Institute for European Environmental Policy



Beyond the smoke: Building support for clean heating measures in Europe

Project's final conference

Sofia – 20 October 2026, 10:00 – 16:00 EEST

With the support of CLEAN AIR FUND

Institute for European Environmental Policy

Welcome remarks



Vassil Terziev
Mayor of Sofia Municipality

Institute for European Environmental Policy

Keynote



Cecilia Vaca Jones
Executive Director,
Breathe Cities

Beyond the smoke: Building support for clean heating measures in Europe

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Session 1: Key findings presentation



Chiara Antonelli
Topic lead, IEEP

Beyond the smoke: Building support for clean heating measures in Europe



Reducing Residential Heating Emissions: What can European cities learn from each other?

From evidence to action through Clean Heating Zones

Chiara Antonelli, PhD,
Institute for European Environmental Policy

Icebreaker

Scan the QR code, go to Mentimeter and answer the following question:

What is the biggest challenge to reducing emissions from residential heating in your city?

OR type this link:
https://form.menti.com/s/alpyt3yyvths

PART I: WHY WE DID THIS PROJECT

Residential heating: a difficult policy challenge

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Residential heating matters…

- Largest source of PM2.5 emissions in the EU
- Major health impacts
- Increasing attention under EU air quality, energy and climate policies.

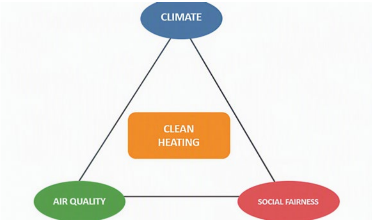
But policies often face resistance:

- Affordability concerns
- Lack of alternatives
- Perceived unfairness









Cities are increasingly expected to deliver an environmentally effective, socially and politically feasible transition

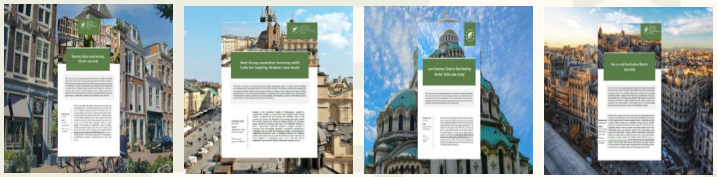
What was Beyond the Smoke?

One-year-long project run by IEEP, with the support of CAF

- Mapping → Compendium



- Case studies → Sofia, Kraków, Madrid, Utrecht municipalities



- Stakeholder engagement → interviews, roundtable, bilateral meetings
- Handbook → Clean Heating Zones



Project geography: Europe + four deep dives.

PART II - THE COMPENDIUM

What did we analyse?

- 29 cities
- Different governance models
- Different climates
- Different heating systems

Measures identified:

- bans/restrictions
- incentives
- retrofits
- district heating
- clean technologies

Divided into 3 main categories determined by the link with air quality

1. **Directly** improving air quality
2. Improving air quality as part of **broader regulations**
3. Part of **broader strategic frameworks** that pursue **other objectives**, with positive effects on air quality.





Full screen link

Example 1 – Skawina

Anti-smog resolution of the Małopolska Region (2017)

Progressive ban of burning solid fuels for residential heating:

- Started with a ban on using low-quality coal and wet wood;
- Will finish with a complete ban on coal in domestic heating installations from 2030 (in Skawina)

- Applies to all entities.
- Compliance ensured by the municipal authorities.

Financial support:

- Different types of subsidies: promoting new heat and energy sources, replacement of polluting old fuel boilers and stoves, addressing energy poverty:
  - Clean Air Programme;
  - Municipal budget and EU funds;
  - Stop Smog Programme (2019-2023)
- **Impacts**: in 2011, 161 days exceeded the daily norm for PM 10 concentration VS. 16 days in 2023.

Example 2 – Malmö

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Seasonal and spatial limits on solid fuel-burning stoves (2019)

- Between 1 April and 30 September, in **certain densely populated areas**, **prohibition on burning solid fuel for heating** and hot water production in a boiler that is not environmentally approved.
- The city provides recommendations on how and when to burn wood to limit pollution.
- **Sanctions**: enforcement is handled by Malmö's Environment Department according to Swedish Environmental Code.

Communication: In Sweden, local governments disseminate information on public websites to encourage awareness of cleaner wood-burning practices and to disseminate knowledge of specified local zoning regulations.

Initial conclusions

Affordable, clean heating is recognised as a need by European municipalities

Measures resembling or inspired by the logic of LEZ

Strengthened link between air quality and clean energy at local level

Flexible approaches, supporting schemes, and clear communication are key to efficient implementation

Integrating clean heating measures in local frameworks can strengthen local action

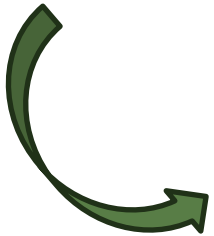
Adequate safeguards against the risk of exacerbating vulnerability to air pollution and energy price volatility

One-fits-all solutions will not work, but best practices can be identified and transferred with targeted scopes



These lessons became the foundation of the Handbook.

PART III: WHY A NEW FRAMEWORK WAS NEEDED – THE HANDBOOK



Five implementation gaps identified

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01	**Insufficient adaptation to local context**	• Current approaches often fail to capture all context-specific aspects • Technical infrastructure varies significantly by area and directly influences policy needs
02	**Lack of meaningful stakeholder engagement**	• Many measures lack representative stakeholder engagement during design and implementation • Participation is frequently limited to early stages
03	**Weak communication strategies**	• New policies are frequently perceived as an overestimation of burdens and an underestimation of benefits • Lack of transparent dialogue can make citizens feel excluded
04	**Limited local capacity and governance coordination**	• Local governments often lack the financial and technological capacity that other governance levels rely on • Poor integration of current MLG frameworks creates gaps in local governance capacity
05	**Weak monitoring and learning mechanisms**	• Lack of guidance on applying low-cost sensors and complementary methods • Absence of harmonised definitions for estimating population exposure

Clean Heating Zones: a framework for combined local action

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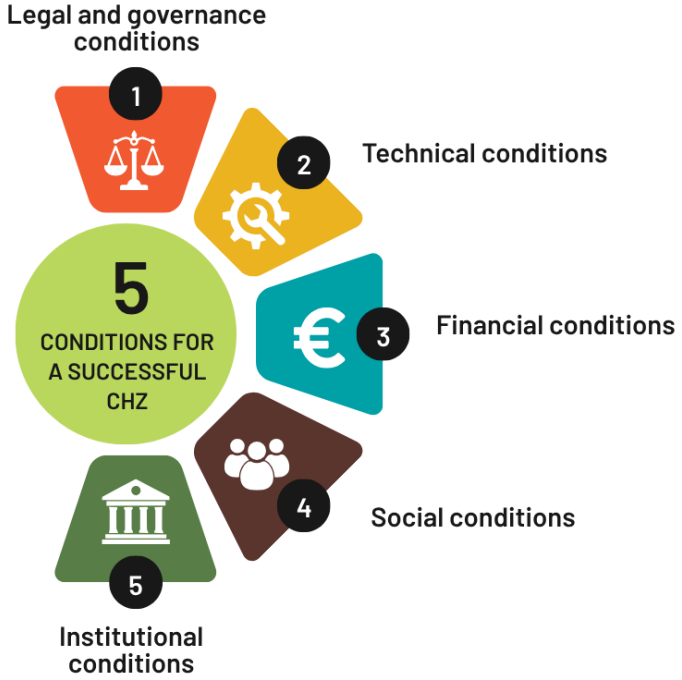
A Clean Heating Zone (CHZ) combines regulatory, financial, infrastructure and engagement measures within a defined area to reduce heating emissions and accelerate the transition to cleaner heating.

- Geographically targeted intervention
- Focus resources where benefits are highest
- Align air quality, climate and energy goals
- Adapt measures to local housing and infrastructure realities

What makes a CHZ different?

Traditional approach	CHZ approach
Single measure	Policy mix
Air quality only	Air quality + climate
Technology-focused	People-focused
City-wide generic action	Place-based action

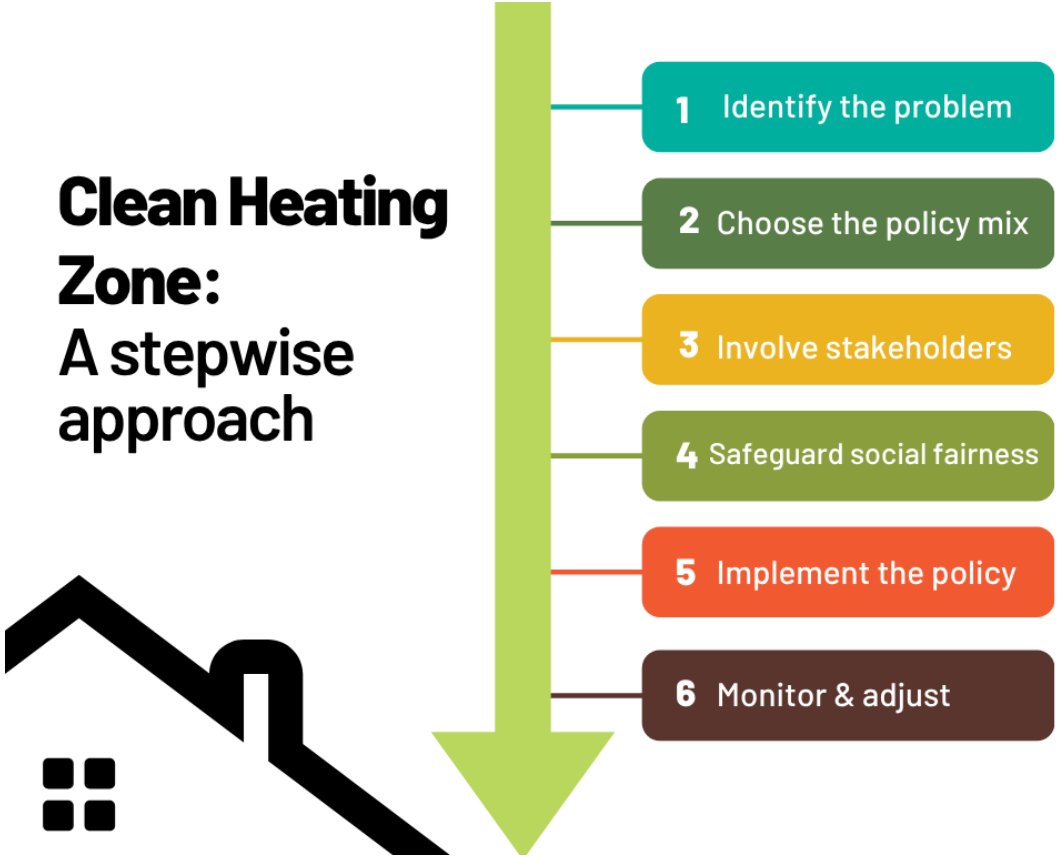
Enabling conditions for a CHZ



Designing a Clean Heating Zone

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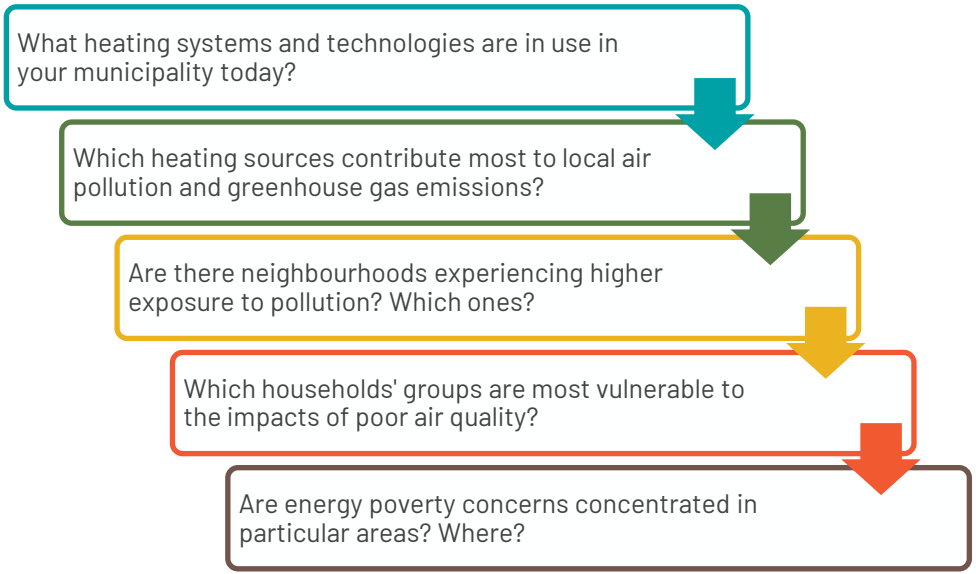
Clean Heating Zone: A stepwise approach



Clean heating is not just a technology challenge. It is an implementation challenge.

A six-step approach

Step 1: Identify the problem



Step 2: Choose the right policy mix

Typology of measure	Example
Regulatory	▪ Bans on specific polluting fuels ▪ Phase-out processes for older devices ▪ Setting emission standards
Financial	▪ Subsidies for heat pumps ▪ Retrofitting incentives ▪ Low-interest loans
Infrastructural	▪ Expanding district heating systems ▪ Improvement of renewable networks
Communication	▪ Public awareness campaigns ▪ Open days and citizens information events

Step 3: Involve the relevant stakeholders

Public authorities

- Municipal departments
- Regional authorities
- Health Agencies
- Air Quality Agencies

Citizens

- Homeowners
- Tenants
- Residents associations
- Vulnerable households



CLEAN HEATING ZONE

Key stakeholders to engage

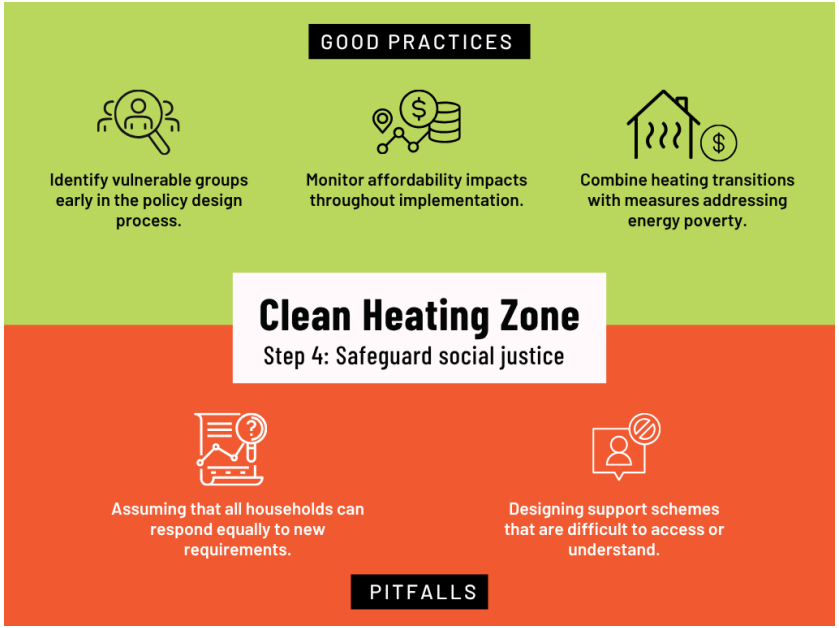
Business stakeholders

- Installers
- Technology experts andowners
- District heating operators
- Energy utilities

Civil Society

- Consumer groups
- Community groups
- Energy poverty organisation
- NGOs

Step 4: Safeguard social justice



Step 5: Implement the policy

4 Phases to implement a CHZ

01 PREPARATION

- establish governance arrangements;
- secure financing;
- develop communication materials;
- consult key stakeholders.

02 ENABLE THE TRANSITION

- launch support programmes;
- expand infrastructure;
- strengthen installer capacity;
- improve access to technical advice.

03 INTRODUCE REGULATORY MEASURES

- apply standards and restrictions;
- communicate deadlines clearly;
- provide ongoing support.

04 ENFORCEMENT

- verify compliance;
- address non-compliance proportionately;
- maintain transparency regarding outcomes.

Step 6: Monitor and adjust

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INDICATORS for monitoring CHZ process

ENVIRONMENTAL INDICATORS

- $PM_{2.5}$ concentrations;
- PM_{10} concentrations;
- black carbon emissions;
- greenhouse gas emissions.

SOCIAL INDICATORS

- energy poverty rates;
- household heating expenditure;
- customer satisfaction;
- distribution of support across income groups.

TECHNICAL INDICATORS

- number of heating system replacements;
- heat pump installations;
- district heating connections;
- renewable heating uptake.

ECONOMIC INDICATORS

- public investment mobilised;
- private investment leveraged;
- local employment effects;
- programme delivery costs.

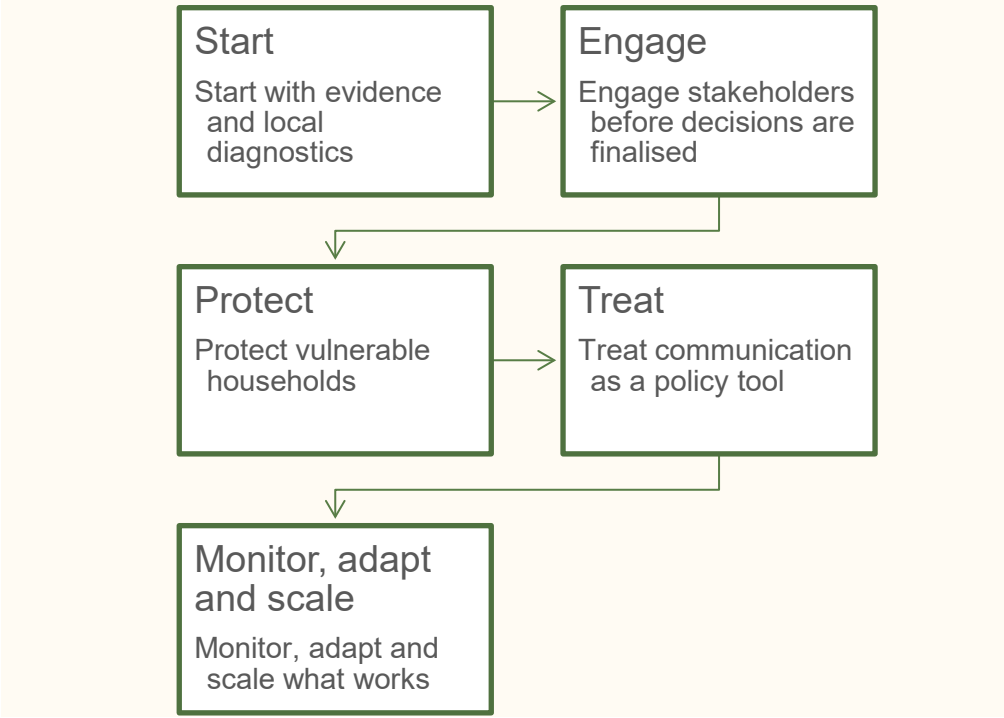
Back to Mentimeter ...

Which element is most often overlooked when designing clean heating measures?

A. Technology
B. Enforcement
C. Affordability
D. Citizen engagement
E. Governance coordination

OR type this link:
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Five recommendations for practitioners



Three takeaways

1. **Cities are already experimenting.**
2. **Success depends on combining measures, not individual interventions.**
3. **Clean Heating Zones provide a practical framework to turn ambition into implementation.**

Thank you!

Check additional IEEP publications here

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Session 2: Deep dive into the case studies



Irene Chiocchetti
Policy Analyst,
IEEP



Marin Marinov
Director of Sofia Air Quality Department

Beyond the smoke: Building support for clean heating measures in Europe

Case studies overview



Sofia: Low Emission Zone in the heating sector (2025)



Kraków: Ban on solid fuels for heating (2019)



Utrecht: Ban on wood-burning indoor (2030)



Madrid: Ban on coal-fired boilers (2022)

Kraków - Ban on solid fuels for heating (2019)

- Anti-Smog Resolution: regional regulation, prohibiting the use of solid fuels in Kraków.
- Context: high levels of NO2 and PM2.5, particularly in winter, breaching EU and WHO guidelines.
- Mobilisation of citizens, supported by doctors and promoted by media, calling authorities to act on public health.
- Successful result of a bottom-up initiative: key role of the grassroots movement Kraków Alarm Smog in the design and building positive narrative
  - ➢ Widespread social acceptance!
- Municipality adopted an inclusive stakeholder engagement process and mobilised funds to support the replacement.

Main successes:

1. **+25,000 solid-fuelled** devices were liquidated from 2012-2019
2. **23-39%:** Reduction estimates in the annual average of PM_{10}.
3. **From 132 (2012) to 31 (2023)**, annual number of days exceeding PM10 limit values.
4. **Close cooperation**
5. **Efficient use of** local, national and EU funds.



Utrecht - Ban on wood-burning indoor (2030)

- First Dutch city to introduce a total ban on indoor wood burning from 2030.
- Driver: to comply with WHO guidelines and act within its competence, as 80% comes from outside the city.
- Context: Residential outdoor wood-burning represents 25% of PM2.5 emissions (vs. 23% in the NL).
- Wood-burning furnaces used mainly for recreational purposes, generally by wealthy citizens.
- From 2021 to 2025: financial scheme for device replacement.
- The municipality has foreseen exemptions for those who cannot afford it or wood-burning as primary heating.

Main successes:

1. **Communication plan** started 10 years before the ban entered into force.
2. **Extensive stakeholder** engagement.
3. **Exemptions** for vulnerable households.
4. **Expected impacts** on air quality, improving people's health and wellbeing.



Madrid - Ban on coal-fired boilers (2022)

- The Air Quality and Climate Change Ordinance includes: ban on coal-fired boilers, phase out oil-based boilers, other emission reduction measures.
- Air quality & climate objectives under a broader sustainability strategy, Madrid 360.
- Context: city's pollution (NO_2, NOx and $PM_{2.5}$) comes from road traffic and residential heating in winter. In summer air quality affected by extreme wildfires.
- Target: around ~500 devices, limited scope, so no major implications for public acceptance.

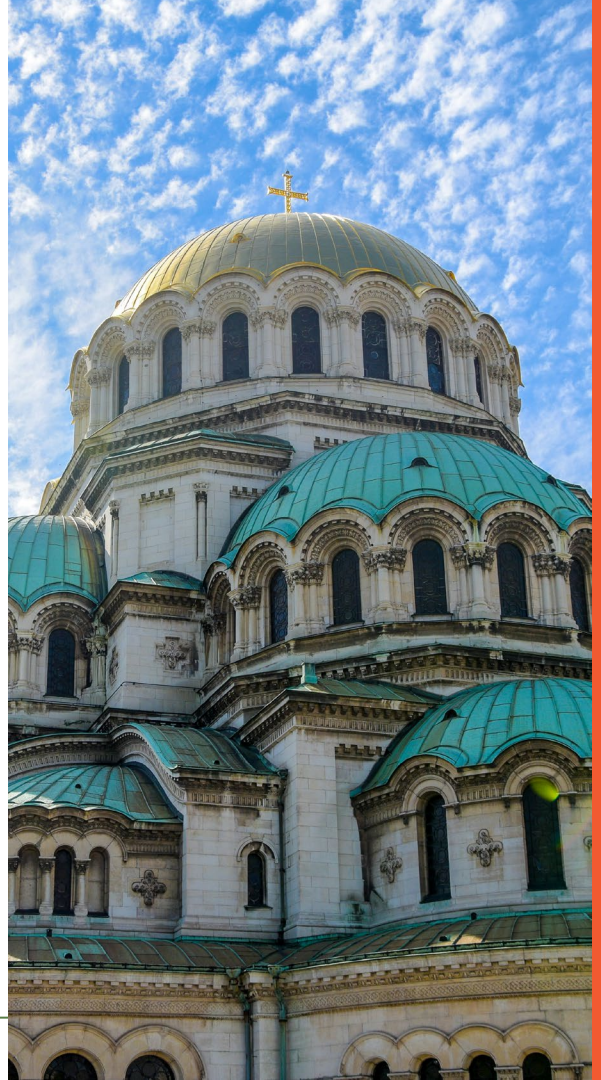
Main successes:

1. **Reached the objective** of eliminating coal-fired boilers.
2. Small, yet **symbolic part** of a broader strategy.
3. Stakeholder engagement + **close contacts** with affected users.
4. **Supporting schemes** for vulnerable households.



Sofia – Low Emission Zone for heating (2025)

- First Low Emission Zone for heating in Europe.
- It bans the use of coal, coal briquettes and wood for domestic heating.
- Context: high concentrations of PM2.5, PM10, Benzo(a)pyrene, NO2 above EU standards and WHO guidelines.
    - ➢ Much of these from solid fuel appliances.
- Such polluting devices mainly used by low-income households, living in suburban areas.
- Gradual implementation: active in 9 districts since 2025, and by 2029 it will apply to the entire municipality by 2029.



Lunch break – see you at 13.45

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Panel session



Moderated by
Raya Lecheva
Journalist



Angel Burov
Professor, University of Architecture, Civil Engineering and Geodesy



Antoniya Novakova
Project Manager
EnEffect



Joel Boehme
Campaign Manager Clean Heat Europe, European Heat Pump Association

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Interactive session



Coordinated by
Florinda Boschetti
Breathe Cities



Marin Marinov
Municipality of Sofia



Fernando Del Valle
Municipality of Madrid



Maria Wiśnicka
Municipality of Warsaw



Manuela Ojan
Municipality of Milan

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Concluding remarks



Eng. Nikolay Nedelkov
Deputy Mayor for Environment, Green System, and Ecology of Sofia Municipality



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Thank you for your participation