution → Scaling & subsidy alignment*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City Energy Dept.; Spatial Planning Dept.; Flemish Government (Energy & Housing)	Heat zoning; renovation regulation; subsidy schemes	Planning workshops; coordination meetings	Yes (city); Partial (regional)	Regular (city); periodic (regional)
Private Sector	DSO (electricity grid); DH operator; private developers; banks	Grid investments; DH infrastructure; feasibility studies; financing letters of support	Bilateral meetings; technical studies; City Marketplace platform	Partial	Project-based
Academia / Research	External consultants; universities (ad hoc)	Scenario modelling; building typology analysis	Technical workshops	Partial	Project-based
Citizens / Civil society	District panels; energy cooperatives; homeowners; volunteers	Feedback; co-ownership models; social affordability safeguards	District panels; "District University" masterclasses; participatory sessions	Partial	Structured during district planning

Key tools:
☑ **District panels** (area-based engagement)
☑ **City Marketplace** (EU-supported financing platform)
☐ **One-stop shop (under development)**
☐ **CRM / digital platform (app-based reporting, not fully structured)**

Quadruple helix status:
Operational at district level but structurally fragmented across governance tiers.

- ## Funding structure

Main sources:	Municipal budget, Regional subsidies, EU funds, Private co-financing.
Role of financial actors:	Banks / private investors provide letters of support to ensure bankability of district projects. Investment segmentation applied (good ROI / monitor / no capital group).
Blending capacity:	Medium – technically feasible but institutionally complex.
Investment logic:	District-based masterplanning → bankable project structuring → phased execution.
Financial risk exposure:	Shared between municipality (planning), utilities (infrastructure), and homeowners.

📊 Implementation results & barriers

Key Results:
- ✓ **Technical Heating Plan with district zoning completed**
- ✓ **Bankable masterplan developed including financing dashboard**

Barriers

Legal	Misalignment between regional renovation law and local heat planning
Financial	Bankability challenges; affordability concerns
Technical	Coordination between electricity grid upgrades and DH rollout
Social	Risk of gentrification; need for citizen ownership
Governance capacity	Fragmented institutional planning across three authorities

Main bottleneck *Institutional fragmentation between Flemish regional planning, municipal heat strategies, and independent DSO investment planning*

🌍 Key lessons for other cities

- District-level master planning can bridge renovation policy and heat infrastructure.
- Renovation obligations are powerful but require spatial integration to maximise impact.
- Early financial segmentation improves project bankability and social balance.
- Institutional coordination is more decisive than technical modelling capacity.

References: City of Oostende / Flemish Government / City Marketplace / Covenant of Mayors for Climate and Energy

URBAN AGENDA for the EU — Building Decarbonisation

M⁴ Vaasa (Finland)

Population: 69,820 **> 50,000 → Medium-size cities**

Maturity

City level 🟢

Country level 🟡
(LHCP/NBRP integration)

Context

Vaasa is a coastal city in western Finland, fully integrated with municipality-owned energy companies and an advanced district heating (DH) network covering most buildings. Over 90% of the local energy supply is already renewable, and the city combines DH with heat pumps and innovative storage solutions. Vaasa leverages strong collaboration with academia, industry, and citizens in a quintuple helix governance approach, with robust monitoring, pilot projects, and citizen engagement programs.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented	Voluntary/strategic	City-wide	Municipality, DH companies	Comprehensive mapping of heating systems; monitoring replacement of oil systems; 80% of buildings connected to DH
District heating expansion	Implemented	Strategic	City-wide	Municipality, DH companies	270 km network, 700 GWh/year; continuous expansion; integration with heat pumps, waste heat, future H2 production
Building renovation	Partial	Voluntary	City-wide	Housing companies, Municipality	EE and sustainability measures, including historical building retrofits; coordination with building coops
Renewable heating	Implemented	Strategic	Building / district	Municipality, DH companies, EPV	>55% waste heat from incineration, 6% from wastewater, ongoing electrification and storage; planning carbon capture for H2 production
Energy communities	Yes	Strategic	Pilot / district	Municipality, academia, industry	Nordic Energy Capital, system-level energy transition; digitalization of energy systems
Pilot projects	Partial	Strategic	Neighbourhood / building	Municipality, DH companies, housing coops	Smart grid solutions; inter-operable buildings for tenants to benefit from renewable sources
Citizen engagement	Yes	Strategic	City-wide	Municipality, NGOs, citizens	Green Leave EU award; participatory budgeting for EU funds; eco-bonus and workshops; energy education (schools + university)

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Economic Affairs and Employment (TEM); Finnish Climate Panel	Framework, emission targets, legislation guidance	National plans not legally binding for all cities yet	Science-based guidance
Regional	Regional Energy Agency (EPV)	Technical support, storage solutions, integration	Limited direct enforcement	Collaborative projects, data sharing
Municipal	City departments (Energy & Climate, Urb Planning, Housing)	Planning, funding allocation, citizen engagement	Resource-intensive; small staff	Direct control over municipal budget
Utilities	Municipal DH companies (Vaasa Energy, RENOVA)	Implementation of DH, heat pumps, waste heat	Complex coordination with private actors	Fully municipal-owned energy system

● Decision making process

Lead actor:	***Municipality of Vaasa***
Core decision-maker	City leadership, DH companies, electricity providers
Integrator	Municipality coordinating with RENOVA, EPV, academia, and

Decision flow: *Planning → Political validation → Budget allocation → Utility / energy company implementation → Building-level connection / citizen programs*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City departments; Energy & Climate; Urban Planning	Planning, funding, coordination	Meetings, steering committees	Yes	Permanent
Private Sector	DH companies, electricity providers, RENOVA	Infrastructure, investment, implementation	Project-based coordination	Yes	Regular / project-based
Academia / Research	Universities, Nordic Energy Capital	Knowledge, digitalization, pilot studies	Project-based workshops	Partial	Project-based
Citizens / Civil society	NGOs, housing coops, pupils	End-user engagement, participatory budgeting, energy education	Workshops, eco-bonus programs	Partial	Ad hoc / campaign-based
Environment	Schools, youth programs	Education, awareness	Energy education cafés	Partial	Ad hoc / project-based

Key tools:
☑ **Participatory workshops, energy education, EU Green Leave campaign**
☐ **One-stop shop / renovation hub – under development**
☐ **CRM / digital platform – pilot ongoing for citizen engagement**

Quadruple helix status:
Fully operational model where all actors participate, ensuring shared responsibility

- ## Funding structure

Main sources:	Municipal budget; National subsidies; EU funds (Horizon, INTERREG)
Role of financial actors:	Participatory budget, advisory support, partial risk-sharing via municipal-led investments
Blending capacity:	High due to combination of municipal, national, and EU funds
Investment logic:	City-wide decarbonization, pilot projects, and DH network expansion
Financial risk exposure:	Primarily borne by municipality, mitigated by municipal-owned energy companies

Implementation results & barriers

Key Results:
- ✓ **Advanced DH network covering 80% of buildings with >90% renewable energy supply**
- ✓ **Implementation of innovative waste heat utilization, heat pumps, and energy storage (including underground heat storage in old oil mines)**

Barriers

Legal	Energy communities restricted by legislation; no mandatory LH mapping yet
Financial	Investment in historical building retrofits and new renewable tech
Technical	Integration of storage, heat pumps, and DH in old buildings
Social	Adoption of heat pumps on the outskirts; resistance to changing oil heating
Governance capacity	Coordination across multiple actors, resource-intensive project management

Main bottleneck   *Lack of stable and structured national decarbonisation framework.*

Key lessons for other cities

- Strong municipal ownership of energy systems accelerates implementation and enables full control over DH network planning.
- Integrated monitoring and data collection supports adaptive management and rapid learning.
- Collaborative quintuple helix governance ensures all actors participate effectively.
- Participatory citizen engagement and incentive programs enhance behavioural alignment

References: Vaasa Municipality Climate & Energy Portal / Nordic Energy Capital – Portico digital energy platform / EPV – Energy and heat storage solutions / EU Green Leave Campaign – citizen participation

URBAN AGENDA for the EU

Building Decarbonisation

M⁵ Kladno (Czech Republic)

Population: 70,000 **> 50,000** → **Medium-size cities**

Context

Kladno is a historically industrial city in the Central Bohemian Region, located near Prague. District heating infrastructure exists and is partly city-owned (distribution via TEPO), while generation involves private actors. No official Local Heat Planning (LHCP) is adopted. Integration between heating and renovation strategies remains informal and project-based (SPARCS). Political backing for implementation is limited, and funding constraints slow down decarbonisation. The city is a signatory of the Covenant of Mayors.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	No official LHCP	Not mandatory	City-level (analytical)	Municipality; CTU Prague	PED modelling under SPARCS EU project based on winter stadium waste heat.
District heating expansion	Implemented	Strategic	City-wide	Municipality; TEPO; private operator	Operational DH; electricity generation to stop by 2027; planned PV integration; price negotiations ongoing.
Building renovation	Implemented	Subsidy-driven	~180 municipal buildings	Municipality	Insulation and energy efficiency upgrades in public buildings; limited residential uptake.
Renewable heating	No; 2027 transition plan	Strategic	Municipal / pilot	Municipality; TEPO	Planned shift toward PV and lower CO_2 mix; waste heat recovery conceptualised.
Energy communities	Pilot	Voluntary	Pilot (housing associations)	Building committees	6-month pilot with house owner associations; early stage.
Pilot projects	Yes (mainly analytical)	Strategic	Pilot	Municipality; CTU Prague	SPARCS & GLOCALFLEX studies; energy broker platform; limited physical demonstration.
Citizen engagement	Partial	Voluntary	Limited	Municipality	LIFE energy hub; communication challenges with vulnerable groups.

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Industry & Trade; national subsidy bodies	Defines regulatory framework; provides subsidies	No mandatory LHCP; limited structured integration	Access to national subsidies
Regional	Central Bohemian Region	Limited coordination	Weak integration capacity	Knowledge exchange
Municipal	Municipality of Kladno	Planning; budgeting; political leadership	Limited fiscal capacity	ISO 50001; SPARCS participation
Utilities	TEPO (city-owned)	DH management; infrastructure operation	Split ownership of generation/distribution	Municipal ownership

● Decision making process

Lead actor: *Municipality of Kladno*

Core decision-maker	Municipal political leadership
Integrator	Energy & Management Municipal Department

Decision flow: *Planning (technical modelling with CTU) → Political validation → Budget allocation (municipal/subsidy) → TEPO operational implementation → Building-level execution*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality; TEPO	Planning; DH management; budgeting	Internal coordination	Yes	Permanent
Private Sector	Industrial actors (e.g. LEGO, DACHSER); SMEs	CO_2 reduction in operations	Project meetings	Yes	Project-based
Academia / Research	Czech Technical University in Prague	Energy modelling; PED studies	SPARCS collaboration	Yes	Continuous (project-based)
Citizens / Civil society	Housing associations; homeowners	Pilot energy communities	Public meetings	Partial	Ad hoc

Key tools:
☑ **Energy broker platform (SPARCS internal data tool – not publicly accessible)**

Quadruple helix status:
Emerging and weakly operational (strong academia involvement)

- ## Funding structure

Main sources:	Municipal budget; national subsidies; EU funds (SPARCS, GLOCALFLEX); limited private investment
Role of financial actors:	No structured involvement; no formal risk-sharing mechanisms
Blending capacity:	Low–Medium
Investment logic:	Project-based (not area-based)
Financial risk exposure:	Primarily borne by municipality

Implementation results & barriers

Key Results:
- ✓ **Operational city-owned utility (TEPO) managing DH system.**
- ✓ **Completion of city-wide energy modelling under SPARCS.**
- ✓ **Pilot energy community experimentation with housing associations.**

Barriers

Legal	No binding obligation for LHCP at municipal level
Financial	Limited municipal budget; dependency on competitive subsidies
Technical	Energy platform still semi-manual; modelling not translated into execution
Social	Weak citizen engagement; communication challenges with vulnerable groups
Governance capacity	Limited high-level political backing; fragmented coordination

Main bottleneck   *Insufficient political commitment and secured funding to move from analytical studies to concrete implementation.*

Key lessons for other cities

- Political validation must precede technical modelling to ensure implementation.
- Academic partnerships can compensate for limited municipal technical capacity.
- Municipal ownership of private utilities is a structural enabler.
- EU projects risk remaining theoretical without secured local co-financing.

References: City of Kladno / SPARCS Project / Covenant of Mayors / Czech Technical University (UCEEB)

URBAN AGENDA for the EU

Building Decarbonisation

M6 Nicosia (Cyprus)

Population: 55,000 **> 50,000** → **Medium-size cities**

Context

Nicosia is the capital of Cyprus and operates in a highly centralised governance framework where energy utilities and most building-related competences remain under national authority. The city does not yet have a dedicated decarbonisation action plan but implements individual climate and energy measures mainly through EU-funded projects. Structural constraints include limited municipal competences, financial capacity gaps, protected historical buildings, and the geopolitical division of the city.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	No	No	–	–	No local heat planning framework in place
District heating expansion	No	No	–	–	No DH system exists
Building renovation	Partial	Voluntary	Building level	Municipality, private owners	Bioclimatic and energy efficiency criteria promoted mainly for new buildings; historic buildings protected by law limit interventions
Renewable heating	Partial	Voluntary / strategic	Pilot / building	Municipality, universities, Electricity Authority of Cyprus	PV installations in universities and municipal facilities (planning phase); LED street lighting fully implemented
Energy communities	Yes	Voluntary	Pilot	Municipality, citizens	First energy community in Cyprus supported by EU funding
Pilot projects	Yes	Strategic	Pilot	Municipality, EU partners	EU Cities Facility investment plan for PV and EV chargers; digital twin initiative under development
Citizen engagement	Partial	Strategic	Project-based	Municipality, citizens, NGOs	Public consultations, surveys via EU projects, municipal app (14,000 users), youth participation initiative under development

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraints	Enablers
National Government	Ministry of Interior; Ministry of Energy; Commerce and Industry	Building legislation, protected heritage regulation, renewable schemes; energy policy & subsidy scheme	Strong centralisation limits municipal autonomy	National subsidy schemes
Regional	Nicosia District Local Government Organisations (5)	(5) Permit issuance	Administrative complexity	Formal cooperation
Municipal	EU & International Relations Unit; Technical Services Department; Urban Planning Unit; Mayor's Office	Project initiation and coordination; funding applications; permit issuance; regulatory oversight; stakeholder coordination	Limited competences and financial capacity	EU project participation
Utilities	Electricity Authority of Cyprus	Solar panel schemes, grid regulation	National-level control	Technical expertise

● Decision making process

Lead actor:	**Municipality of Nicosia**
Core decision-maker	Municipality, national ministries, Electricity Authority of Cyprus
Integrator	Municipal technical services department

Decision flow: *Project concept development→ Consultation with national ministries & utility → Political validation → Funding application submission → Implementation*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality of Nicosia, National Government, Nicosia District Local Government Organisations	Project coordination; funding; permit issuance; regulatory oversight	Project-based working groups; consultations for permits	Shared competence national/regional level	Regular for ongoing projects;
Private Sector	National Electricity Authority of Cyprus (EAC), Chamber of Commerce, SMEs, Commercial banks	Implementation; advisory role; potential co-financing	Business Council meetings for banks; project coordination meetings	Partial	Project-based; irregular
Academia / Research	University of Cyprus Other universities located in Nicosia	Pilot development; youth engagement; smart city initiatives	workshops consultations	Partial	Project-based
Citizens / Civil society	Residents, NGOs, Youth groups, Participants in Energy Community	Feedback loops; surveys; involvement in energy community	Public consultations; municipal mobile app (14,000 users); developing Youth Portal	Consultative, not co-decisional	

Key tools:

☑ **Municipal digital app** (issue reporting & surveys)
☑ **Public consultations**
☐ **Fully operational renovation one-stop-shop (under development)**

Quadruple helix status:
Partially operational through EU-funded projects

- ## Funding structure

Main sources:	EU funds (EU City Facility, LIFE, Horizon Europe, Erasmus+), national subsidies.
Role of financial actors:	Banks/private investors participate in project-specific financing (energy communities).
Blending capacity:	Moderate to low. While combining EU, national and limited municipal funds is possible, it is administratively complex and slow.
Investment logic:	Opportunity-based and funding-led, rather than embedded in a long-term strategy.
Financial risk exposure:	Primarily borne by the Municipality during project preparation and co-financing stages; partial risk-sharing only in energy community schemes.

Implementation results & barriers

Key Results:

- ✓ **Establishment of the first energy community in Cyprus**
- ✓ **Development of PV investment plan and EV charging strategy**

Barriers

Legal	Protected heritage buildings; central control over utilities
Financial	Limited municipal budget; high dependency on EU funds
Technical	Lack of in-house technical capacity
Social	Stakeholder mobilisation and long-term engagement challenges
Governance capacity	Limited municipal competence within a highly centralised governance system

Main bottleneck   *Restricted autonomous energy planning and infrastructure decision-making*

Key lessons for other cities

- In highly centralised governance systems multilevel coordination is critical.
- Funding-driven action without a structured climate plan leads to fragmented implementation.
- Digital citizen engagement tools can strengthen responsiveness and trust.
- Energy communities can act as a catalyst for broader energy transition governance reform.

References: Municipality of Nicosia / Electricity Authority of Cyprus / EU City Facility / Covenant of Mayors for Climate and Energy

Building Decarbonisation

M7 Vitoria-Gasteiz (Spain)

Population: 260,000 **> 50,000** → **Medium-size**

Context

Vitoria-Gasteiz has developed integrated energy and building decarbonisation initiatives at city level, leveraging participatory approaches, energy communities, district heating projects, and bottom-up citizen engagement. Strong interdepartmental collaboration and partnerships with private and research actors underpin strategic implementation, supported by municipal frameworks like OPENGELA and the 100 Cities Mission.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented	Voluntary	City-wide	Municipality, Climate & Energy Service	Mapping used to design interventions and support citizen engagement
District heating expansion	Implemented	Voluntary	District (Coronación)	Municipality, municipal utilities	Large community boiler; pilot project to cover residential and municipal buildings
Building renovation	Implemented	Voluntary	District / Pilot (Zaramaga)	Municipality, Ensanche 21, private owners, architects	Participatory planning; residents decide contracting; one-stop-shop support
Renewable heating	Implemented	Voluntary	Municipal buildings / pilot projects / District	Municipality, Utilities	Heat pumps and renewable energy in new offices; focus on A-grade EE
Energy communities	Multiple pilot interventions implemented	Voluntary	District / Building	Municipality, Ensanche 21, citizens, architects	Zaramaga pilot with participatory selection of contractors
Pilot projects	Initiated	Voluntary	Pilot / District	Citizens, Municipality	Citizen engagement & one-stop-shop. Data collected from 50 households
Citizen engagement	Fully operational	Voluntary	District / City-wide	Citizens, Municipality, NGOs	Participatory planning, forums, workshops, digital platform (OPENGELA)

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Spanish government	Legal framework (CTE)	Only licensing mandatory	Central regulation ensures minimal building standards
Regional	Gobierno Vasco	Supports coordination, provides technical support, enables funding approvals	Competence split can slow projects	Steering committee and forums facilitate integration
Municipal	City departments (Sustainability, Architecture, Culture)	Planning, coordination, implementation, citizen engagement	Resource-intensive	OPENGELA one-stop-shop, interdepartmental teams, civic centres
Utilities	Municipal utility for DH, energy management	DH implementation, data provision	Limited scope; competences split	Integration with pilot projects

● Decision making process

Lead actor:	***Municipality of Vitoria-Gasteiz***
Core decision-maker	Participating citizens (specially in building retrofit projects)
Integrator	OPENGELA (municipal one-stop-shop) + municipal departments

Decision flow: *Planning → Participatory citizen engagement → Architectural/technical design by municipal/private teams → Residents approve design + select contractor → Budget allocation → Implementation → Monitoring and feedback*

URBAN AGENDA for the EU

Building Decarbonisation

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	City departments Ensanche 21, Gobierno Vasco	Planning, coordination, project implementation, interdepartmental integration	Steering committees, OPENGELA one-stop-shop, neighborhood forums	Yes	Permanent / regular
Private Sector	Contractors, SMEs, building owners, banks (via credit lines for retrofits)	Project implementation, financing, investment support	Advisory boards, PP meetings	Yes	Project-based / regular
Academia / Research	Universidad País Vasco (UPV), CEAP	Knowledge contribution, technical studies, pilot design, evaluation	Research collaborations, pilot studies, technical advice	Partial	Project-based
Citizens / Civil society	Residents, cooperatives, NGOs	Active decision-making, feedback, participation in energy communities	OPENGELA platform, forums, surveys	Partial	

Key tools:
☑ **One-stop shop / renovation hub: OPENGELA office**
☑ **Formal consultation processes: AUZOGUNE neighborhood forums – participation portal**
☑ **CRM / online stakeholder platform: citizen web platform with energy and project feedback**

Quadruple helix status:
Partially operational, strong citizen participation

- ## Funding structure

Main sources:	Municipal budget, regional/Spanish subsidies, EU funds, private finance
Role of financial actors:	Participate in advisory and risk-sharing forums; ensure feasibility of resident-led investments
Blending capacity:	Medium; integration of public and private funds underway
Investment logic:	Project-based; district or pilot focused
Financial risk exposure:	Shared via PP collaboration; OPENGELA provides risk mitigation and oversight

Implementation results & barriers

Key Results:
- ✓ **Successful participatory refurbishment of 22 buildings in Zaramaga**
- ✓ **DH in Coronación district, integrating municipal and social housing.**
- ✓ **Citizen engagement hubs (OPENGELA, AUZOGUNE) enabling continuous bottom-up input.**

Barriers

Legal	Limited national regulation for energy communities and participatory retrofit
Financial	Integration of PP funding; credit lines depend on municipal/financial cooperation
Technical	Scaling pilot solutions to city-wide implementation; renewable integration and monitoring
Social	Citizen participation requires continuous engagement; older residents need support to understand interventions
Governance capacity	Interdepartmental coordination required; complex planning & approval processes

Main bottleneck   *Ensuring effective citizen participation and integration of financial instruments*

Key lessons for other cities

- Bottom-up citizen engagement can drive building retrofit and DH adoption.
- One-stop-shop offices facilitate technical support and citizen decision-making.
- Pilot projects are essential to learn and adapt processes before scaling city-wide.
- Strong interdepartmental municipal coordination enables multi-sector integration.

References: Vitoria-Gasteiz – Oficina de Transformación Energética (OPENGELA) / AUZOGUNE – Neighborhood participation fórums / Ensanche Eco-district / IURC – Urban Cooperation / AVS Euskadi – public housing & urban development association

URBAN AGENDA FOR THE EU

Building Decarbonisation

M **8** **Pécs** (Hungary)

Population: 74,000 **> 50,000** → **Medium-size**

Maturity

City level ●

Country level ●
(LHCP/NBRP integration)

Context

Pécs has a long-standing district heating (DH) system, largely biomass-based (95% carbon neutral), serving 45% of households. Large prefabricated building stock (~38.5%) provides opportunities for energy retrofitting. The city participates in the EU "100 Smart and Neutral Cities" initiative (climate city contract 2023), with pilot projects for building retrofit, smart metering, renewable heating, and citizen engagement.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Implemented	Partially aligned (EED / DH Act)	City-wide	Municipality, PÉTÁV, national regulator	Mapping and planning conducted; large DH already decarbonised.
District heating expansion	Partially implemented	Strategic / voluntary	Small-scale extensions	Municipality, PÉTÁV	Limited expansion; large new pipelines not planned.
Building renovation	Partial	Voluntary	Pilot / city-wide	Municipality, private owners, contractors	Prefabricated buildings retrofitted; 2 pilot buildings (2004–2010); energy audits.
Renewable heating	Pilots completed; on-going scaling	Voluntary	Pilot / district	Municipality, Pécs Univ., Contactelectro, PÉTÁV	Biomass for DH; solar farm study (80 MW peak); hydrogen research and pilot integration.
Energy communities	Pilot phase	Voluntary	Pilot	Citizens (50 households engaged), municipal company	Smart metering and energy automation trials; limited households involved.
Pilot projects	Implemented	Strategic	Pilot	Municipality, PÉTÁV	Implemented building retrofits, smart meters.
Citizen engagement	Initial phase; limited scope	Voluntary	Pilot	Municipality, citizens	Digital platform for energy data; participatory communication campaigns.

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministries, national regulators	Regulatory framework, limited support	Centralized decisions; low feedback mechanisms	Energy legislation aligned with EED; future DH plan requirement
Regional (County)	County-level authorities	Advisory, voting in steering committee	Limited autonomy	Participation in climate governance structures
Municipal	Municipality departments, PÉTÁV, Urban Development Company	Planning, implementation, stakeholder coordination	Budget and technical capacity constraints	Integrator role, one-stop-shop operation
Utilities	PÉTÁV	DH operations, renewable integration	Limited expansion scope	Decarbonized DH system, biomass-based

● Decision making process

Lead actor:	**Municipality of Pécs**
Core decision-maker	Municipal political leadership / Steering Committee (PÉTÁV -DH Company + other actors)
Integrator	Pécs Urban Development Company

Decision flow: *planning → pilot implementation → learning → scaling up*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality, municipal companies	Planning, coordination, technical assistance	Climate Platform, Steering Committees	Yes	Permanent
Private Sector	SMEs, private building owners, Contactelectro	Implementation, investment, data sharing	Advisory sessions, workshops	Yes	Project-based
Academia / Research	Pécs University, renewable research centers	Technical studies, pilot support	Project collaboration, technical reports	Partial	Project-based
Citizens / Civil society	Households, NGOs	Energy data, participation	Digital platform, events, campaigns	Partial	Pilot / ad hoc

Key tools:
☑ **One-stop shop / renovation hub (municipal digital platform for energy monitoring)**
☑ **Formal consultation processes (Climate Platform, Steering Committees)**
☐ **Dedicated CRM platform not yet established**

Quadruple helix status:
Partial but operational; financial sector still under development

- ## Funding structure

Main sources:	EU funds (LIFE, Horizon), municipal operational budget, national programmes
Role of financial actors:	Early stage; advisory support
Blending capacity:	Low; combining funding sources is complex
Investment logic:	Pilot-focused; scale-up requires future funding mechanisms
Financial risk exposure:	Primarily municipal / private company dependent

📊 Implementation results & barriers

Key Results:

- ✓ **DH system largely decarbonized (95%), biomass-based**
- ✓ **Two model-pilot for building refurbishments (energy efficiency measures, smart meters, and renewable integration)**
- ✓ **50 households engaged + pilot implemented**

Barriers

Legal	Energy community regulation still developing; regulatory gaps for smart grids
Financial	Limited access to green finance; EU funds partially utilized
Technical	Technical capacity constraints for large-scale retrofits and renewable integration
Social	Limited citizen participation at scale; awareness campaigns ongoing
Governance capacity	Coordination intensive; multi-stakeholder steering committees require resources

Main bottleneck Financial, legal and regulatory constraints, making implementation resource-intensive.

🌍 Key lessons for other cities

- Municipal leadership is critical to integrate DH and building decarbonisation initiatives.
- Pilot projects and phased implementation facilitate learning and capacity building.
- Digital tools and one-stop-shop platforms enable citizen engagement and data-driven decision-making.
- Early alignment with national and EU frameworks reduces barriers, but flexibility is essential.

References: LEGOFIT Horizon Project – energy-efficient renovation of prefabricated buildings / Pécs Climate Platform – citizen engagement & DH coordination (internal city platform) / PÉTÁV District Heating Company

URBAN AGENDA for the EU

Building Decarbonisation

S1 Soria (Spain)

Population: 39,000 **< 50,000 → Small cities**

Context

Soria has developed advanced sustainability initiatives via LIFE CO2-0 and PEOPLE CO2-0 projects, establishing *"Zona de eco-inversión preferente"* and pilot energy renovation programs. The municipal administration leverages national and EU funding for building retrofits, renewable heating, and green infrastructure projects, complemented by citizen engagement and participatory processes. The city demonstrates cross-sector collaboration despite limits in private sector engagement and local capacity.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Pilot-level only	No	Pilot / neighbourhood	Municipality, CESEFOR, private utility REBI	No full municipal heat plan; data-driven RRP under RD 853/2021. Pilot integrating renewable heat for municipal buildings and community connection to DH
District heating expansion	Implemented	No	Neighbourhood / municipal buildings	Private utility REBI, Municipality	Challenges due to private ownership
Building renovation	Implemented	Partially	Municipal buildings / pilots	Municipality, contractors, EU programs	EE upgrades: market, police & social facilities
Renewable heating	Implemented pilots / Municipal buildings	Partially	Building / district	Municipality, REBI, contractors	Integration of renewable heating; private initiative REBI provides district heating using renewables
Energy communities	Not yet implemented	No	N/A	N/A	Considered in Soria roadmap
Pilot projects	Implemented	No	Pilot / neighbourhood	Municipality, CESEFOR, contractors, NGOs	LIFE projects (CO2-0, PEOPLE CO2-0) and national pilots
Citizen engagement	Implemented	No	City-wide	Municipality, NGOs, CESEFOR	Participatory Hoja de Ruta Soria 2030, digital platforms, workshops

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Transport, Mobility & Urban Agenda	Provides funding frameworks (Agenda Urbana)	No binding building decarbonisation	National financial support & technical guidance
Regional	Junta de Castilla y León	Provides grants for energy renovation projects; manages Next Generation/EU funds	Limited local discretion; competitive grants	Funding, technical frameworks
Municipal	Soria City Council	Planning, coordination, implementation	Staff capacity; municipal budget	Local political commitment
Utilities	REBI (private)	District heating provision; renewable heating supply	Private ownership limits municipal control	Provides renewable DH services to municipal and pilot buildings

● Decision making process

Lead actor:	*Municipality of Milan*
Core decision-maker	Municipality leads, with technical coordination by CESEFOR
Integrator	Oficina de rehabilitación energética

Decision flow: *Planning → Technical design → Funding applications → Implementation via municipal services / private contractors*

URBAN AGENDA for the EU · **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality of Soria; Junta regional	Planning, funding applications, pilot implementation	Workshops, steering committees	Yes	Permanent / project-based
Private Sector	REBI, contractors, SMEs, construction associations	Implementation, energy supply, building retrofits	Advisory meetings, technical support	Yes	Project-based
Academia / Research	Universidad de Valladolid – Cátedra Agenda Urbana	Knowledge generation, pathway analysis, technical advice	Collaborative workshops	Yes	Project-based
Citizens / Civil society	NGOs, cooperatives, citizens, CESEFOR	Consultation, participatory planning, feedback	Digital platforms, workshops, BRERA app	Yes	Project-based / ad hoc

Key tools:
☑ **One-stop shop / renovation hub –** <u>Oficina de Rehabilitación Energética</u>
☑ **Formal consultation processes –** <u>workshops under Hoja de Ruta Soria 2030</u>
☑ **Digital citizen engagement platform / app –** <u>BRERA project</u>

Quadruple helix status:
Strong public, research, and citizen participation

- ## Funding structure

Main sources:	EU funds (Next Generation, LIFE, PLTR), municipal budget, regional grants (Agenda Urbana, Castilla y León)
Role of financial actors:	Advisory support (Caja Rural de Soria, Chamber of Commerce)
Blending capacity:	Medium – complementary funding aligned with grant requirements
Investment logic:	Pilot- and neighborhood-based, voluntary prioritization via Hoja de Ruta Soria 2030
Financial risk exposure:	Primarily borne by municipality; private sector responsible for DH investment

Implementation results & barriers

Key Results:

✓ **Energy ERRP San Pedro el Carmen – energy renovation pilot at neighbourhood scale integrating multiple building types.**
✓ **Participatory integrated urban roadmap "*Hoja de Ruta Soria 2030*".**

Barriers

Legal	Limited binding national/regional mandates for energy renovation
Financial	Lack of upfront funding for disadvantaged communities; reliance on external grants
Technical	Shortage of skilled contractors; high cost of building retrofits
Social	Community expectation management; variable citizen engagement
Governance capacity	Municipal staff capacity; coordination required with multiple stakeholders

<u>Main bottleneck</u> *A combination of technical construction capacity with financial barriers.*

Key lessons for other cities

- Early establishment of dedicated energy/rehabilitation offices improves coordination.
- Combining municipal, regional, and EU funding is essential to overcome financial constraints.
- Structured citizen participation strengthens acceptance and prioritization.
- Public–research partnerships facilitate technical expertise and implementation support.

References: <u>ERRP San Pedro el Carmen</u> / <u>Hoja de Ruta Soria 2030</u> / <u>Cátedra Agenda Urbana UVa</u>

Building Decarbonisation

Samsø (Denmark)

Population: 3,660 **< 50,000 → Small cities**

Maturity

City level	🟢
Country level *(LHCP/NBRP integration)*	🟢

Context

Samsø is a Danish island municipality recognized worldwide as a model for renewable energy and circular economy. Self-sufficient in energy since 1997, the island produces more electricity than it consumes through local wind turbines and solar installations. Strong community ownership and stakeholder engagement underpin the climate-neutral vision for 2050. Municipal planning integrates building decarbonization, renewable heating, energy communities, water management, and circular agriculture.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Yes	No, strategic	Island-wide	Municipality, Samsø Energy Academy	Mapping of energy demand and potential, integrated with land-use and water management for district heating and electrification scenarios.
District heating expansion	Yes	No, strategic	Island-wide	Municipality, community-owned utilities	Multiple DH systems analyzed for electrification and straw/farming-based supply; community participation ensures ownership.
Building renovation	Partial	No, strategic	Pilot / municipal buildings	Municipality, citizens, SMEs	Municipal buildings refurbished; voluntary energy retrofits for private owners; challenges with legislation for circular materials.
Renewable heating	Yes	No, strategic	Island-wide	Municipality, citizens, utilities	Broad deployment of renewable solutions, integration with district heating, and community energy initiatives.
Energy communities	Yes	Voluntary / strategic	Island-wide	Citizens, cooperatives, SMEs	Citizens invested via loans since 1997; community-driven renewable energy ownership.
Pilot projects	Yes	No, strategic	Multiple pilots	Municipality, universities, NGOs	EU projects: LIFE ACT, INTERREG ReNutriWater, ØKS SOLAR FARM, HORIZON NBS4DRAUGHT; pilot circular agriculture, water reuse, and renewable energy integration.
Citizen engagement	Yes	Voluntary	Island-wide	Citizens, NGOs, municipality	Participatory workshops, co-creative planning, manifesto for climate action, continuous dialogue through master plan development.

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Climate, Energy and Supply	Sets climate law, funding, Climate Action Plans	Climate law applies only to government	National tripartite agreements
Regional	4 Danish regions	Coordination for cross-municipal transition projects	Limited direct influence on local projects	Intermunicipal knowledge sharing, project facilitation
Municipal	Municipality of Samsø	Local planning, implementation, stakeholder coordination	Small budget, reliance on voluntary engagement	Strong local community, long transition experience
Utilities	Community-owned DH, solar/wind coops	Implementation of renewable energy and heat systems	Technical limitations, integration challenges	Local ownership, citizen investment

● Decision making process

Lead actor:	*Municipality of Samsø*
Core decision-maker	Municipal Technical & Env. Committee, Municipal Financial Committee, Municipal Board Committee
Integrator	Samso Energy Academy (NGO) + municipal agencies

Decision flow: *Stakeholder workshops → Expert synthesis → Draft master plan → Political approval → Implementation → Feedback to national level (via Danish tripartite agreements and EU project reports)*

URBAN AGENDA for the EU

Building Decarbonisation

• Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality + Municipal Board; Technical & Env. Committee	Planning, coordination, decision-making on LHPs and master plan	Manifesto for Climate Action; workshops; Green Master Plan	Yes	Permanent
Private Sector	Local multiutilities; SMEs; farmers; tourism operators	Implementation of renewable energy, building retrofits, DH, CE projects	Workshops; project-specific meetings	Yes	Regular / project-based
Academia / Research	University of Copenhagen; Aarhus University; Seges; Velas	Knowledge, modeling, technical expertise, evaluation of pilots	Expert workshops; synthesis reports	Partial	Project-based
Citizens / Civil society	Cooperatives; local households; NGOs; energy academy	End-users, co-creation, participation in pilot projects, community investment	Workshops; stakeholder meetings; UNFCCC Climate Leaders award	Partial	Ad hoc / event-based

Key tools:
☑ **One-stop shop / advisory hub - technical guidance and project facilitation**
☑ **Formal consultation processes / Bottom-up workshops feed into Green Master Plan**
☑ **District / area-based engagement** for energy and land-use projects
☑ **City marketplace /** co-creation platform - Manifesto for Climate Action / masterplan
☑ **Supporting financing platform - Community-driven investments**

Quadruple helix status:
Fully operational through co-creative workshops

• Funding structure

Main sources:	Municipal budget, National subsidies, EU funds, local energy coops
Role of financial actors:	Limited structured involvement; private finance fragile
Blending capacity:	High –aligned with EU programmes, municipal budget, and citizen investment.
Investment logic:	Multi-sector, cross-cutting projects with pilot, district, and island-wide scales.
Financial risk exposure:	Primarily municipal and community-driven; low dependence on external investors.

📊 Implementation results & barriers

Key Results:
✓ **Self-sufficient in renewable electricity (solar, wind, and district heating).**
✓ **Citizen-led energy communities since 1997 with strong financial participation.**
✓ **Co-created Green Master Plan, aligning circular island strategies (energy, water, building, and land-use).**

Barriers

Legal	Regulatory barriers for circular building materials, limitations in national climate law applicability to municipalities
Financial	Small municipal budget; reliance on citizen investment; limited external PPPs
Technical	Integration of multi-utility systems; adaptation of older buildings
Social	Ensuring participation and buy-in from all residents; communication complexity
Governance capacity	High coordination demand across sectors and stakeholders; reliance on NGO facilitation

Main bottleneck *Complex national regulations and cross-sector coordination.*

🌍 Key lessons for other cities

- Strong local community ownership accelerates energy transition and citizen engagement.
- Bottom-up, co-creative governance ensures holistic integration.
- Multi-sector collaboration enables circular and sustainable solutions.
- Early and continuous stakeholder engagement reduces social resistance.

References: Samsø Climate Projects / Green Master Plan / UN Global Climate Action Award – Samsø

URBAN AGENDA for the EU

Building Decarbonisation

S³ Rethymno (Greece)

Population: 32,470 **< 50,000 → Small cities**

Maturity

City level ●

Country level ●
(LHCP/NBRP integration)

Context

Rethymno is a small Cretan municipality with a predominantly top-down governance structure for building decarbonisation. Competences on private buildings remain largely at national level. The municipality focuses on retrofitting its own building stock, energy efficiency measures (e.g. LED street lighting), and participation in emerging energy communities. Administrative complexity, archaeological permitting constraints, and limited municipal capacity significantly shape implementation speed.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	No	Not mandatory locally	—	National government	No formal local heat mapping; climatic conditions reduce urgency; national planning dominates.
District heating expansion	No	No	—	—	No DH or expansion plans.
Building renovation	Yes	4% annual target (strategic, not strictly enforced)	~10 municipal buildings	Municipality; national funding bodies	Schools and Town Hall retrofitted. One flagship municipal building operates close to zero-emission, producing surplus electricity in summer. Strong financial gap between estimated and real retrofit costs.
Renewable heating	Yes	Mandatory only for new buildings	Building-level	Private owners; installers	Solar thermal widely deployed in Crete for over 20 years.
Energy communities	Partial	Voluntary	Early-stage; building-level	Municipality; private owners; water & sewerage utility	Municipality participates in an energy community linked to water/sewerage services using RES to reduce demand. Framework still emerging nationally.
Pilot projects	Yes	Strategic	Building-level	Municipality	ERDF-funded demonstrators (e.g. Town Hall retrofit).
Citizen engagement	Partial	Formal consultation mandatory by law	Project-based	Municipality; citizens	Traditional consultation perceived as ineffective; exploring digital engagement tools (apps).

🏛 Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministries: Environment and Energy; Infrastructure and Transport	National Energy & Climate Plan; building legislation; funding calls; appliance replacement schemes	Strong centralisation; complex permitting; archaeological approvals	National subsidy schemes; regulatory clarity for new buildings
Regional	Region of Crete	Adapts national plans to regional needs; approves local adjustments	Administrative layers	Regional adaptation flexibility
Municipal	Municipality of Rethymno	Municipal building retrofit; local planning alignment; citizen encouragement	Limited decision-making power; staff shortage	Local technical knowledge; implementation experience
Utilities	Public electricity DSO; water / sewerage utility	Grid management; RES integration; energy community	National regulatory dependency	Operational collaboration with municipality

● Decision making process

Lead actor:	***Municipality of Rethymno***
Core decision-maker	National Government
Integrator	Municipal technical department

Decision flow: *National planning → Regional adaptation → Local alignment → Funding approval → Municipal implementation*

URBAN AGENDA for the EU · **Building Decarbonisation**

• Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality of Rethymno; Region of Crete; Ministry of Environment & Energy	Planning alignment; permitting; funding; implementation of municipal retrofits	Steering committees; working groups; formal approvals	Yes	Permanent (but top-down)
Private Sector	SMEs; private building owners; banks; utilities; energy community members	Building-level investments; RES deployment; loan provision	National subsidy schemes; information meetings; email coordination	Yes	Project-based
Academia / Research	National Technical University of Athens; Technical University of Crete	Technical advice; innovation support; technology assessment	Project collaboration; expert consultation	Partial	Project-based
Citizens / Civil society	Homeowners; energy community participants; local stakeholders	End-users; participation in subsidy calls; consultation input	Mandatory consultation meetings; exploring digital app-based engagement	Partial	Ad hoc

Key tools:
☑ **Formal consultation processes - Legally required for municipal plans**
☐ **One-stop shop / renovation hub - Not established**
☐ **Dedicated CRM platform - identified**

Quadruple helix status:
Emerging but structurally top-down

• Funding structure

Main sources:	Municipal budget (critical); national subsidies; ERDF funds; limited EU direct funding
Role of financial actors:	Provide loans (15–20 year repayment, sometimes interest-free); structured nationally
Blending capacity:	Low–Medium
Investment logic:	Opportunistic; funding-call driven
Financial risk exposure:	High for municipality (budget gaps between estimated and real retrofit costs)

📊 Implementation results & barriers

Key Results:
- ✓ **~10 municipal buildings retrofitted (schools, Town Hall)**
- ✓ **50% reduction in municipal energy demand (LED lighting & energy efficiency measures)**

Barriers

Legal	Complex permitting; archaeological approvals; overlapping laws
Financial	Insufficient municipal budget; large cost overruns; limited private co-financing
Technical	High retrofit cost for 30–40-year-old buildings
Social	Consultation fatigue; limited bottom-up mobilisation
Governance capacity	Severe staff shortage; high administrative burden

Main bottleneck *Centralised decision-making combined with limited municipal administrative capacity.*

🌍 Key lessons for other cities

- Municipal retrofits can serve as visible demonstration projects, even in centralised systems.
- Strong alignment with national funding calls is essential in top-down governance models.
- Administrative capacity (dedicated Energy Office) is critical for continuity and scaling.
- Energy communities require trust-building and simplified corporate structures to gain citizen acceptance.

References: Municipality of Rethymno / Law 5037/2023 – Energy Communities / "Exoikonomo" programme (Energy upgrade for households) / ELECTRA Programme (public building upgrades)

URBAN AGENDA from the EU
Building Decarbonisation

S⁴ Santa Perpetua de Mogoda (Spain)

Population: 26,000 **< 50,000 → Small cities**

Context — Adjacent to the Àrea Metropolitana de Barcelona (AMB), the municipality combines consolidated residential neighbourhoods with areas facing structural accessibility deficits and socio-economic vulnerability. It is currently finalising Spain's first municipal Strategic Renovation Plan, aligned with national long-term renovation objectives and the EU 2050 decarbonisation targets, though implementation remains constrained by limited financial capacity, particularly in vulnerable districts as Can Folguera Antic.

🌍 Building decarbonisation maturity

	Status	Mandatory?	Scale	Main stakeholders	Key highlights
Heat planning / mapping	Pilot / early-stage	No	Pilot area / district	Municipality, regional authorities	No full municipal plan yet; preliminary data analysis and building prioritisation; identifies building age, accessibility, socio-economic vulnerability.
District heating expansion	Partial / private-led	No	Limited areas	Private DH operator (REBI), building owners, municipality	Private DH network (municipality collaborates) already operational, serving municipal buildings and some residents.
Building renovation	Implemented	Partially voluntary	Pilot / district	Municipality, private owners, contractors	Renovation pilots in Can Folguera Antic; accessibility improvements, envelope upgrades, some EE measures; municipal coordination and EU funding support.
Renewable heating	Partial / pilot	Voluntary	Municipal buildings	Municipality, private DH operator	In place for municipal building retrofits and DH integration; pilots.
Energy communities	Planned / not yet operational	Voluntary	N/A	Citizens, municipalities, NGOs	Considered in the strategic plan, but no active yet; challenging due to funding, regulation, and engagement.
Pilot projects	Implemented	Voluntary	Pilot	Municipality, citizens, contractors	Can Folguera Antic pilot; focus on accessibility, envelope renovation, minor EE measures.
Citizen engagement	Active	Voluntary	Pilot / district	Citizens, property owners, administrators, municipality	Participatory processes; information campaign; community meetings, municipal digital platforms.

🏛️ Governance model

● Multilevel governance

Level	Key actors	Role	Constraint	Enabler
National Government	Ministry of Housing	Regulatory framework	Slow regulatory transposition; limited binding heat planning	Alignment with EU 2050 targets
Regional (Catalonia) / Metropolitan	Generalitat de Catalunya; Àrea Metropolitana de Barcelona (AMB)	60% co-financing of pilot district; territorial coordination	Limited budget	Clear eligibility criteria; Strategic metropolitan alignment
Provincial	Diputació de Barcelona	Financial and technical support for plan drafting	No financial support	Service guide and advisory support
Municipal	Housing Unit; Climate Change Unit	Strategic planning; citizen engagement	Budget exposure	Holistic governance structure urbanism–climate
Utilities	Water & energy utilities	Data inputs -consumption	Limited engagement	Operational data availability

● Decision making process

Lead actor:	***Municipality (Housing Unit)***
Core decision-maker	Municipal political leadership (Urbanism & Housing Councillor)
Integrator	No formal external integrator; internal coordination between

__Decision flow:__ *Strategic diagnosis → Political validation → Funding application (EUCF / Generalitat) → Regional subsidy allocation → Municipal coordination → Building-level mobilisation*

URBAN AGENDA for the EU — **Building Decarbonisation**

- ## Quadruple helix approach

Helix	Stakeholders	Contributions	Communication channels	City Interaction	Frequency
Public Sector	Municipality (Housing & Climate Change); Generalitat de Catalunya; Diputació de Barcelona	Strategic planning; funding allocation; regulatory alignment; vulnerability indicators	Municipal participation platform; civic centre meetings; Pla de Barris communication channels	Yes	Permanent
Private Sector	Property administrators; technical consultants (CICLICA; Territoris XLM); GNE Finance; EIB	Technical diagnostics; investment structuring; advisory support	Direct one-to-one meetings; neighbourhood briefings; EUCF advisory sessions	Yes	Project-based
Academia / Research	Not formally involved	No structured research partnership	—	No	—
Citizens / Civil society	Residents; community presidents; vulnerable households in pilot district	End-users; approval of building-level interventions; feedback	Civic centre assemblies; neighbourhood meetings; municipal web & social media; citizen platform	Partial	Ad hoc / District based

Key tools:
☑ **Formal consultation processes since 2022**
☑ **Building diagnostic and prioritisation tools (Building stock vulnerability mapping + Citizen management and engagement interface for prioritisation**

Quadruple helix status:
Emerging; primarily public-sector driven

- ## Funding structure

Main sources:	Municipal budget; regional subsidy (Pla de Barris – 60% co-financing); EUCF technical assistance; exploration of EIB-backed financing via GNE Finance
Role of financial actors:	Currently advisory and exploratory (EUCF partner GNE Finance; dialogue with potential EIB involvement); no structured risk-sharing mechanism in place
Blending capacity:	Low–Medium (public subsidy-dependent; limited private capital mobilisation so far)
Investment logic:	District-based (Area of Conservation and Rehabilitation – Can Folguera Antic)
Financial risk exposure:	Primarily borne by the municipality; high dependency on external subsidy schemes

📊 Implementation results & barriers

Key Results:
✓ **Can Folguera Antic pilot launched, with planning, citizen consultation, and first refurbishment projects approved for funding.**
✓ **Citizen engagement implemented through civic centres.**

Barriers

Legal	Early stage of national LHCP/NBRP; lack of legal clarity for implementation
Financial	Funding gap –insufficient budget for actual refurbishment; dependency on subsidies
Technical	Limited local experience with integrated refurbishment planning
Social	Expectations of citizens rising due to long preparatory communication
Governance capacity	Coordination between newly created housing and climate units

Main bottleneck   *Financial gap for implementation*

🌍 Key lessons for other cities

- Ensure project maturity before broad public communication to manage expectations.
- Combining municipal budgets with EU funding is critical to overcome financial bottlenecks.
- Citizen engagement needs structured guidance and clear pathways to influence decisions.
- Dedicated interdepartmental coordination improves alignment for integrated approaches.

References: Santa Perpetua Municipal Housing Plan 2024–2030 / Can Folguera Antic Pilot: citizen engagement

URBAN AGENDA for the EU

Building Decarbonisation

6. Cross-cutting analysis

6.1. Mapping of city-level and country-level decarbonisation maturity

To better understand the trajectory of building decarbonisation in Europe, we mapped the maturity level of the 18 analyzed cities in comparison with their respective countries. The map highlights where local initiatives are ahead, aligned, or lagging behind national frameworks. **The mapping considers progress in local heating and cooling plans (LHCPs), implementation of national building renovation strategies (NBRPs), governance capacity, financial readiness, and the operationalisation of decarbonisation measures.**

This comparison allows us to identify patterns in local vs. national alignment, highlight cities serving as frontrunners, and extract transferable lessons for municipalities at different stages of maturity.
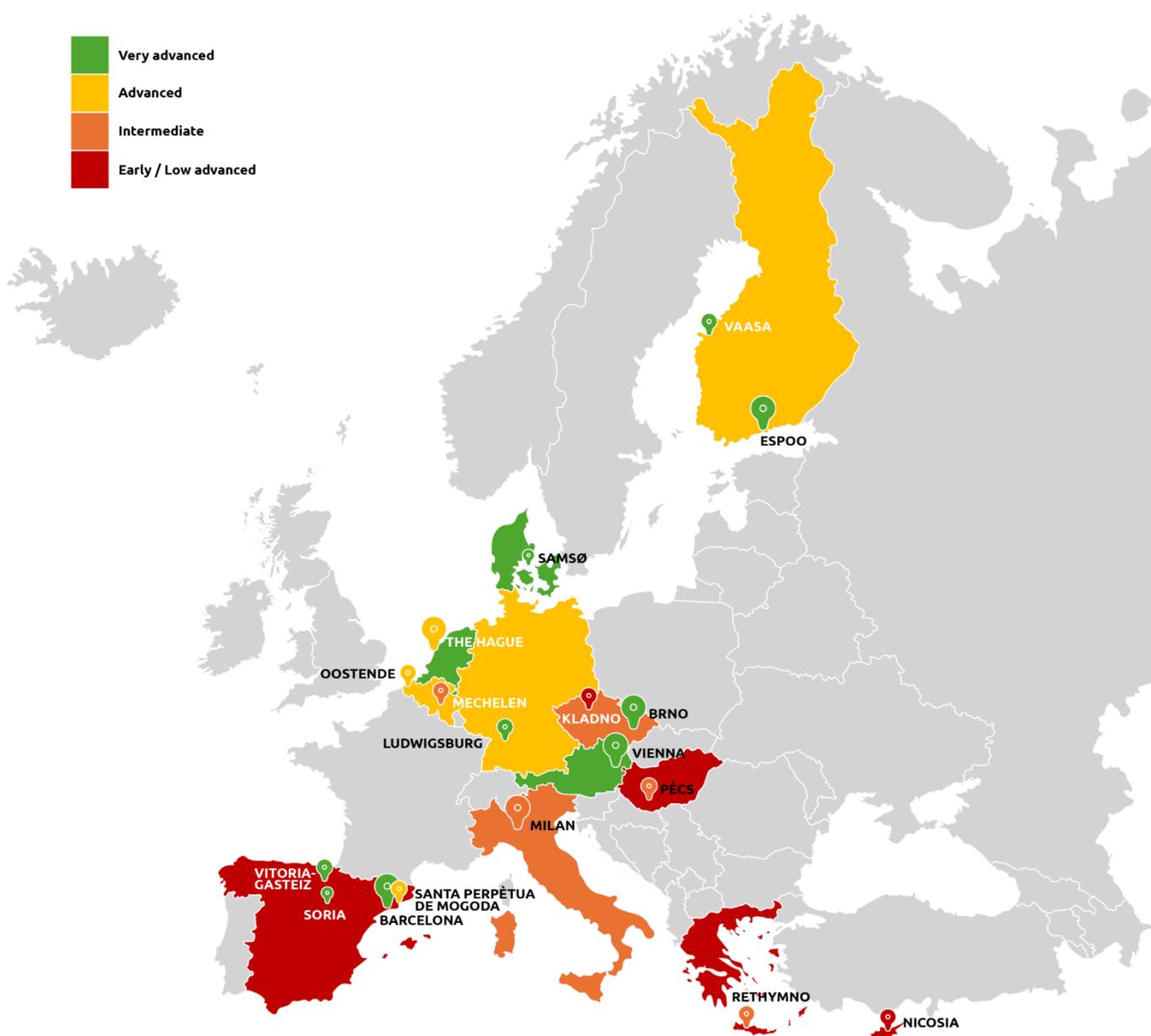
6.2 Comparative insights across the 18 Cities

The study confirms that building decarbonisation maturity is not determined solely by national regulatory advancement, but by the interaction between national frameworks and local governance capacity.

Three structural patterns emerge:

1. Alignment between national frameworks and local implementation capacity

Cities operating in countries with clearer integration between Local Heating and Cooling Plans (LHCPs) and National Building Renovation Plans (NBRPs) tend to demonstrate more coherent investment planning and stronger vertical coordination. However, even in mature national contexts, implementation speed depends heavily on municipal administrative capacity and political prioritisation.

2. Governance model sophistication as a maturity accelerator

Highly advanced cities are characterised not only by technical deployment (district heating, building renovation programmes), but by structured governance ecosystems:

- Clearly identified lead actor and integrator
- Institutionalised cross-departmental coordination
- Stable stakeholder platforms
- Predictable financial engineering models

Intermediate and lower-maturity cities often face fragmentation of responsibilities and limited integrator functions, slowing implementation despite policy ambition.

3. Financial governance as a decisive differentiator

The most advanced cases demonstrate:

- Blended finance approaches
- Long-term investment planning
- Risk-sharing mechanisms
- Dedicated municipal or regional energy agencies acting as financial intermediaries

By contrast, less mature cities rely more heavily on short-term project-based funding, often limiting scalability.

6.3 Governance patterns identified

Across the 18 cases, five recurring governance configurations can be observed:

A. Strong municipal leadership

- The municipality acts as strategic lead, integrator, and decision-maker, often supported by a municipal energy or climate agency.
- **Vienna, Barcelona, Milan**

B. Utility-led or energy company-driven

- Local or regional utilities play a central operational and investment role, particularly in district heating expansion contexts.
- **The Hague, Brno, Espoo**

C. Networked partnership

- Implementation relies on structured public-private-civic collaboration platforms, often formalised through climate pacts or urban transition alliances.
- **Mechelen, Vaasa, Kladno**

D. Nationally driven compliance

- Cities act primarily as implementers of nationally defined frameworks, with limited autonomy but increasing regulatory obligations.
- **Santa Perpetua de Mogoda, Nicosia**

E. Community-driven

- More common in smaller cities, where innovation emerges from targeted pilot projects and local energy communities.
- **Vitoria-Gasteiz, Rethymno, Soria**

F. Pilot-based

- Targeted pilot projects initiated by municipalities or partnerships to test innovative solutions before scaling.
- **Oostende, Pecs, Samsø**

These models are not exclusive but illustrate dominant patterns influencing speed, coherence, and resilience of implementation.

6.4 Advantages and disadvantages of governance models identified

The five dominant governance configurations identified across the case studies present distinct strengths and structural trade-offs. Their effectiveness depends on administrative capacity, political stability, regulatory alignment, and financial maturity.

Below is a structured comparative overview:

Governance Model	Key stakeholders / Roles	Advantages	Disadvantages	Most Suitable Context
Strong municipal leadership model	Municipality acts as strategic lead, integrator, and coordinator. Often supported by a municipal energy agency.	- Clear accountability - Faster decision-making - Strong alignment with local climate goals - Better horizontal coordination	- High dependency on municipal capacity - Political cycle risks - Potential overload of local administration	Large cities and mature medium-sized cities with strong administrative capacity
Utility-led / energy company model	Local/regional utility leads infrastructure investment and operational delivery (often district heating).	- Technical expertise - Investment capacity - Long-term infrastructure planning - Operational efficiency	- Risk of limited citizen engagement - Commercial priorities may diverge from social goals - Lower democratic visibility	Cities with strong district heating networks and established public utilities
Networked partnership model	Formalised public-private-civic platforms coordinate action (climate pacts, alliances).	- Broad stakeholder ownership - Innovation-friendly - Shared responsibility - Greater legitimacy	- Slower consensus-building - Risk of unclear accountability - Coordination complexity	Metropolises and large cities with diverse stakeholder ecosystems
Nationally driven compliance model	Implementation primarily structured by national regulation; city role focused on execution.	- Policy coherence - Clear regulatory framework - Stable funding alignment	- Limited local flexibility - Lower local ownership - Risk of minimum-compliance approach	Smaller or administratively constrained cities
Community-driven model	Bottom-up initiatives led by citizens, energy communities, or local cooperatives.	- High citizen engagement - Social innovation - Strong local legitimacy	- Limited scalability - Fragmented implementation - Funding instability	Small cities / towns and rural contexts
Pilot-based / experimental model	Targeted pilot projects initiated by municipalities or partnerships to test innovative solutions before scaling.	- Opportunity to test new technologies or governance approaches - Learning-oriented - Can attract additional funding	- Limited reach initially - Requires structured monitoring to scale - Risk of discontinuity after pilot	Medium-sized cities and innovation-friendly contexts

No governance model is inherently superior. Effectiveness depends on:
- Administrative capacity
- Financial engineering maturity
- Political continuity
- National regulatory clarity
- Stakeholder ecosystem density

However, cities that combine **clear municipal leadership with structured stakeholder engagement and stable financial governance** tend to demonstrate the highest implementation maturity.

6.5. Barriers and structural bottlenecks

Despite progress, cities report persistent challenges:

Legal and Regulatory	• Ongoing uncertainty during EU directive transposition. • Misalignment between planning obligations and funding cycles.
Financial	• Limited municipal borrowing capacity. • Difficulty de-risking private investment in building renovation. • Overreliance on short-term grants.
Technical	• Skilled workforce shortages. • Data fragmentation. • Complexity of district heating decarbonisation.
Social	• Low citizen uptake. • Energy poverty concerns. • Resistance to behavioural change.
Governance Capacity	• Departmental silos. • Limited integrator role. • Insufficient monitoring systems.

The most common bottleneck is not technical feasibility, but **coordination complexity combined with financial structuring gaps.**

6.6 Best practices and quick wins

Several enabling factors consistently appear in higher-performing cities:

✔ Clear integrator function
Identifying a single coordinating entity significantly reduces fragmentation and accelerates decision-making.

For example, in **Ludwigsburg**, the municipal utility (Stadtwerke Ludwigsburg-Kornwestheim – SWLB) acts as a technical and operational integrator under the German Heat Planning Law (WPG), ensuring continuity between planning and infrastructure delivery.

In **The Hague**, the municipality has assumed a strong coordinating role in the transition to gas-free districts, aligning neighbourhood heat strategies with national frameworks.

✔ Institutionalised multilevel dialogue
Regular coordination platforms between local, regional, and national actors improve policy coherence during directive transposition phases.

Germany's mandatory municipal heat planning framework (Wärmeplanungsgesetz – WPG) provides a structured vertical governance model that clarifies roles between Länder and municipalities.

Similarly, **Denmark**'s long-standing national-municipal coordination model enabled **Samsø**'s renewable energy transition by aligning local district heating initiatives with national regulatory and financial instruments.

✔ Operational one-stop shops and digital building passports
Integrated advisory services for citizens and businesses reduce administrative burden and increase renovation uptake.

Vitoria-**Gasteiz**'s neighbourhood-based renovation office, *Opengela*, provides integrated technical, legal, and financial advisory services for homeowners, facilitating collective renovation processes.

In **Flanders**, the digital building passport "*Woningpas*" centralises property-level renovation data, improving transparency and renovation planning for households.

✓ Data-driven planning

Cities using building stock mapping, heat demand modelling, and digital monitoring tools demonstrate more targeted and cost-effective interventions.

Ludwigsburg's municipal heat planning relies on detailed building-level heat demand mapping under the German Heat Planning Law (WPG), enabling prioritisation of district heating zones.

Vienna applies structured building stock analysis and digital monitoring tools within its climate and energy strategy framework.

Spain's Urban3R platform supports building stock analysis and renovation planning at scale.

✓ Stable financial architecture

Blending EU funds, national subsidies, municipal budgets, and private capital ensures continuity beyond electoral cycles.

Milan's climate and energy strategy combines municipal funding, EU financing streams, and private investment mobilisation under the Piano Aria e Clima framework.

Samsø's transition demonstrates how cooperative ownership models and citizen investment in district heating and wind projects can create long-term financial stability and social acceptance. Samsø Renewable Energy Island

The Hague's exploration of municipal heat companies and mini-heat networks illustrates emerging financial risk-sharing models for scaling neighbourhood heat systems.

The analysis also highlights practical actions that can generate immediate improvements without structural reform:

Quick Wins

- Formal designation of a decarbonisation coordinator within municipal administration
  (The Hague, Ludwigsburg)

- Establishment of a simple cross-departmental working group.
  (Mechelen, Ostend)

- Launch of communication platforms centralising information for citizens.
  (Vitoria-Gasteiz Opengela)

- Early mapping of priority renovation districts.
  (Ludwigsburg, Samsø)

- Pilot-scale financial aggregation schemes to reduce investment risk.
  (Samsø)

These measures can strengthen governance even in lower-capacity contexts.

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7. Conclusions and recommendations

The analysis of these 18 case studies, across metropolises and large cities, medium-sized cities, and small municipalities, provides a robust and diverse snapshot of building decarbonisation governance across Europe. While not statistically representative, the sample captures a meaningful spectrum of maturity levels, governance cultures, and implementation pathways.

Key lessons emerging from the analysis:

- **National policy maturity does not automatically translate into rapid or coherent local implementation.** In several cases, national-level alignment remains a structural bottleneck, particularly where municipal mandates, technical capacity, or fiscal autonomy are limited.

- **Governance architecture**—clear mandates, coordination mechanisms, and defined leadership roles—**is as decisive as technological deployment** in determining implementation speed and coherence.

- **Financial engineering and risk-sharing mechanisms remain the central scaling lever** for building decarbonisation, particularly for district heating expansion and deep building renovation programmes.

- **Persistent data gaps**—on building energy consumption, heating system typologies, ownership structures, and socio-economic vulnerability—**continue to constrain evidence-based planning and prioritisation.**

- **Local contextual factors**, including energy prices, building stock characteristics, ownership fragmentation, and administrative traditions, **strongly condition which governance models are feasible and socially acceptable.**

- **Pilot projects and citizen engagement initiatives demonstrate high innovation potential**; however, without structured replication, institutionalisation, and financing pathways, their systemic impact remains limited.

These cities demonstrate that meaningful progress in building decarbonisation is underway across Europe. **Progress is most visible where governance and implementation conditions are structurally embedded rather than project-based**. Success tends to be supported by:

- **Clear vertical and horizontal governance frameworks,** with explicit coordination between municipal, regional, and national levels.
- **Regulatory clarity or mandatory planning frameworks** that create accountability and predictable timelines.
- **Structured multi-actor cooperation aligned with the quadruple helix approach,** ensuring defined roles rather than ad-hoc participation.
- **Integrated data and monitoring systems** that support planning, sequencing, and evaluation.
- **Financial models** that combine public support, private capital mobilisation, and long-term revenue stability.

The current sample offers valuable comparative insight but also highlights the need for **deeper structural comparison between national frameworks and local implementation maturity.** In particular, further analysis is needed to better understand:

- The causal relationship between national regulatory frameworks and observed local governance performance.
- Which governance configurations are structurally transferable versus highly context-dependent.
- How financial, regulatory, administrative, and technical constraints interact—and how they can be mitigated systematically rather than through isolated interventions.

The study therefore represents a strong diagnostic foundation, but further analytical refinement could transform it into a practical governance benchmarking framework for European cities.

Possible next steps:

- Expand the mapping to include additional municipalities, particularly from underrepresented regions and smaller urban contexts, to strengthen comparative validity.
- Deepen the assessment of national-local alignment, explicitly linking LHCPs and National Building Renovation Plans (NBRPs) to observed city-level governance maturity and implementation outcomes.
- Develop operational guidance for cities, including governance templates, decision-flow models, stakeholder mapping tools, and data-collection frameworks aligned with EU indicators.
- Facilitate structured peer-learning mechanisms through EU platforms, enabling systematic transfer from advanced governance models to emerging contexts.
- Systematically identify scalable "quick wins," such as digital monitoring tools, one-stop-shops, structured citizen engagement mechanisms, and replicable energy community models.
- Promote financial innovation and shared-risk instruments that strengthen municipal implementation capacity while ensuring alignment with national and EU funding frameworks.
- Establish monitoring and iterative feedback mechanisms that allow continuous governance improvement across levels.

Final statement

The European transition toward integrated heating and building renovation strategies ultimately depends less on isolated technological breakthroughs and more on governance coherence, financial structuring, and institutional maturity.

A structured, context-sensitive, and data-driven governance approach—combined with stakeholder engagement, especially of end users, and scalable financing mechanisms— can enable cities of all sizes to accelerate toward a resilient, low-carbon built environment.

The 18 mapped cases provide a strong foundation; the next phase should deepen comparison, strengthen national-local alignment analysis, and translate lessons into practical governance instruments that can support the next generation of European urban decarbonisation strategies.

Annex 1 – Case Studies desk research (initial mapping)

Source: Own elaboration, Building Decarbonisation Partnership

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