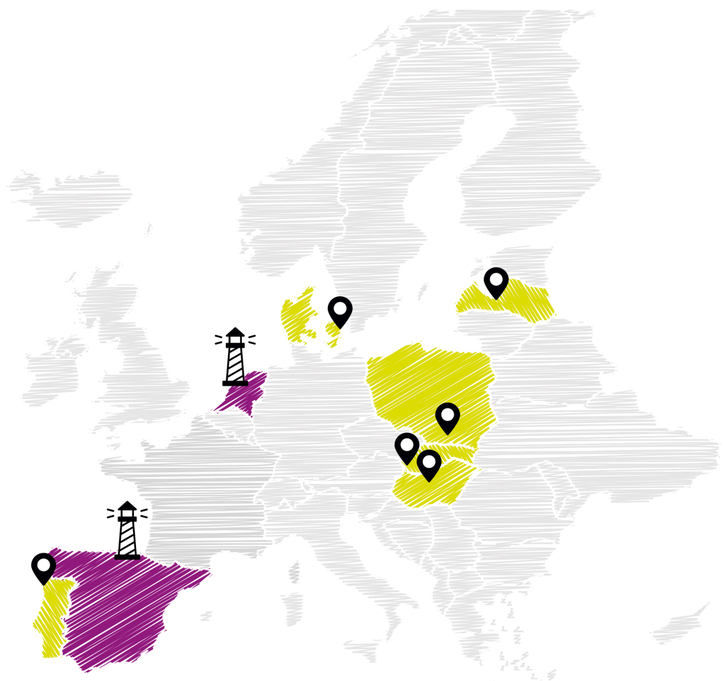
atelier
Positive Energy Districts

Final Conference
11-12 March 2026, Bilbao

Fellow City Matosinhos

Matosinhos is a city in transformation, rediscovering how people, nature, and technology can thrive together. Through ATELIER, the city is advancing toward carbon neutrality by 2030, with Positive Energy Districts emerging in Custió and along the River Leça.



matosinhos

In Custió, a Renewable Energy Community is being created within a rehabilitated neighbourhood. Energy-efficient building upgrades and local solar generation reduce consumption, tackle energy poverty, and provide cleaner, more affordable energy while fostering a fair and inclusive energy transition.

Parameter	Unit	Value
Installed capacity	kWp	104.2
Number of PV modules	—	217
Module power	Wp	480
Annual energy production	kWh/year	145,880
Number of housing units	—	154
Number of buildings	—	6

Along the River Leça, ecological restoration has enabled a green corridor where historic water mills are being explored as small-scale renewable energy sources. By linking natural heritage, clean energy, and sustainable mobility, the river becomes a living infrastructure for climate resilience and urban quality of life.

Parameter	Unit	Ponte do Carro Mill	Carvalhas Mill
Flow rate	m³/s	1.5	1
Installed capacity	kW	6.34	3.11
Energy / day	kWh	153	74
Energy / year	kWh	37,500	19,600
Investment	€	58,200	27,400
Tariff	cent/kWh	12	12
Revenue / year	€	4,500	2,350
Simple payback	years	12.93	11.66

ATELIER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864374

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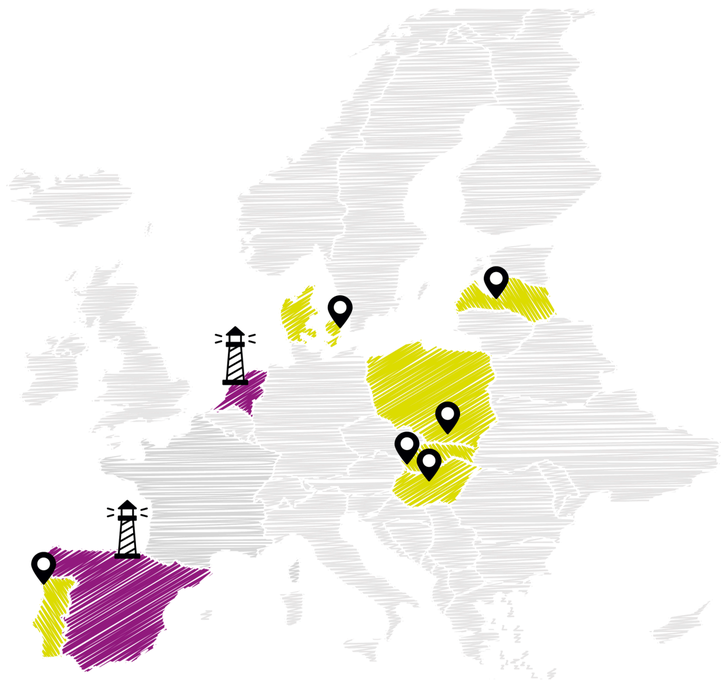
Lighthouse City Amsterdam

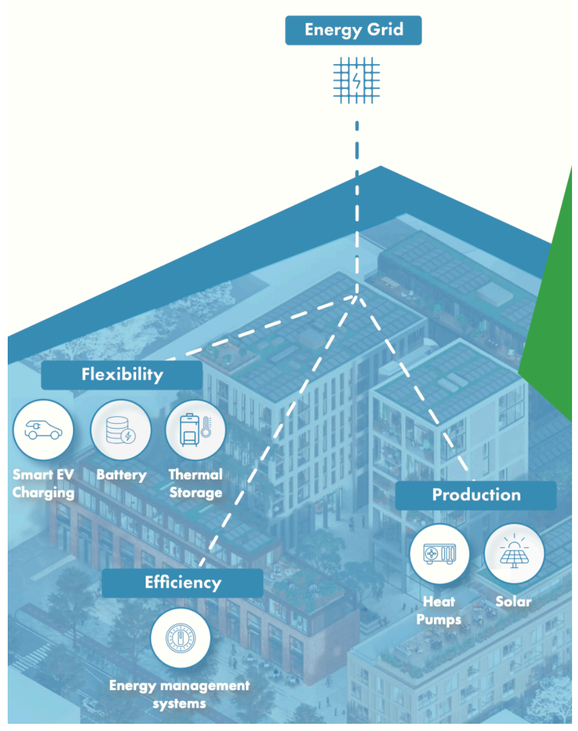
Amsterdam has long been a city shaped by water, trade, and reinvention. In ATELIER, this spirit took on a new form: transforming the overlooked corners of the city into neighbourhoods that generate more energy than they use - and where people genuinely want to live, work and meet.

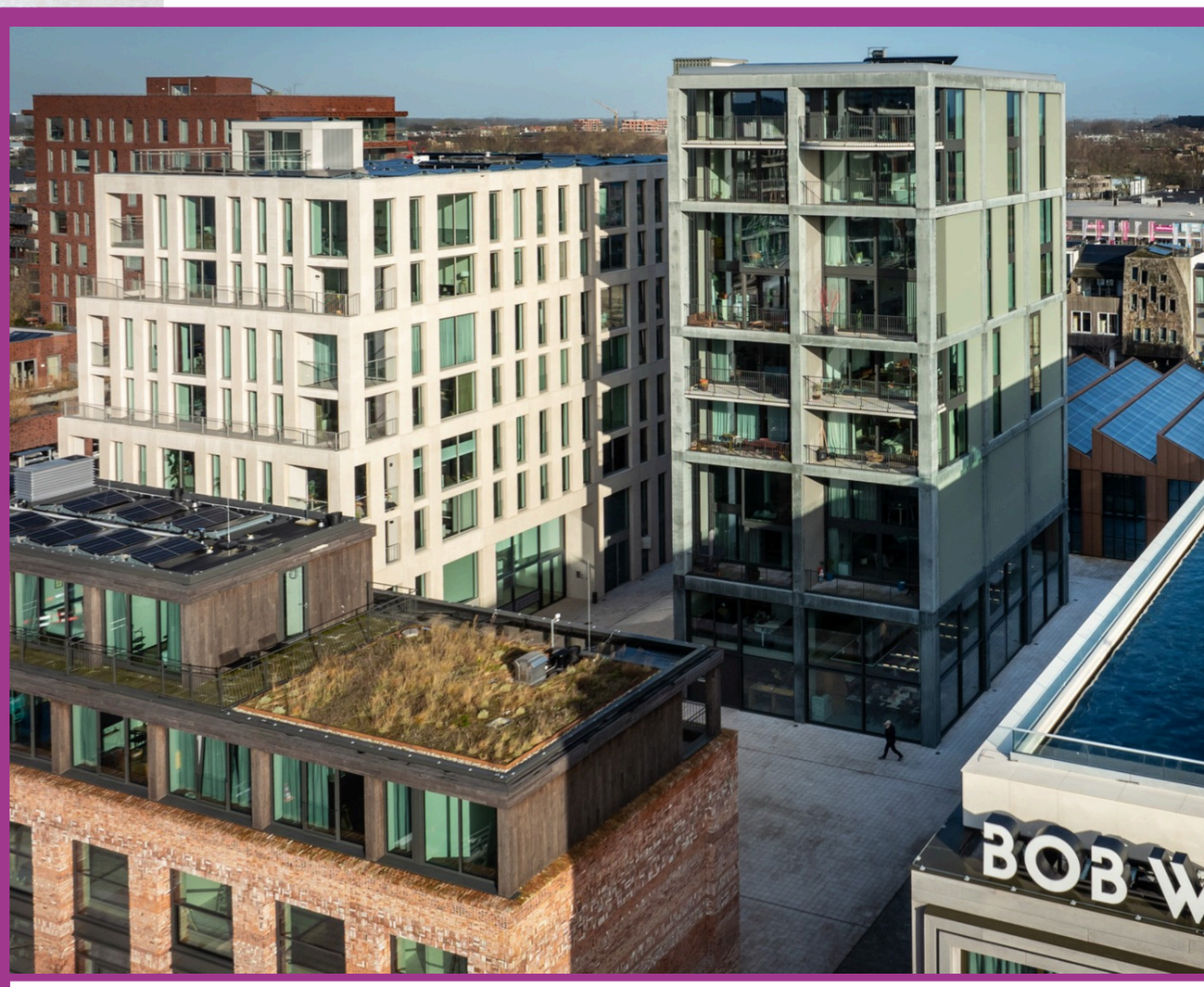
The district of Buiksloterham offered the perfect setting. Once defined by industry, infrastructure and fragmented ownership, it is now becoming a model for circular, resilient and future-proof urban development.

City of Amsterdam



The **Republica** case demostrated how a district can operate as one coordinated energy system though a single grid connection. By combining local production, storage and smart control, energy peak can be managed internally while the district remains connected to the wider grid. This show how city districts can increase self production and consumption, improve system stability and resude pressure on the electric grid.





The demonstration site **Poppies** is constructed with sustainable and circular materials. Main characteristic is the modular wooden construction in CLT (cross laminated timber). The 96 individual housing units are prefabricated in a factory and assembled onsite.

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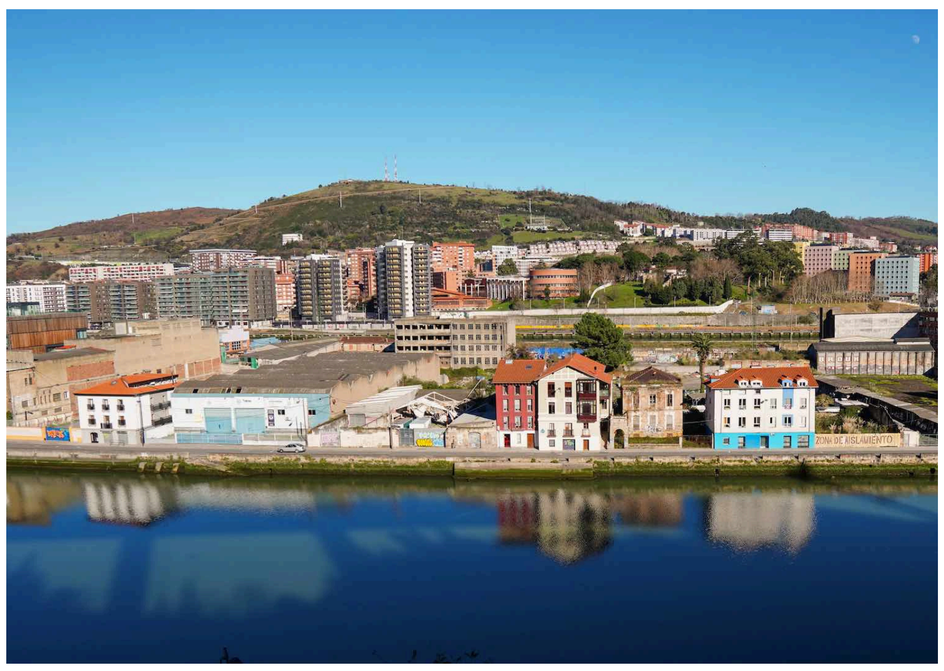
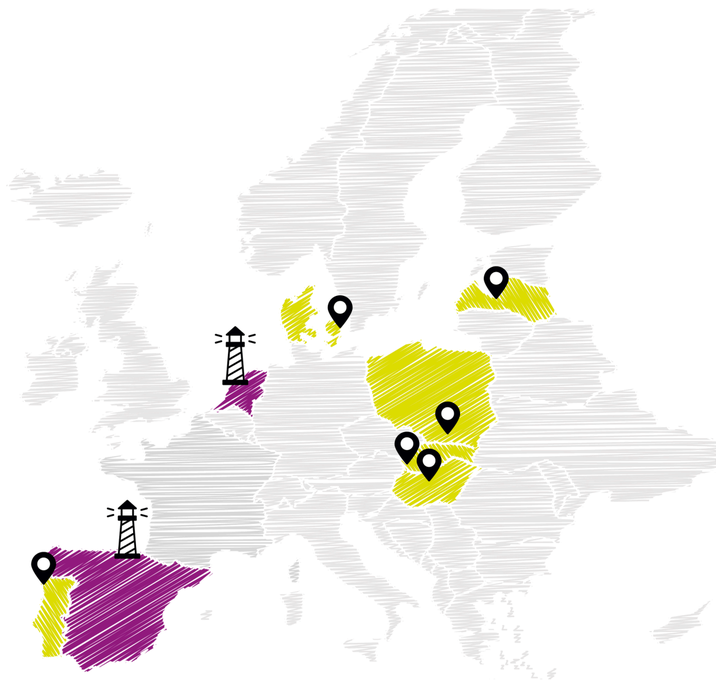
Lighthouse City Bilbao



Bilbao is a city with a rich history of succesful urban regeneration recovering so many industrial and obsolence spaces.

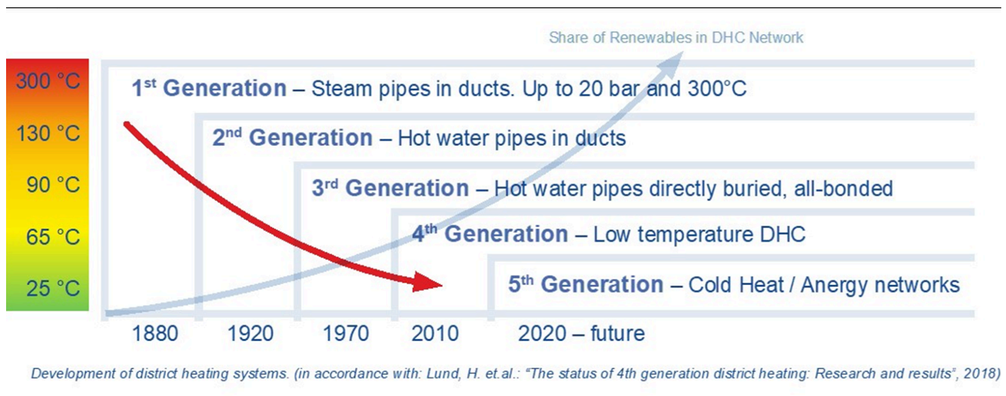
Zorrozaurre island is an example of that city´s urban transformation. A long scale project based on the revitalisation of a brownfield area considering sustainable and environmental principles.

Bilbao



With the aim of achieving a low carbon emission area, a 5th generation low temperature network is being implemented. The system captures groundwater at 14-15 degrees and then distributes to each individual building when water to water heat pumps are used to adjust temperatures. .

The aim is to extend the DH&C system also beyond the boundaries of the island through a subfluvial connecting with major potential consumers such as the football stadium.



Development of district heating systems. (in accordance with: Lund, H. et.al.: "The status of 4th generation district heating: Research and results", 2018)

The PED area includes a variety of buildings: three municipal refurbished buildings (Papelera, Beta I and Beta II) used as universities and three new social housing residential blocks.

All the buildings are connected to an onsite geoexchange borehole field for heating, cooling and HSW demands. Papelera building is also equipped with solar thermal pannels that will be coupled to the infrastructure as heating storage.

In short, ATELIER represents not only a step forward for the development of Zorrozaurre but for the long-term goals of the city in the process of achieving climate neutralitty.

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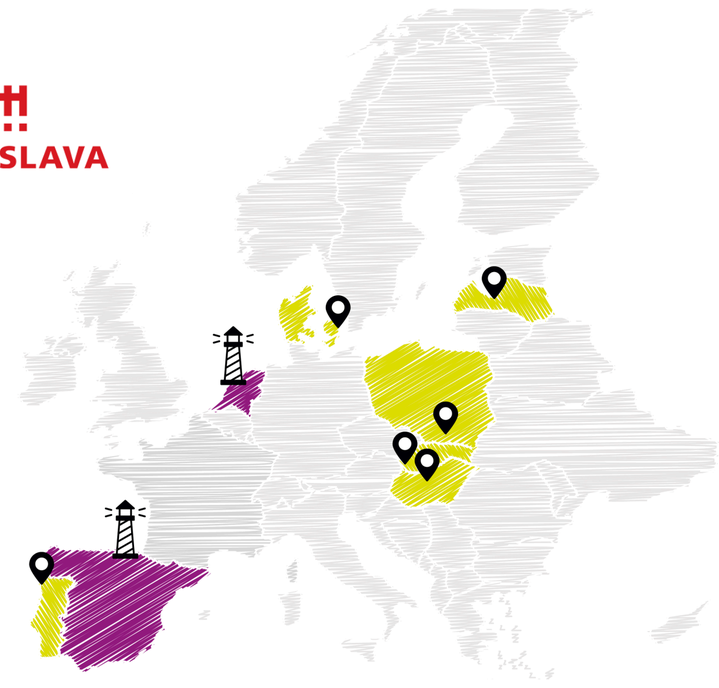
Fellow City Bratislava

Bratislava, like many growing European capitals, faces the challenge of **transforming its energy system** while ensuring sustainable urban development. In response, the city developed a **streamlined process for installing heat pumps on municipal land**, enabling buildings that lack space for private geothermal wells to shift **from fossil fuels to renewable heating solutions**. This initiative reflects Bratislava's commitment to climate neutrality by 2030 and demonstrates how public policy can support low-carbon, resilient neighbourhoods.

BRATISLAVA



As part of the ATELIER project, Bratislava conducted a comprehensive survey of the city's **brownfield sites**, creating detailed analyses to assess their potential for redevelopment as **Positive Energy Districts (PED)**. These assessments highlight which underused areas could be transformed into neighbourhoods where **energy efficiency**, **renewable energy integration**, and **climate adaptation** are central. **The Twin City project** (former industrial area) demonstrates the potential of **heat pump installations on city-owned land,** and with integration into **existing infrastructure**, the development achieves reliable renewable heating while remaining connected to the wider city network. The pilot also shows how **public authorities, developers, and residents can collaborate** on low-carbon solutions and explores operational coordination, including monitoring energy demand and smart controls across multiple buildings.

The demonstration system includes multiple **water-to-water heat pumps** with maximum output temperatures up to 80 °C, drawing energy from wells installed on municipal land to access groundwater resources. Each building in the Twin City district is connected to a **coordinated energy network**, which allows for optimized energy distribution, peak load management, and flexibility in operation. The system is designed to integrate seamlessly with existing heating infrastructure, enabling implementation without major structural changes. Pilot data also track **energy savings**, efficiency gains, and **greenhouse gas reductions**, providing valuable insights for future scaling. By combining innovative engineering, careful urban planning, and municipal oversight, the project serves as a comprehensive example of how cities can implement **district-scale renewable heating** and make tangible progress toward climate goals.

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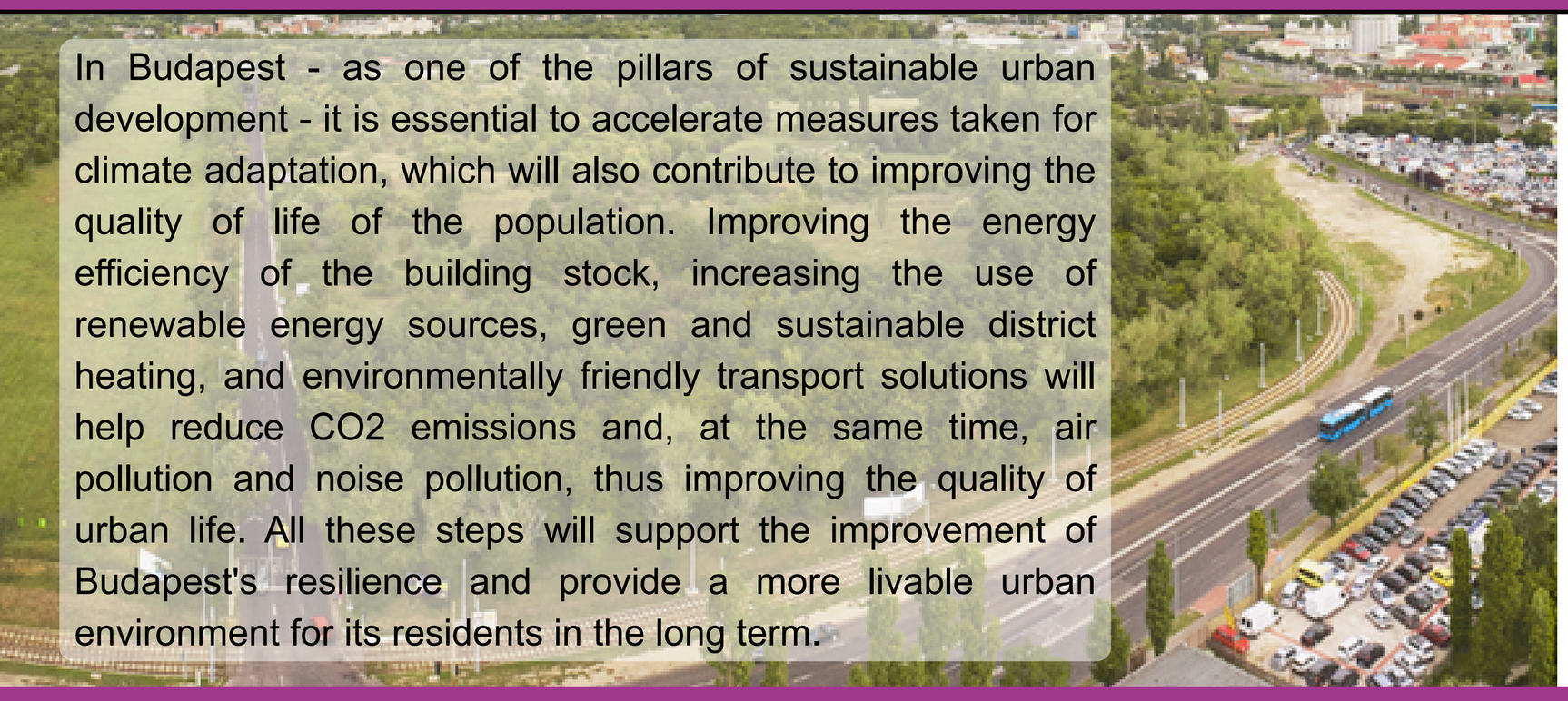
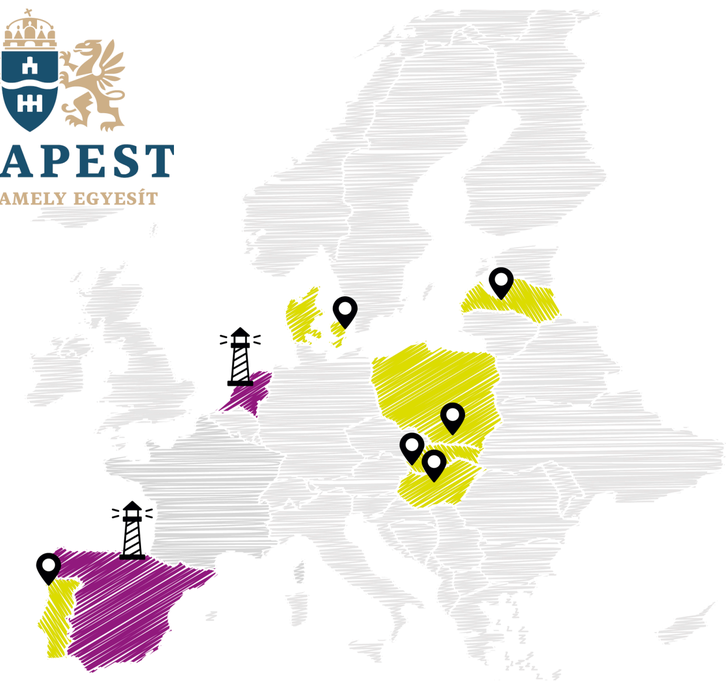
Fellow City Budapest



In Budapest - as one of the pillars of sustainable urban development - it is essential to accelerate measures taken for climate adaptation, which will also contribute to improving the quality of life of the population. Improving the energy efficiency of the building stock, increasing the use of renewable energy sources, green and sustainable district heating, and environmentally friendly transport solutions will help reduce CO2 emissions and, at the same time, air pollution and noise pollution, thus improving the quality of urban life. All these steps will support the improvement of Budapest's resilience and provide a more livable urban environment for its residents in the long term.

BUDAPEST
A VÁROS, AMELY EGYESÍT

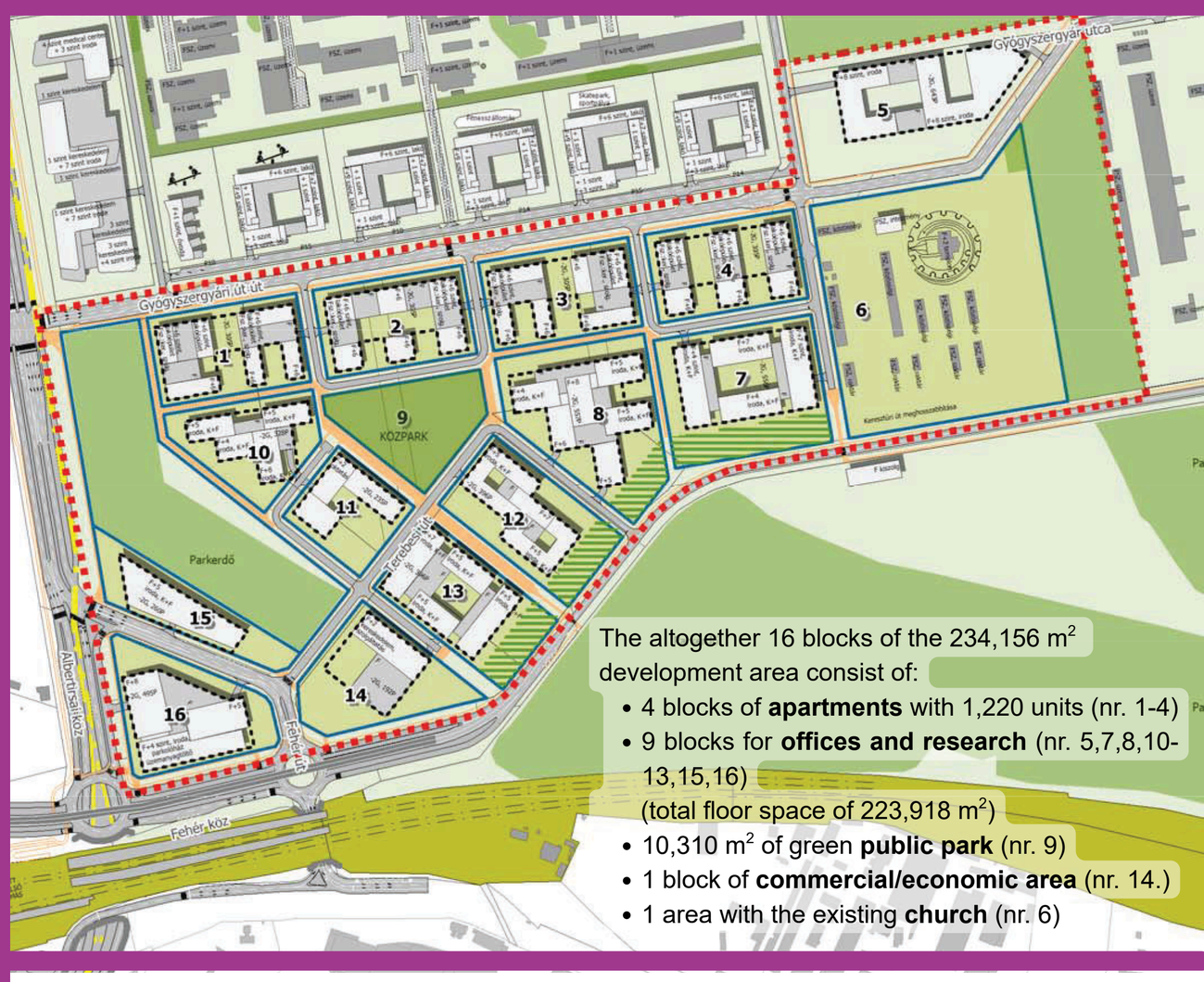


Budapest, as part of the ATELIER project, has developed a PED concept for one of its vacant brownfield properties. It suggests a mixed-use development of residential, workplace, and economic blocks.

In the PED concept study, 16 technology scenario calculations were made, out of which 4 proved to be feasible to fulfill the positive energy balance requirement with the use of heat recovery ventilation (45% lower heat demand).

The total energy demand of the PED area can be covered by:

- 4,537 MWh/a electricity production by PV panels on roof;
- 6,724 MWh/a electricity production by integrated PV panels on façade;
- geothermal energy for the heating;
- a mix of solar collector and 4th & 5th gen. district heating, or a mix of solar collector with geothermal and electrical for domestic hot water production.



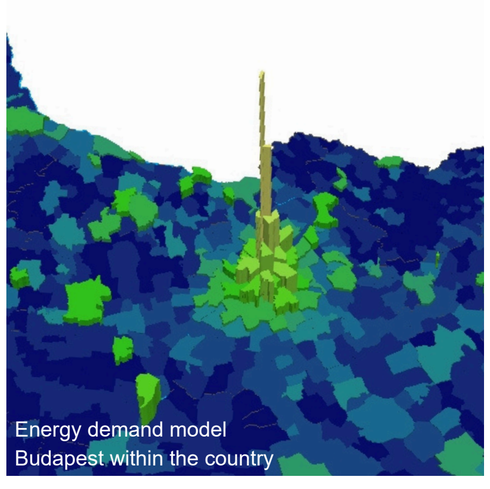
The altogether 16 blocks of the 234,156 m² development area consist of:

- 4 blocks of **apartments** with 1,220 units (nr. 1-4)
- 9 blocks for **offices and research** (nr. 5,7,8,10-13,15,16) (total floor space of 223,918 m²)
- 10,310 m² of green **public park** (nr. 9)
- 1 block of **commercial/economic area** (nr. 14.)
- 1 area with the existing **church** (nr. 6)

2 scenarios are based exclusively on renewable energy sources, with net-zero GHG emissions (1 scenario autonomous energy supply).

Key Achievements, since Budapest has joined ATELIER:

- Joined 100 Climate Neutral Cities Contract
- Budapest Capital City Plan: new urban planning strategy to include PED developments as a new sustainable development principle on brownfield areas
- Initiated a master plan tender including PED principle for the biggest brownfield area of the city: Rákosrendező
- Joined another EU-funded PED project: ASCEND


Energy demand model
Budapest within the country

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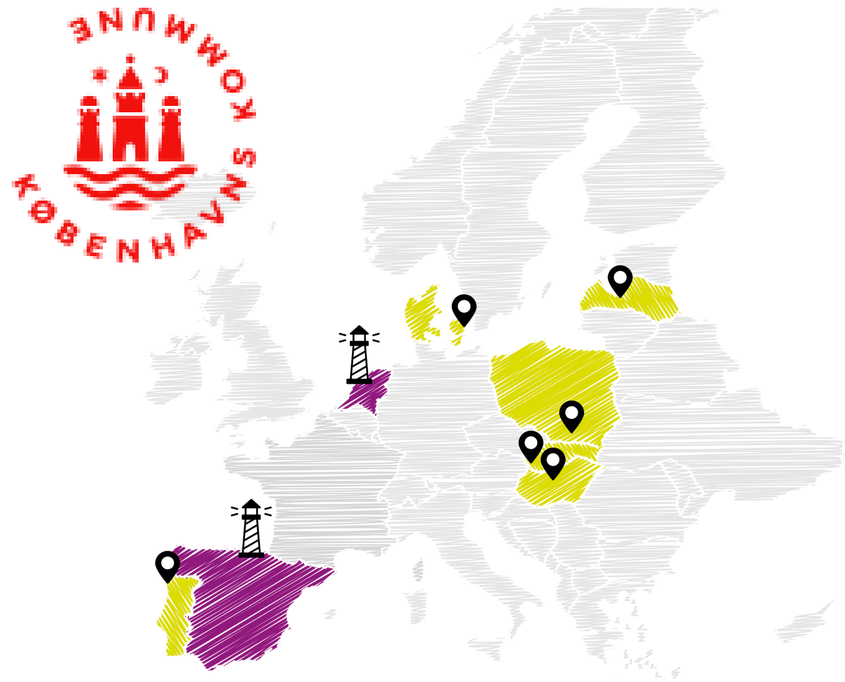
Fellow City Copenhagen

Copenhagen´s first climate plan was introduced in 2009. The ambition was a 20% carbon reduction by 2015. The second climate plan aimed for carbon neutrality in 2025.

Copenhagen's third climate strategy has raised the barre to carbon positivity in 2035. How to achieve this ambition is outlined in the Energy Strategy 2035. However, Copenhagen has decided to go beyond setting a target only for geographical emissions and has chosen to also include resource consumption emissions. These emissions are to be halved by 2035.

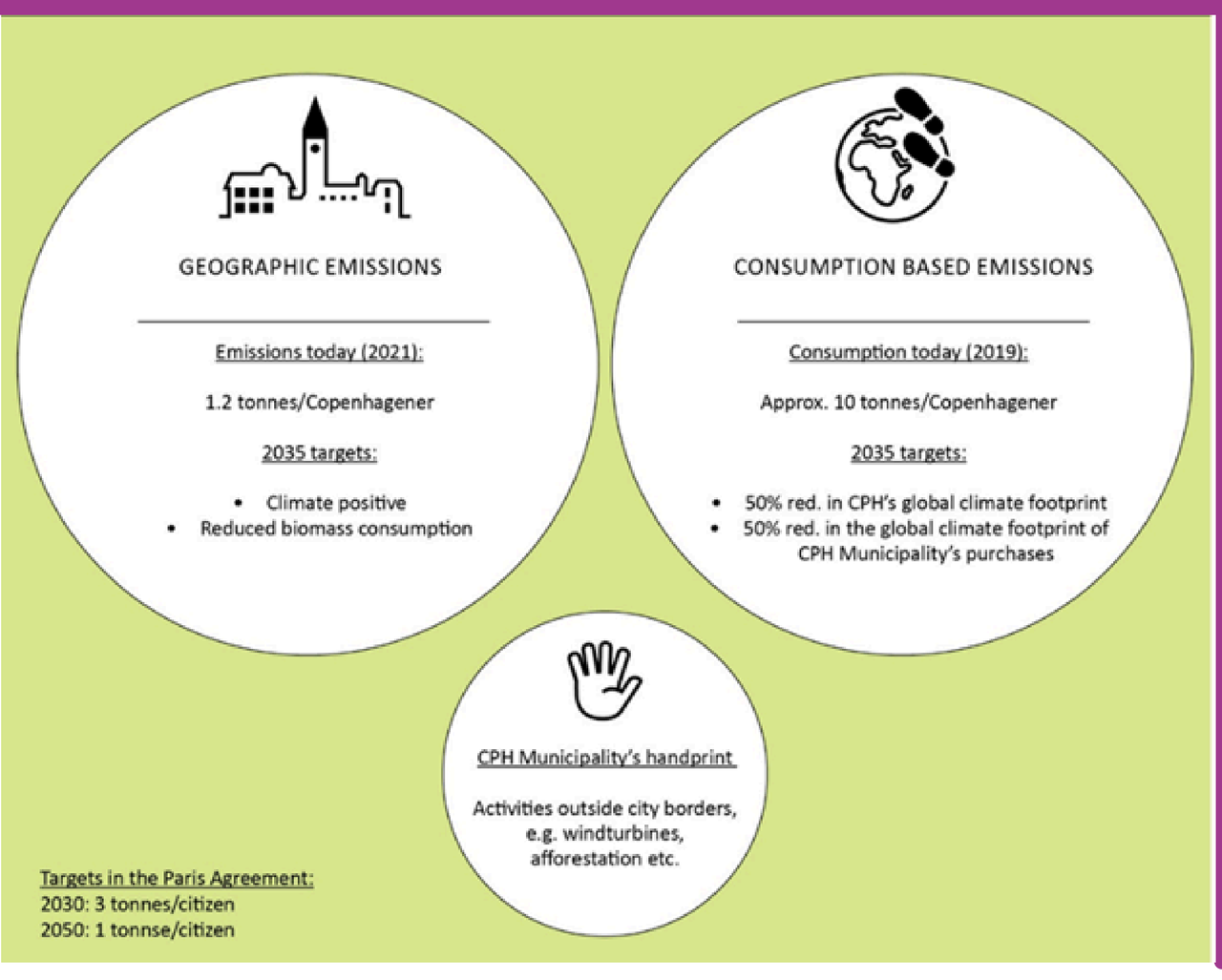
In Energy Strategy 2035, Copenhagen has expanded the ATELIER PED concept to include the entire geographical area of the city. New approaches for collaboration and partnerships are expected to bring about the agreed change.



Technical buildings designed for multi-functionality

The buildings and infrastructure of our cities define our options for sustainable living. The ongoing green transformation of our energy systems means that some of the energy production must take place in the urban areas and no longer just on the outskirts of the city. However, space is a valuable and scarce resource within the city.

Copenhagen and Bratislava therefore launched an international competition inviting students of architecture, urban design or similar disciplines to explore how technical buildings for large heat pumps can be designed for multi-functionality – integrating these buildings in new and existing urban city-scapes, so that they become proud landmarks lending identity to the local districts and contribute to a liveable city for all citizens.



Buildings as Flexumers

The political ambition of Copenhagen is not only carbon neutrality but also reduced biomass in energy production. This requires more decentralised RE production, which demands expansion of the electric grid capacity and that areas are made available for the technical installations. Reducing biomass also requires lower district heat supply temperatures which again relies on the energy efficiency of buildings and intelligent integration between buildings and the district heating system.

The plan is that the shift to lower supply temperatures is complete by 2033. Intelligent, online building control systems is critical to mobilizing the buildings' capacity to provide heat flexibility. As so-called Flexumers, buildings can contribute to security of supply and to keeping heat prices low.

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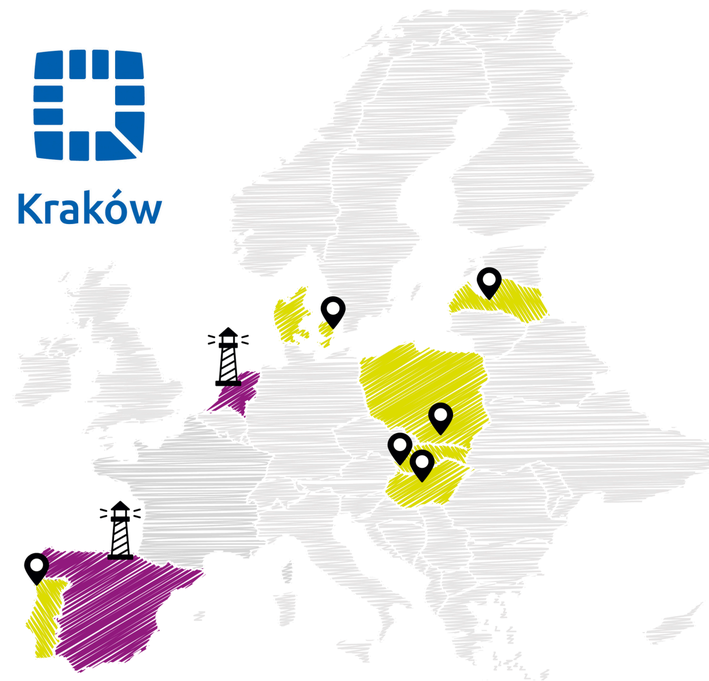
Fellow City Krakow

From air quality improvement to systemic energy transformation

Kraków



ATELIER: Impulse for Energy Transformation

ATELIER is a catalyst for systemic energy transformation, strengthening the city's climate pathway

2017 — **2026**

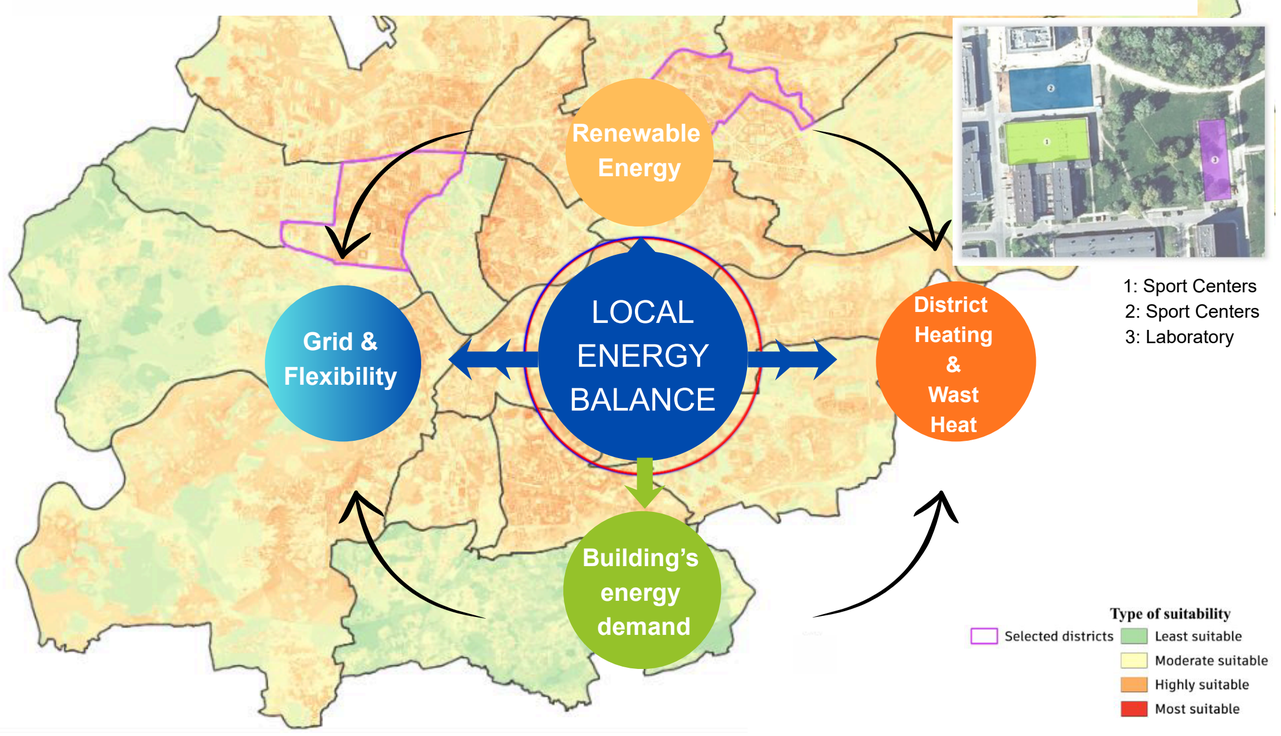
Climathon → Climate-KIC → Deep Demo Project → EU Mission 100 Cities → Climate City Contract

ATELIER

- Agreement on the construction of new heat sources
- Exploratory geothermal well in Przylasek Rusiecki
- Municipal Climate Change Adaptation Plan
- Positive Energy District concept
- Energy Advisory Centre
- Sustainable Energy and Climate Action Plan (SECAP)
- City Development Strategy
- Climate and Environment Advisors

From local change to system integration

Energy efficiency - renowables - energy balancing - sector coupling



PED development focused on a selected urban area, assessed in terms of spatial structure, infrastructure capacity and stakeholder readiness.

Participatory Governance & Engagement

- Kraków 2050 urban vision
- ATELIER Innovation Platform
- Climate Assembly Panel
- Climate Pact for Businesses
- Educational programmes for all age groups

Key take-aways

- increasing local renewable energy use (sun, air, ground, water)
- electrification of heating: heat pumps + photovoltaics + electricity and heat storage
- integration with the district heating network, hybrid solutions: local generation + district heating network
- adaptation of spaces to climate change
- electrification of transport, development of public transport and active mobility
- combating energy poverty

Still ahead of us

- local energy balancing,
- energy cooperatives and communities,
- scaling and replicating verified solutions

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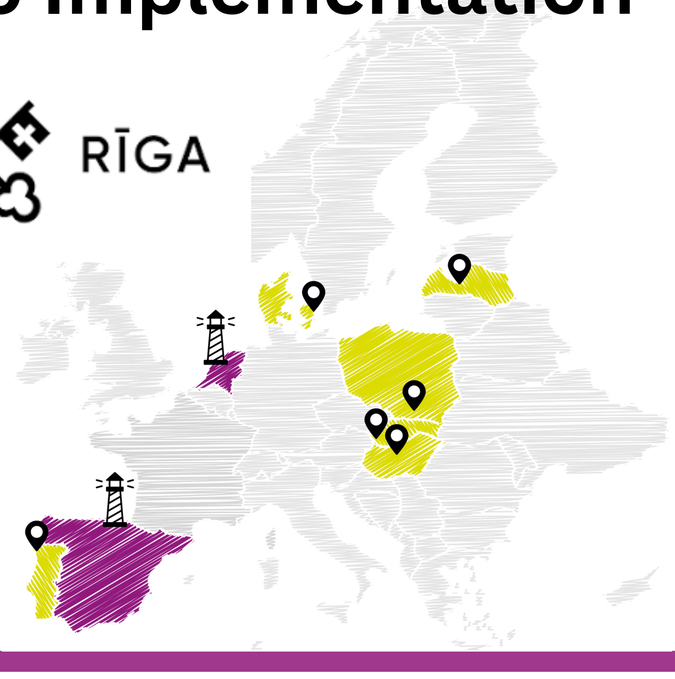
Fellow City Riga

Advancing PEDs in Riga: From Conceptual Design to Implementation

Riga has been awarded the EU Climate-Neutral and Smart Cities Mission Label.

The city's Climate City Contract actively supports the development of Positive Energy Districts (PEDs).

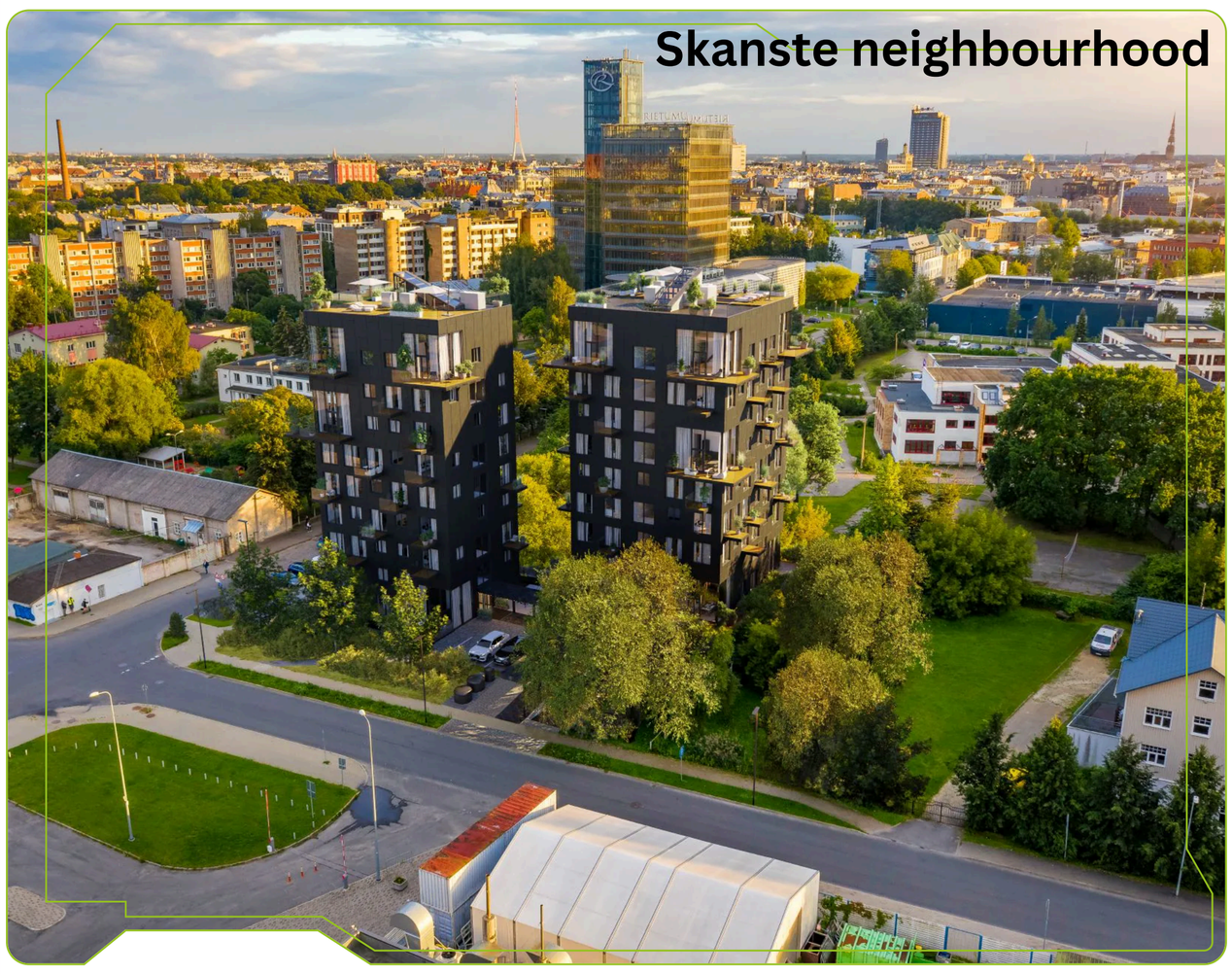
RĪGA

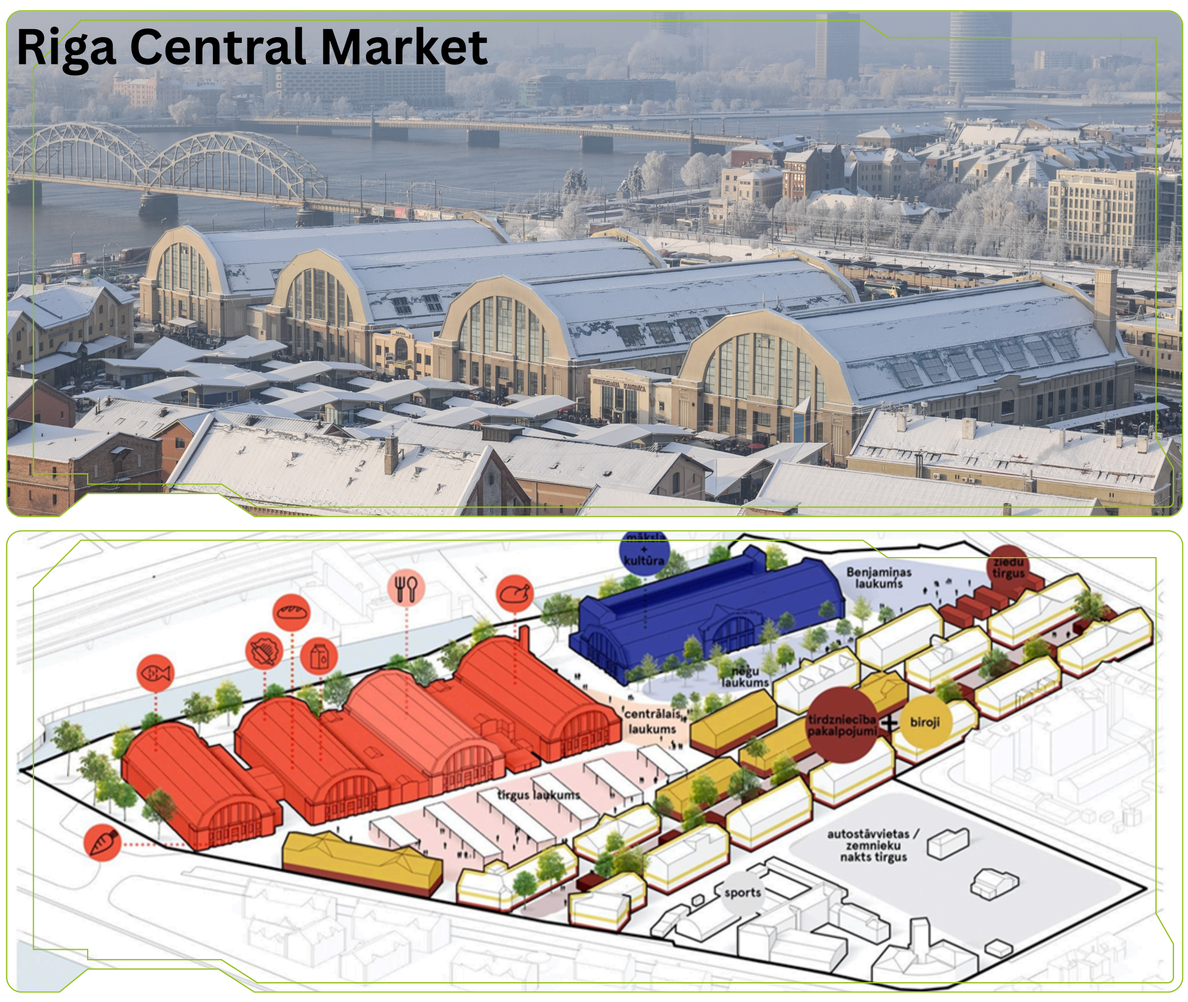


As district-level drivers of climate neutrality, **PEDs reflect Riga's commitment to a sustainable urban future** and offer a framework for upscaling within the wider national energy system. Building on the **experience gained through ATELIER** and strong international collaboration, Riga has strengthened its capacity to move from conceptual PED design to real implementation.

- ATELIER conducted a city-scale analysis in Riga to assess PED potential and **identify priority areas.**
- Riga examined **barriers and enablers for PEDs**, developed strategies for broader adoption, and established a **PED Living Lab** to strengthen **stakeholder and citizen engagement.**
- A potential PED area was selected in Skanste, where **alternative PED scenarios** combining photovoltaics, heat pumps and other solutions were explored to reduce CO_2 emissions, achieve a positive energy balance, and enhance grid flexibility.
- The conceptual work showed that **achieving ambitious PED goals depends on strong multi-actor collaboration.**

Riga's PED pathway demonstrates that **technical solutions alone are not enough**; the Skanste pilot highlights the importance of **shared risk, early stakeholder alignment, and participatory governance.**





Spatial and functional structure of the Riga Central Market

The lessons from ATELIER are now being put into practice through several municipal PEDs, showing Riga's commitment to scaling climate-neutral districts beyond pilots and integrating them into regular urban development.

One example is the **Riga Central Market**, a UNESCO World Heritage complex with high energy demand due to its Northern climate, large historic pavilions, and specialised heating and cooling needs for food operations.

Its structure makes it **well-suited for a PED,** functioning as a **coherent, data-driven energy system with shared generation, storage, consumption, and smart-management assets.** The site provides an ideal **real-world PED testing environment** where diverse users can co-create and test decentralised flexibility solutions aligned with **Mission Cities' climate-neutrality goals.**

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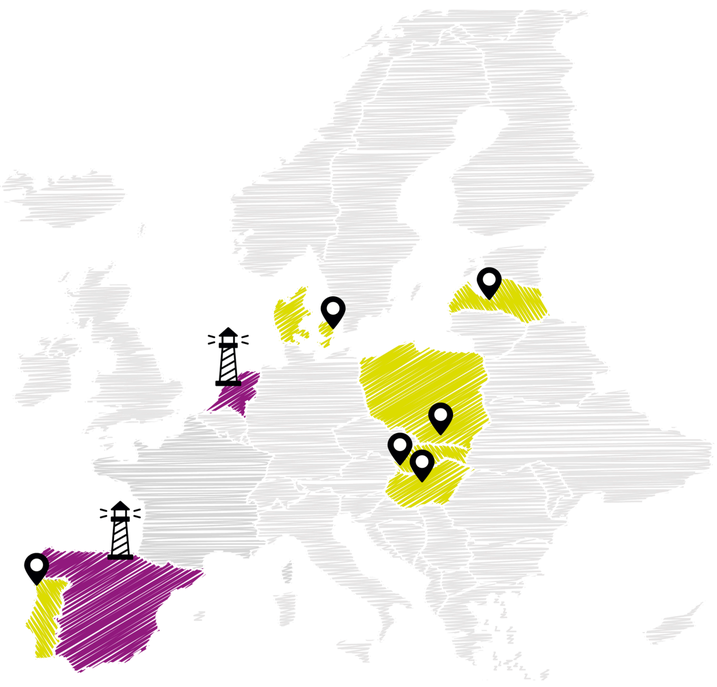
Energy City Vision

Within ATELIER, an **Energy City Vision** has been developed for the eight participating cities. The methodological approach is grounded in the Cities4ZERO framework*, which provides a structured pathway towards climate neutrality at the urban scale.

Significant emphasis was placed on advanced energy-system modelling to understand each city's system structure, behaviour and key drivers. This included assessing the baseline, exploring alternative future scenarios, and selecting a preferred master scenario to guide the action plan.

The modelling framework supports evidence-based decision-making by evaluating decarbonisation pathways and helping prioritise effective energy-transition measures.



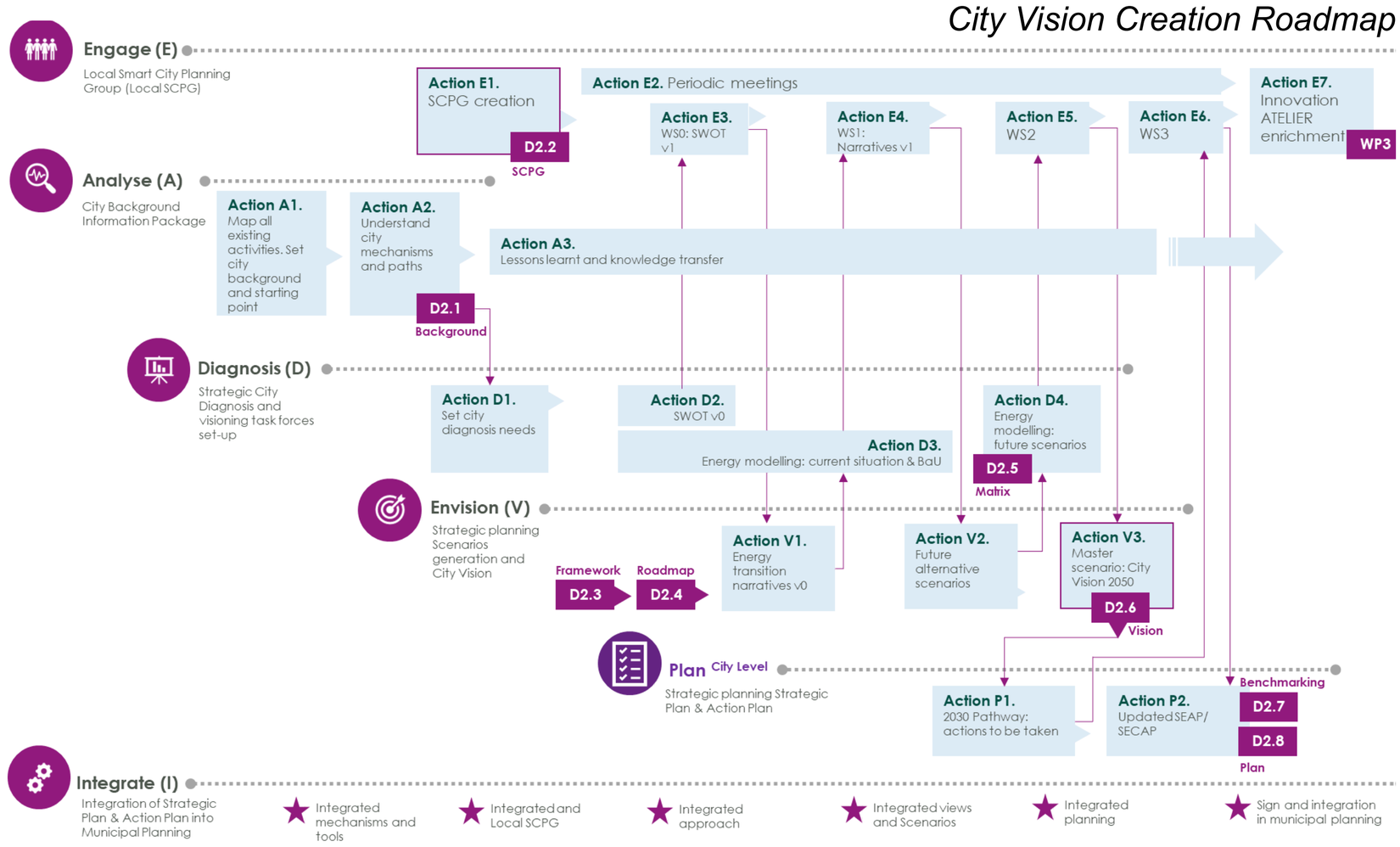
tecnalia Inspiring Business

*Urrutia et al., 2020, https://doi.org/10.3390/su12093590

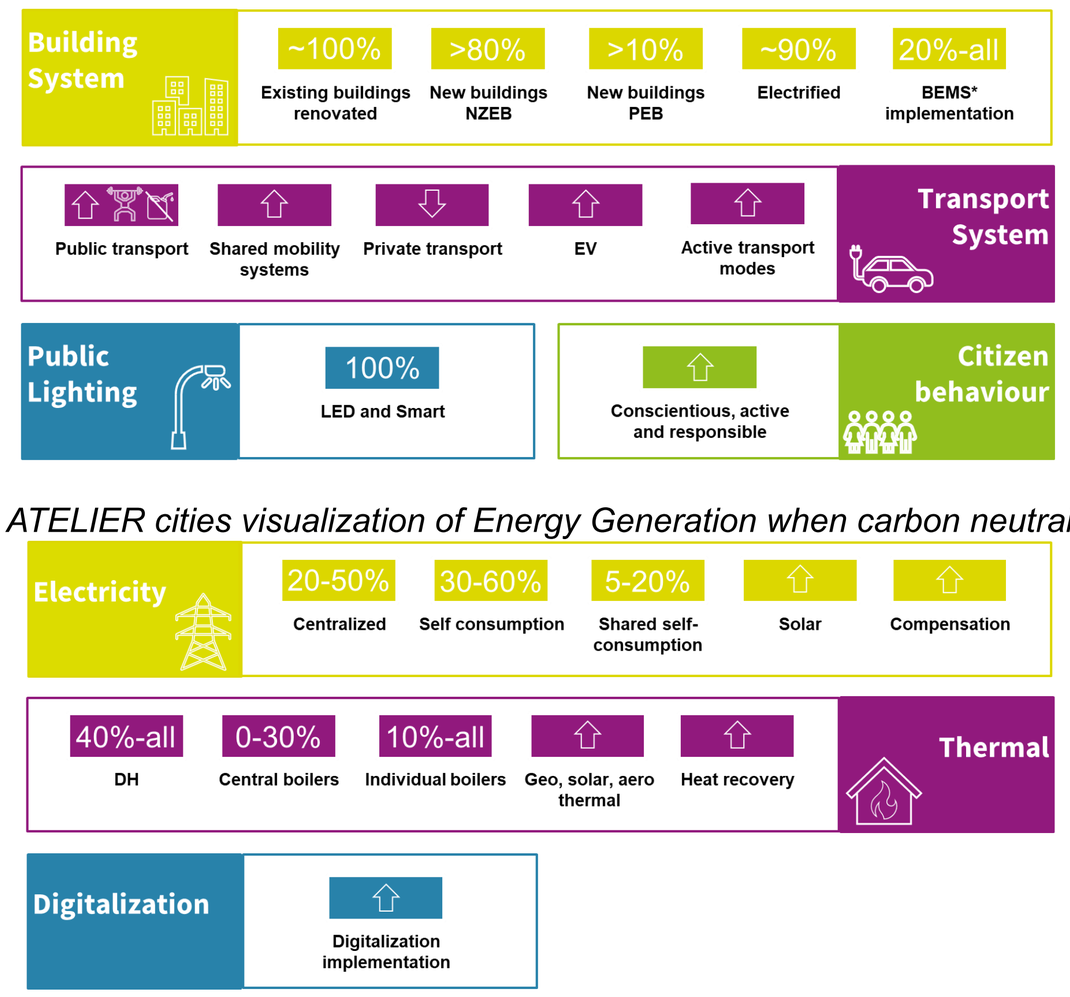
The ATELIER cities represent a broad diversity of European urban contexts and characteristics. Defining a common methodological approach capable of addressing the specificities of all city environments therefore posed a significant challenge.

A general roadmap was established at project level, which was subsequently adapted by each city to its specific needs and local conditions. Each city prioritised the areas considered most relevant, addressed its particular challenges, and aligned the process with its own municipal planning timeline.

City Vision Creation Roadmap



ATELIER cities visualization of Energy Use when carbon neutral



ATELIER cities visualization of Energy Generation when carbon neutral

Ensuring a successful transition of the energy system into climate neutral is no an easy task. Cities are making a remarkable effort to establish a plausible pathway towards achieving their carbon neutrality goals. Their strong commitment to the energy transition is evident through the allocation of necessary resources, the execution of numerous studies to support decision-making, the setting of ambitious objectives and the actions to accomplish them, the inclusion of diverse perspectives, and the involvement of all stakeholders in the participatory processes among other initiatives.

City vision creation is a living process that requires continuous updates to adapt to changing circumstances, incorporate the latest innovations, and apply the lesson learned from experience. This enriching process is key to fostering the transition.

More information about ATELIER cities energy vision

ATELIER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864374

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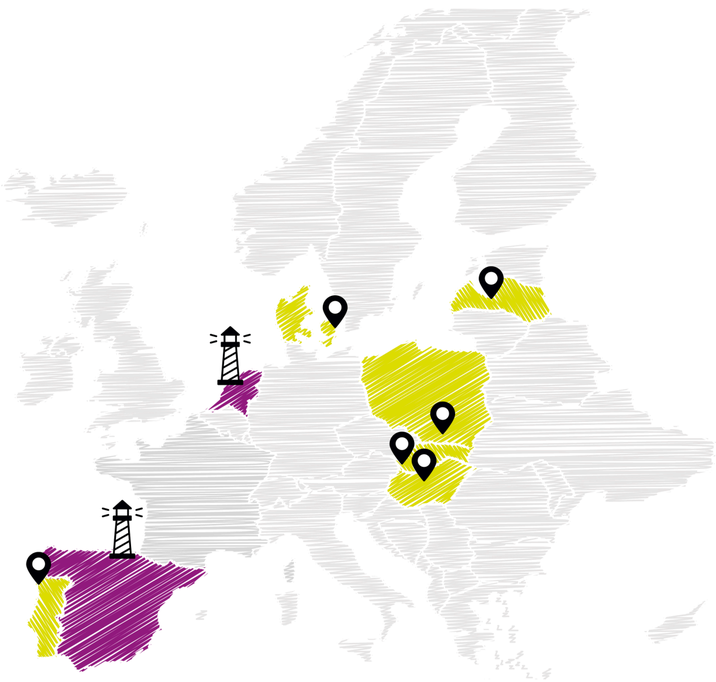
Innovation Ateliers

The **Innovation Atelier** is a method and set of tools that cities can adopt to address complex sustainability and social challenges through **collaboration across domains and actors**. It brings together municipal departments, external partners and experts to jointly explore the governance, financial, legal and planning questions that arise in complex urban projects.



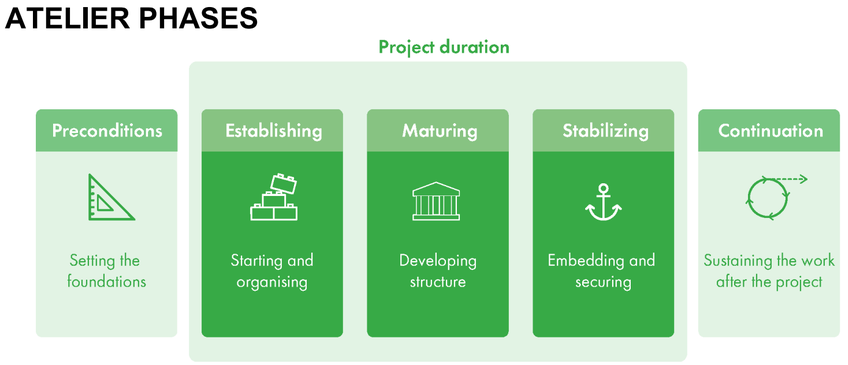
Developed within the ATELIER project to support the realisation of Positive Energy Districts, the Innovation Atelier offers a **practical approach that cities can apply in their own context**. It provides a structured way to tackle issues that cannot be solved within a single department or organisation. By structuring collaboration around shared questions, the Innovation Atelier creates **continuity, transparency and a stable basis** for managing the non-technical processes of urban innovation

TNO innovation for life

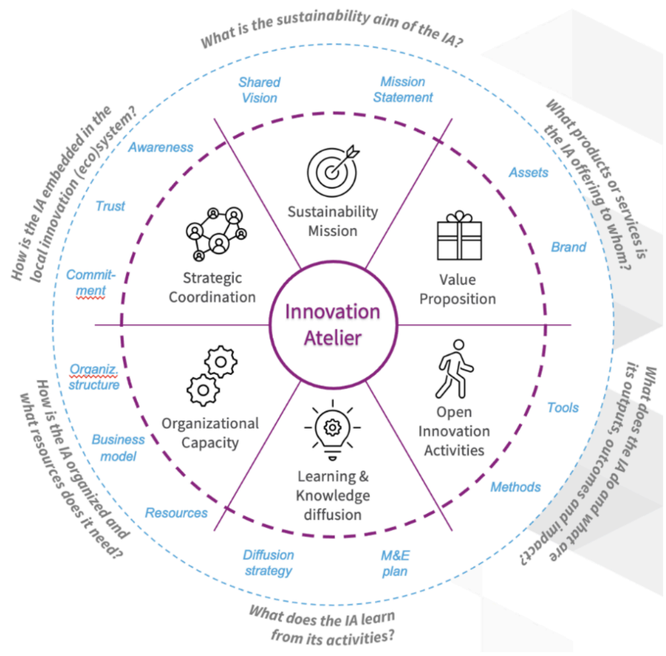
Partners must **align procedures, regulatory frameworks, financing models and operational choices.** The Innovation Atelier offers a structured development path to support this alignment. It begins with a **preconditions** phase, where political support, organisational readiness and ecosystem mapping are prepared. In the **establishing phase**, the mission, roles and coordination structure are defined. The **maturation** phase expands the network and professionalises working routines. The **stabilising** phase strengthens continuity and resilience. Finally, the **continuation** phase develops a long-term strategy to sustain the Innovation Atelier beyond the project context.

Within these stages, the Innovation Atelier addresses a set of building blocks that structure the work: from defining a shared sustainability mission and value proposition, to organising governance, aligning business and financing models, and setting up monitoring and learning mechanisms.

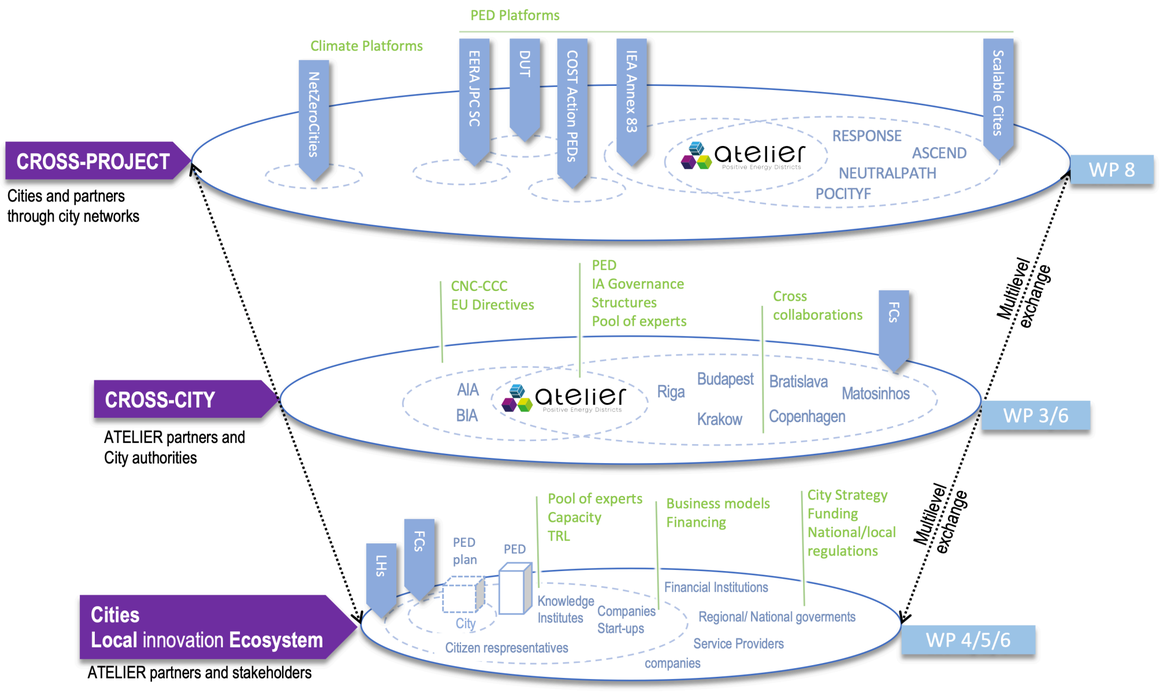
INNOVATION ATELIER PHASES



INNOVATION ATELIER BUILDING BLOCKS



MULTILEVEL KNOWLEDGE EXCHANGE



The Innovation Atelier effectiveness is reinforced by **multilevel knowledge exchange**: within the local ecosystem, between partner cities and across projects. This circulation of insights helps identify interdependencies early, align stakeholders and ensure that solutions are transferable.

The results are the development and testing of the Innovation Atelier method in eight European cities, documented lessons on governance, stakeholder engagement and financial and legal barriers, and structured cross-city learning that enabled comparison of approaches and uptake of shared solutions.

The outcome is **practical guidance with clear steps**, **formats and examples** that cities can use when developing PEDs or applying the Innovation Atelier method in other complex transition projects.

ATELIER project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 864374

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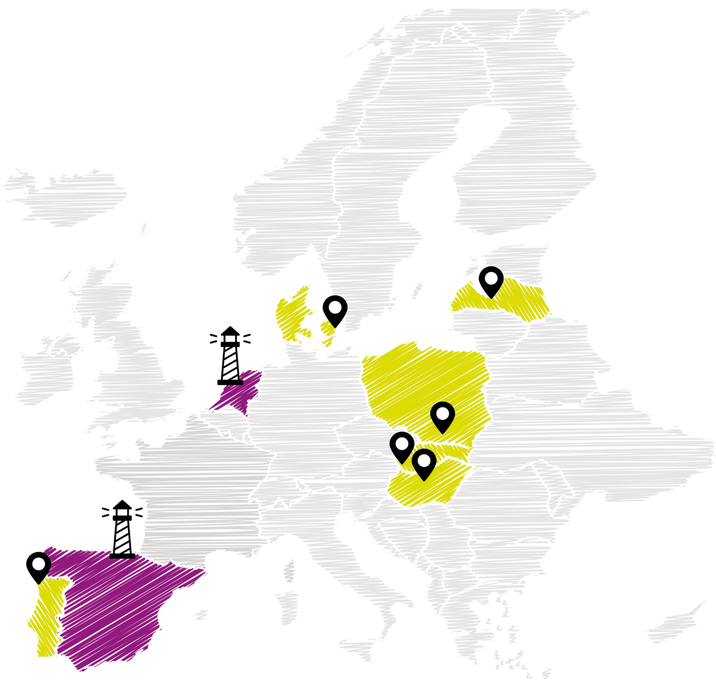
Replication & Upscaling

The ATELIER project developed six **replication plans** to support the implementation of Positive Energy Districts (PEDs) in the Fellow Cities of Bratislava, Budapest, Copenhagen, Krakow, Matosinhos, and Riga, building on the experience of Amsterdam and Bilbao.

The plans align with each city's **long-term climate vision and the EU Mission for Climate-Neutral and Smart Cities**, combining a GIS-based multi-criteria spatial analysis with stakeholder co-creation (SWOT–PESTEL) to identify suitable districts, define technical solutions and establish feasible financial and governance strategies.

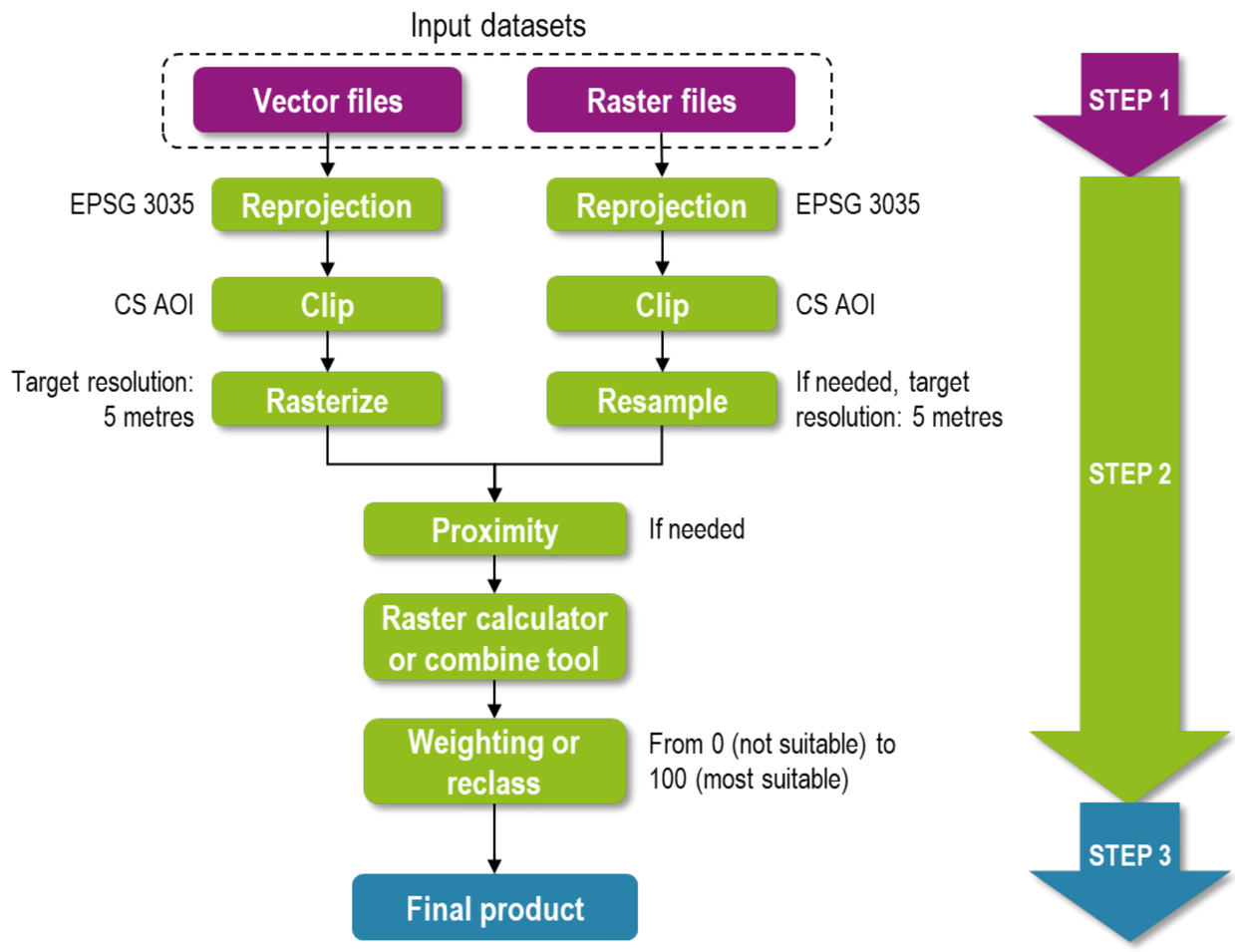


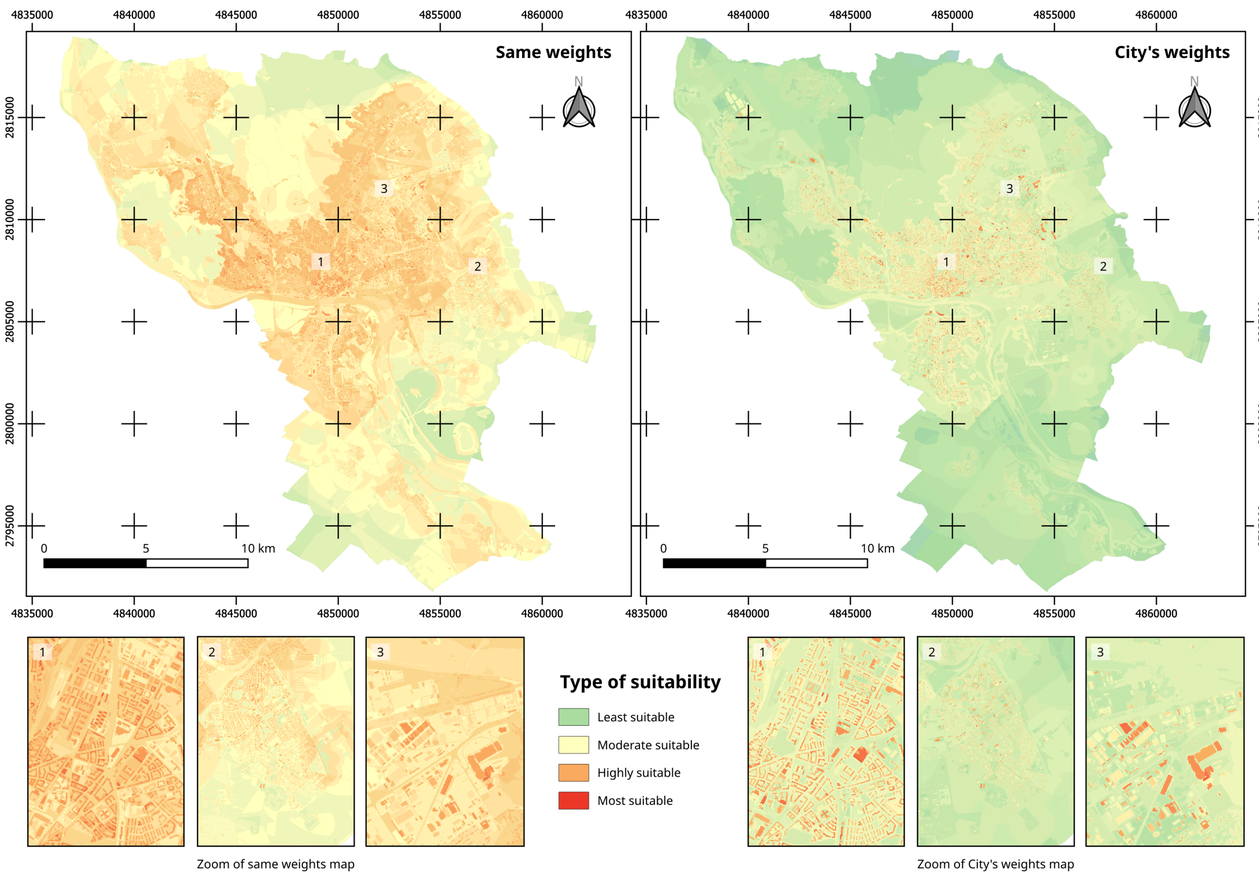
CARTIF

To identify the most suitable areas for developing Positive Energy District, a **structured and evidence-based procedure** was applied.

First, relevant urban data were collected and harmonised to ensure consistency and comparability across the city. Key aspects such as energy demand, renewable potential, urban characteristics and social factors were then integrated and jointly assessed. Through a transparent weighting and evaluation process, areas were classified according to their suitability for PED implementation.

This approach provides a clear, adaptable and replicable framework that supports **informed decision-making and strategic urban planning.**





The results provide a clear spatial overview of the city's potential for PED development under two scenarios: a **neutral approach** with equal weighting of all criteria and a **city-prioritised approach** reflecting local strategic preferences.

While the equal-weights map offers a balanced, diagnostic perspective of overall potential, the city-specific weighting refines the analysis by highlighting areas that best align with municipal priorities and climate objectives. The example of Bratislava illustrates how the adjustment of weights can shift suitability patterns, concentrating attention on strategically relevant districts while maintaining consistency in the most promising zones.

Overall, the comparison demonstrates that the **methodology is robust yet flexible**: it supports evidence-based decision-making while allowing cities to tailor results to their specific context and policy ambitions.

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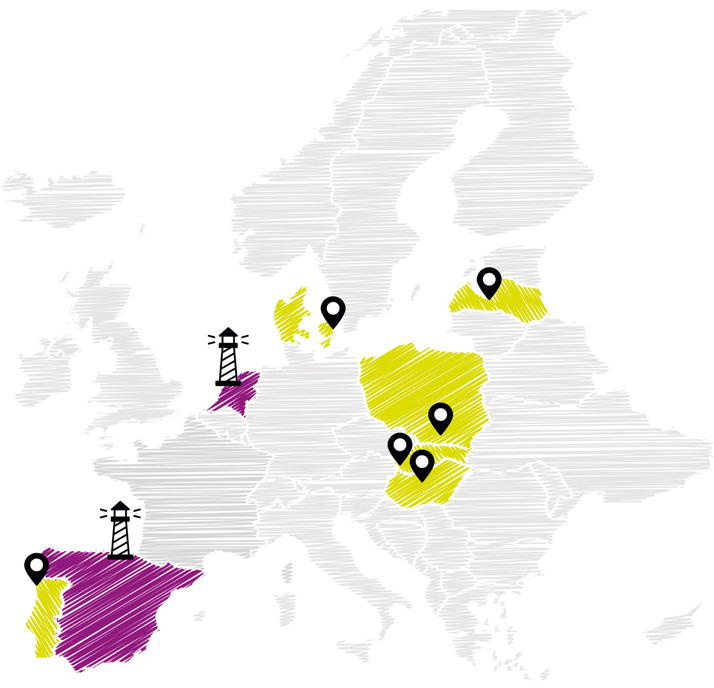
Exploitation

The exploitation approach for ATELIER focused on **helping partners progressively mature their results into real-world solutions.** Steinbeis Europa Zentrum supported the partners' R&D efforts with a structured, outward-looking process that places potential users and customers at the centre.

Because exploitable results arise in other work packages, the impact was maximised by combining **market evidence** and **scale-up strategies** (needs, competitive landscape, market potential, value creation) with partner support mechanisms such as IP management, patent landscaping and synergy building. These reduced barriers and accelerated milestone achievement.

Overall, the goal was to **enable exploitation that continues beyond the project's end.**



Steinbeis Europa Zentrum

Steinbeis Europa Zentrum conducted several iterations to select the so-called **Key Exploitable Results (KER)** of the project. Once selected, the workflow roughly consists of **a three step process**:

1) prepare a **Market Analysis** to better understand the market segment, the respective needs and how the KERs of the project address those needs (*customer pains*) together with the consideration of relevant internal and external factors;

2) co-design a **Business Model** that builds on the outcomes of such market analyses, documenting the cycle of value creation, value delivery and value capture;

3) strategise next steps by detailing an **Exploitation Roadmap** that tackles the current state, the future desired state and a long-term vision.

Steinbeis Europa Zentrum also combined the consortium's overarching IP management and provided synergy creation support with a more targeted patent landscape analysis and business case work.

IP management stretched from the beginning to the end of the project, helping to create awareness among project partners on how to deal with ownership regimes, access rights, etc. In addition, the **synergy creation support** focused on preparing exploitation materials such as the Solution Factsheets (see left) and on promoting opportunities for networking and matchmaking.

Concrete outputs were obtained, such as the **Patent Landscape Analysis**, which generated business intelligence insights to support the further exploitation of eligible Exploitable Results, and the **Business Cases**, which assessed the innovation journeys of selected ERs of the project.

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