

Showcasing How To Phase Out Fossil Fuels From Urban Heating & Cooling

Presentation for the Concerted Action of the Energy
Efficiency Directive
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... Decarb City Pipes 2050 ...

Decarb City Pipes 2050: Transition Roadmaps To Energy Efficient, Zero-carbon Urban Heating And Cooling

- ▶ Horizon 2020 – Energy Call 2019
- ▶ Topic: Supporting public authorities to implement the Energy Union
- ▶ Duration: July 2020 to August 2023
- ▶ Budget: 1,9 Mio Euro
- ▶ www.decarbcitypipes2050.eu



Other Project Partners

Besides the 7 cities: Vienna, Munich, Winterthur, Bilbao, Rotterdam, Dublin & Bratislava

- ▶ **UIV Urban Innovation Vienna (Project Coordinator)**
- ▶ **Energy Cities (Belgium, France)**
- ▶ **Halmstad University, Dept for Human Geography and Spatial Planning (Sweden)**
- ▶ **Utrecht University, Dpt. For Construction & Energy Engineering (Netherlands)**
- ▶ **Tecnalia Research & Innovation (Spain)**



ENERGYCITIES



Why Decarb City Pipes

It's complicated, it's urgent and we're not prepared

- Climate urgency requires **more stringent and faster action**
- **Transitioning urban heating and cooling is key**
- **Long life-cycles mean urgency to start planning NOW**
- **Many uncertainties** (technical, legal, process-related, social)
- **High-level of skills**, knowledge and planning capacity **required**
- **Cities are ill-equipped** for this challenge

Goals Of The Project

Equip cities with the know-how, capacity and mandate to act

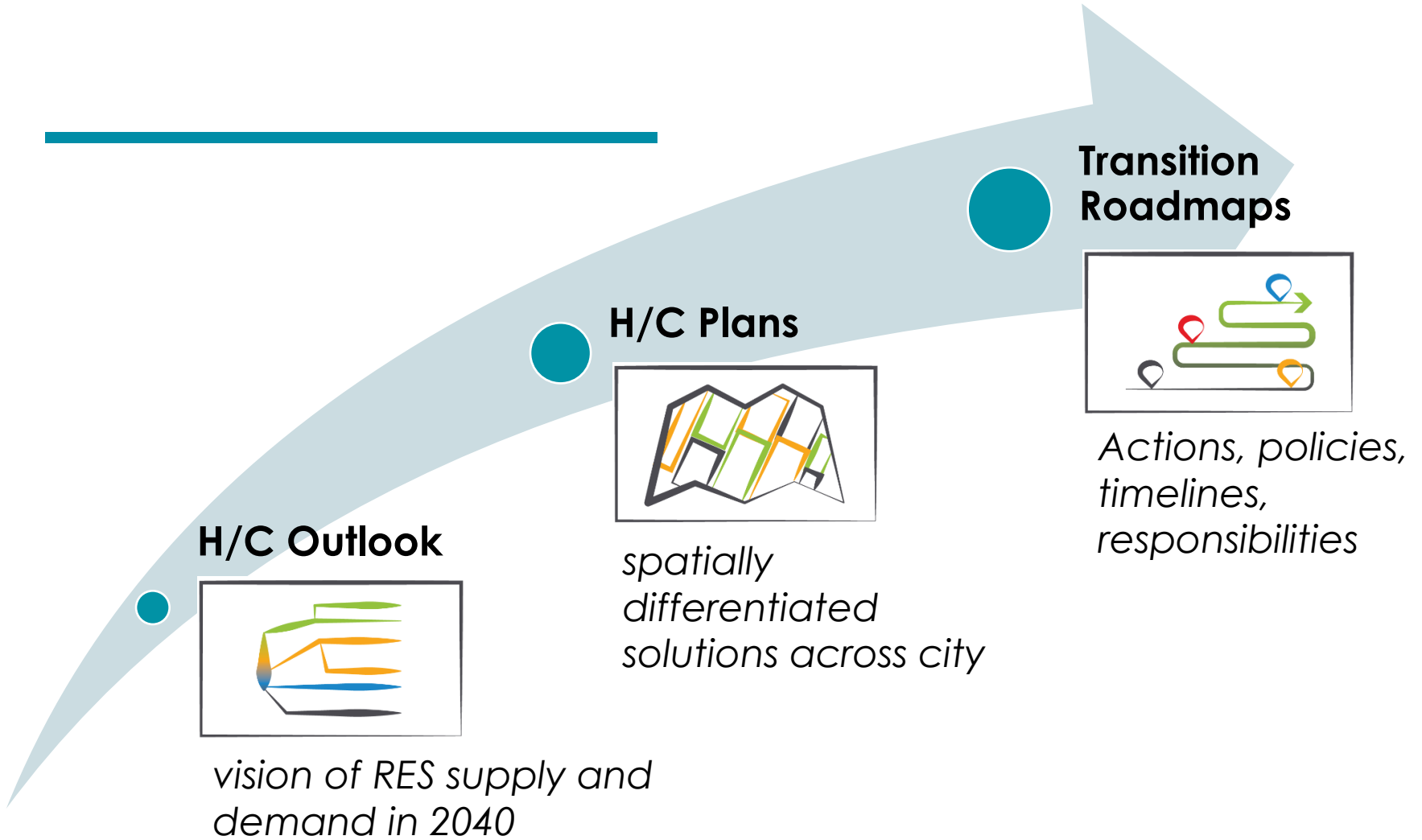
- ▶ build-up **planning and implementation capacity** in each city
- ▶ address the “**hot potato**” of **phasing out** fossil gas (or gas boilers!) in building sector
 - meaning “no gas” for space heating!
- ▶ break challenge down into manageable, concrete steps
- ▶ show-case how local authorities can succeed in this challenge
- ▶ ... and spread the word.



7 Cities to showcase how it could work...

City	Bilbao	Bratislava	Dublin	Munich	Rotterdam	Vienna	Winterthur
Climate neutral by	2050	2050	2050	2035	2050	2040	2040
Gas	85%	30%	72%	50%	72%	42%	41%
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Triple Jump To Readiness



Partner cities will develop the following approach:



WHAT

Cities will assess the existing energy demand for heating and cooling, estimate the future demand and the potential of renewable energy to supply it. Techno-economic megatrends will be confronted to local circumstances, to determine which solutions are the most suitable.



WHERE

Spatially differentiated plans will be developed to determine where the different solutions are the most cost-effective for each district, depending for instance on the energy infrastructures available, the types and density of buildings, or the local energy resources.



WHEN & HOW

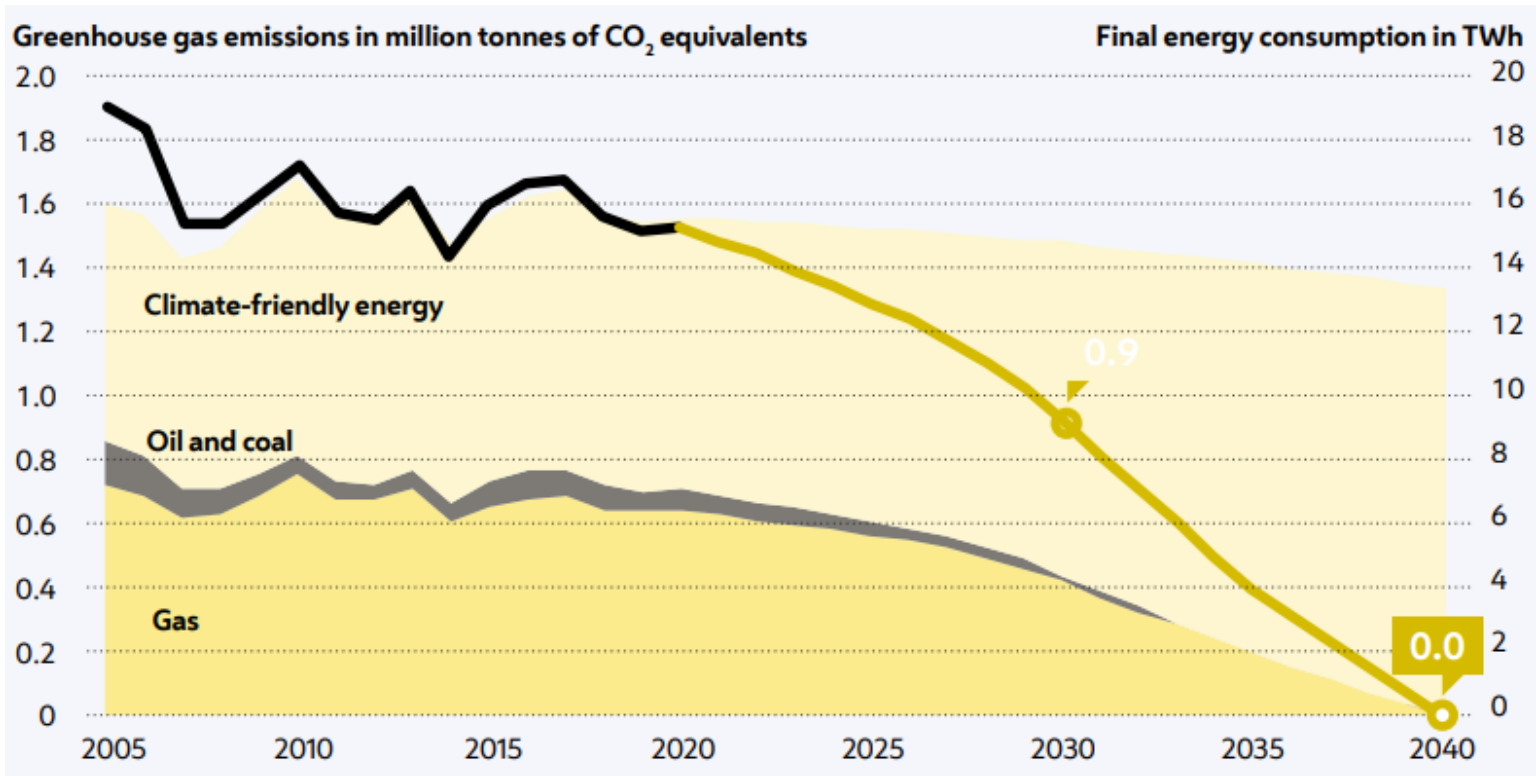
Transition roadmaps will define how to implement these solutions, at which pace, and who should be involved. The adaptation and creation of suitable legal and financial instruments will be key to succeed.

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Showing fossil fuels the door in Vienna

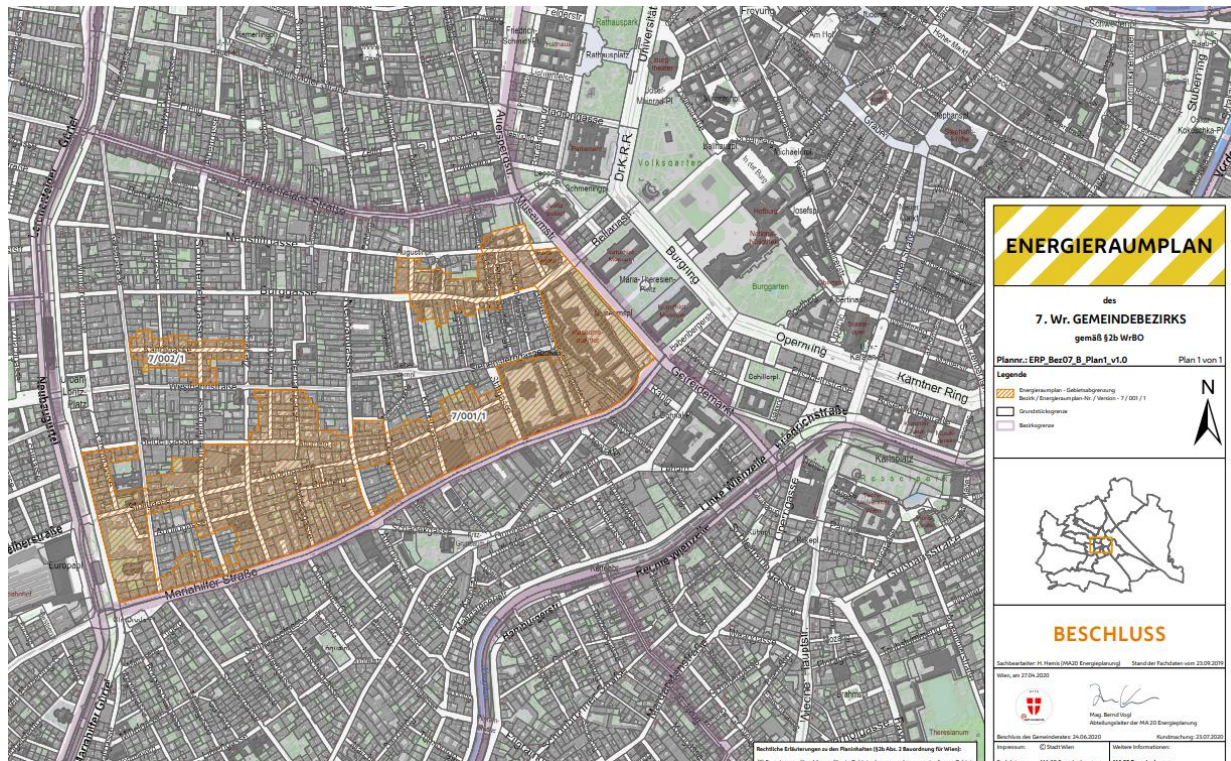
Pathway for greenhouse gas emissions in the building/heating sector till 2040.



Source: Vienna Climate Guide, City of Vienna 2022

Energy Zoning in Vienna

Since 2020: Prohibition of gasboilers in new buildings in designated areas



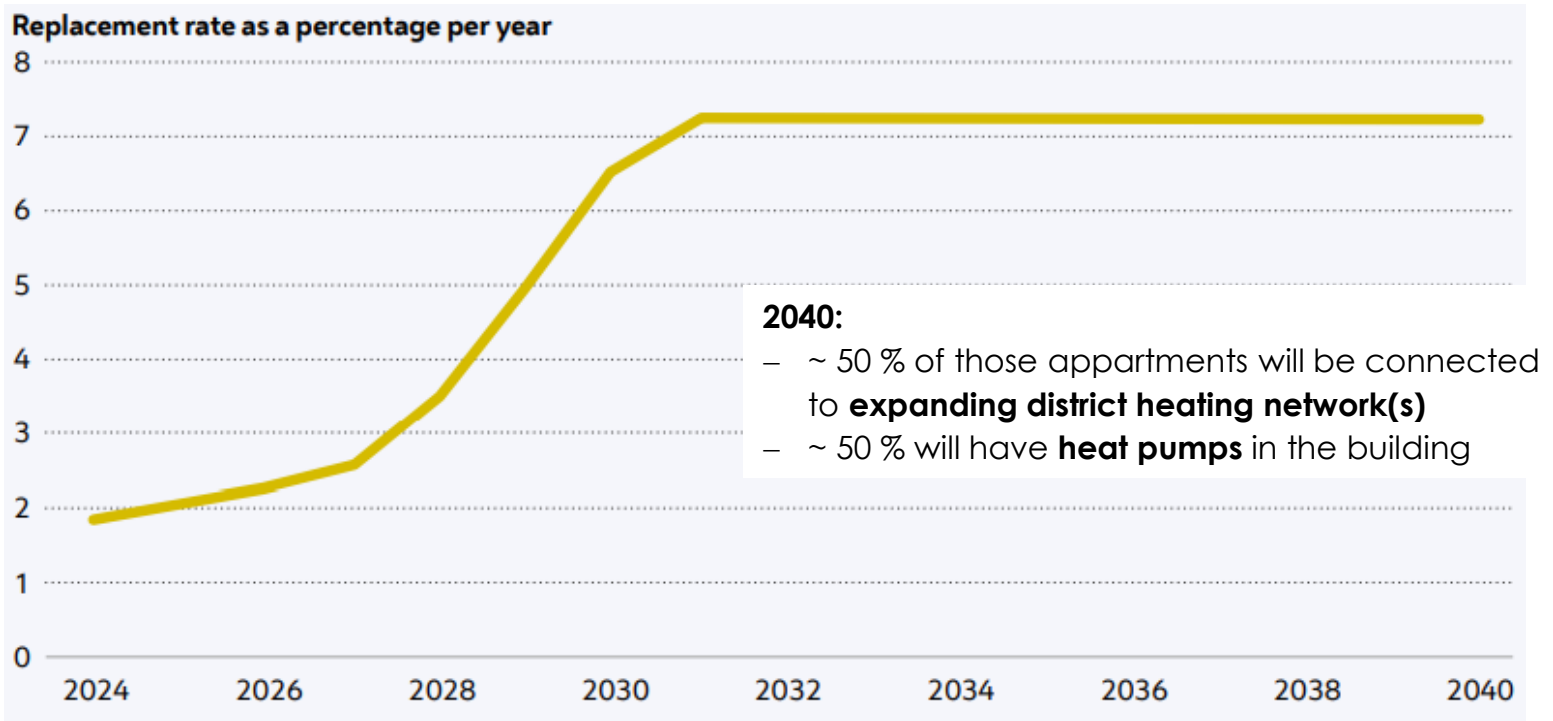
Spatial Energy Plan, 7th district, Vienna

Heating & Cooling Concept Vienna (2023)



Getting rid of gas boilers in more than 500,000 units!

Roadmap for annual replacements till 2040



Heating & Cooling Plan in Vienna



4 Types of Zones:

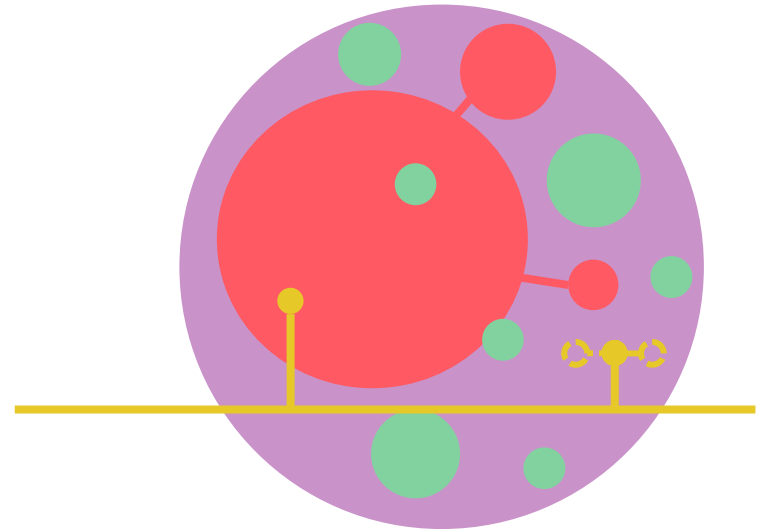
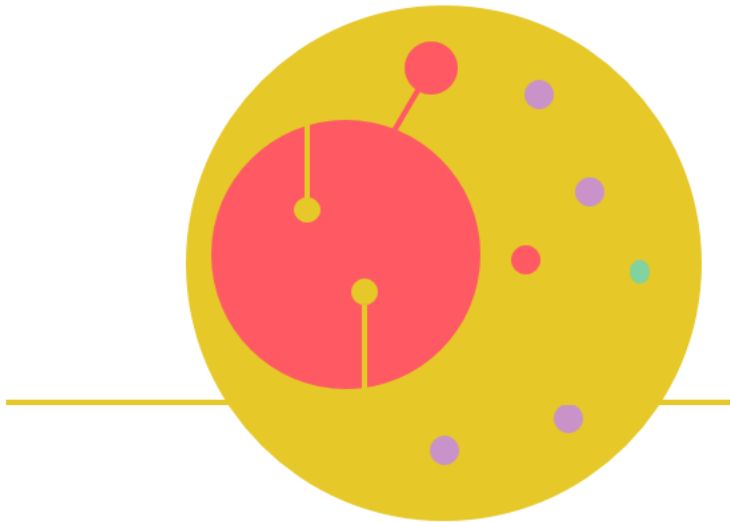
1. District heating
2. Proofing zones for DH
3. Microgrids / decentral low temperature DH
4. Single RES solutions

Spatial Vision for H/C in Vienna in 2040

Today



2040



Natural gas supply

Central district heating

Decentralised systems (Heat pumps, biomass etc)

Local heating (anergy) networks

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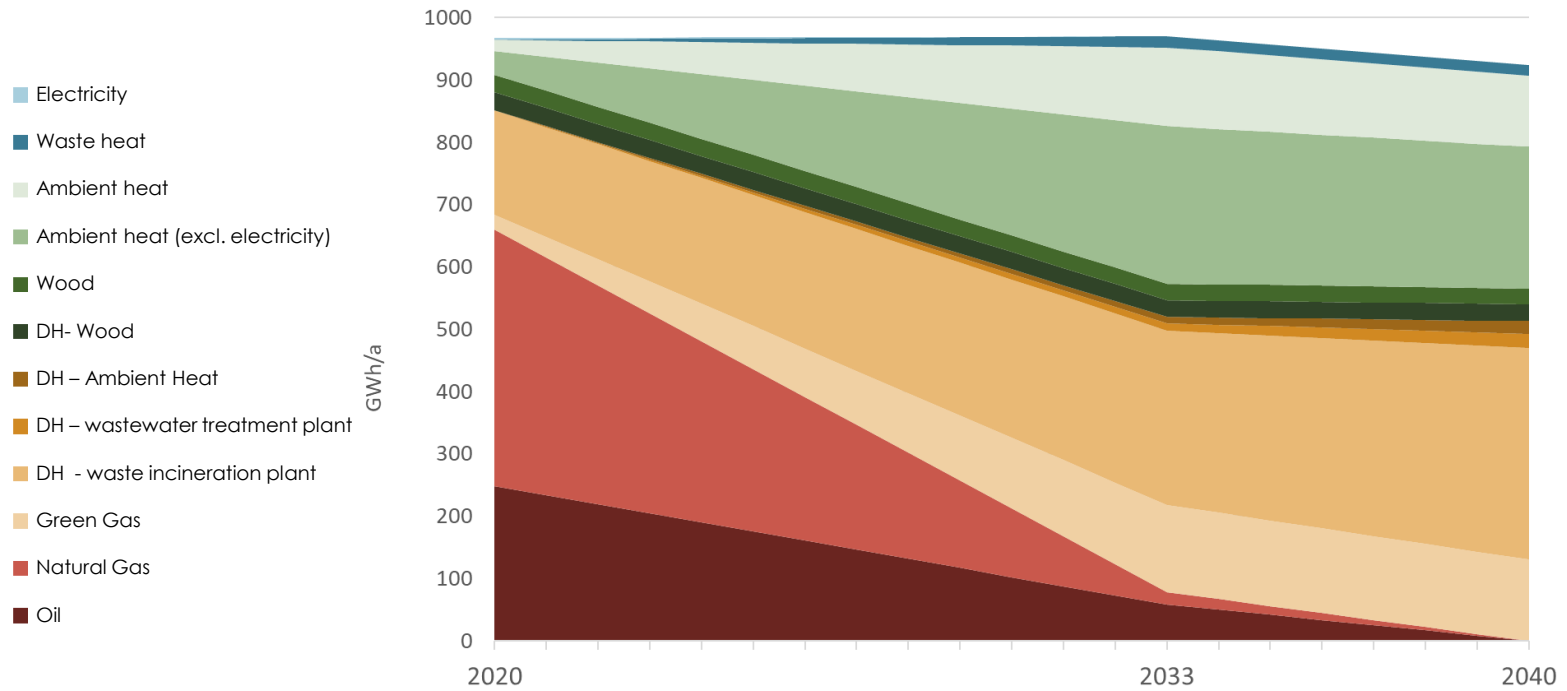
Winterthur

Legal Framework

- ▶ **Zero-emission-goal to achieve in 2040** (confirmed by voting population in November 2021)
 - ▶ 1t CO₂ in 2033 -> for heat-supply 300 kg CO₂/Person
 - ▶ Enables the implementation of the H/C-Plan (ensures finances, gives priority, support of City Council!)
- ▶ **New Energy Law Canton Zurich (since autumn 2022)**
 - ▶ No more fossil heating solutions allowed in new & existing buildings (with exceptions)
 - ▶ Lot more of approvals for heat pumps in the last half year
 - ▶ Mandatory connections possible (building law)
- ▶ No new connections to the gas network are built
- ▶ In the areas with an exiting district heating providing of **gas will be stopped in the year 2030**
- ▶ In the areas with lower heat demand density (no district heatings) providing of **gas will end in the year 2033**
- ▶ In the areas where a district heating will be built in the next years providing **of gas will end in the year 2040**

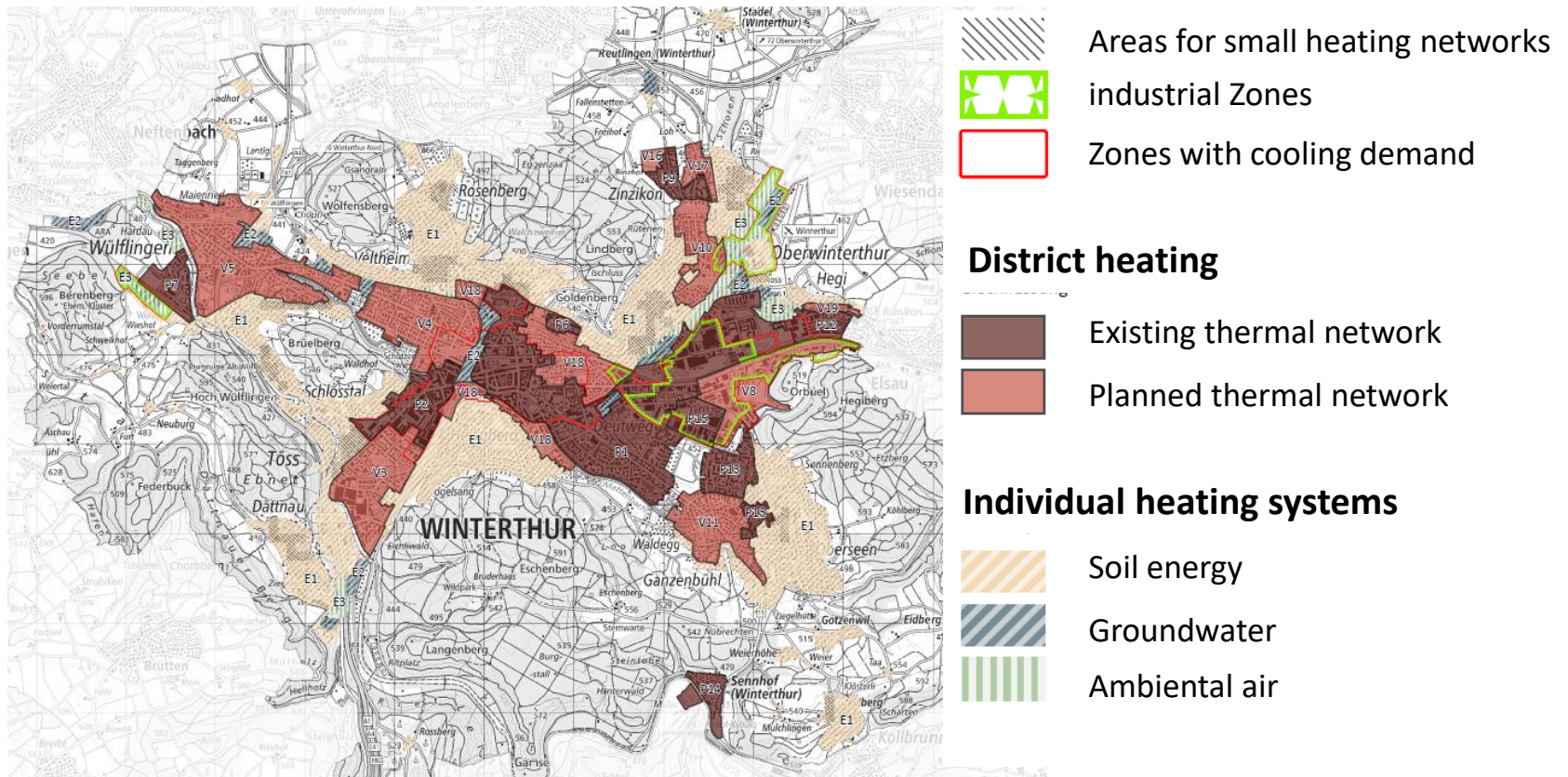
Pathway for the heating sector

Transition of heating sources: 100% renewables by 2040!



Heating and Cooling Map Winterthur

Transition of heating sources: Renewable Gas only available on long-term in industrial zones!



Challenges in Winterthur

Current challenges the city faces

- ▶ **Finances**
- ▶ **Waste heat incineration plant** (new constitution about circular economy)
- ▶ **Velocity of building new pipelines** (vs. Energy law)
- ▶ **Expansion of electricity grid**
- ▶ **Transition solutions** (because of energy law):
Mandatory connections and transition solutions are only possible if:
 - ▶ a budget for the construction of the district heating is spoken and
 - ▶ preliminary contracts are possible.

Possible transition solutions:

- ▶ Another fossil heating until connection to DH is possible with preliminary contracts
- ▶ Microgrids with neighbours until pipeline is ready to connect
- ▶ Preliminary contract and utility is taking the risk of a heating brakedown until pipeline is ready (early connection) (> 1 year to connection and still working heating system)
- ▶ Mobile heating centers (< 1 year to connection)

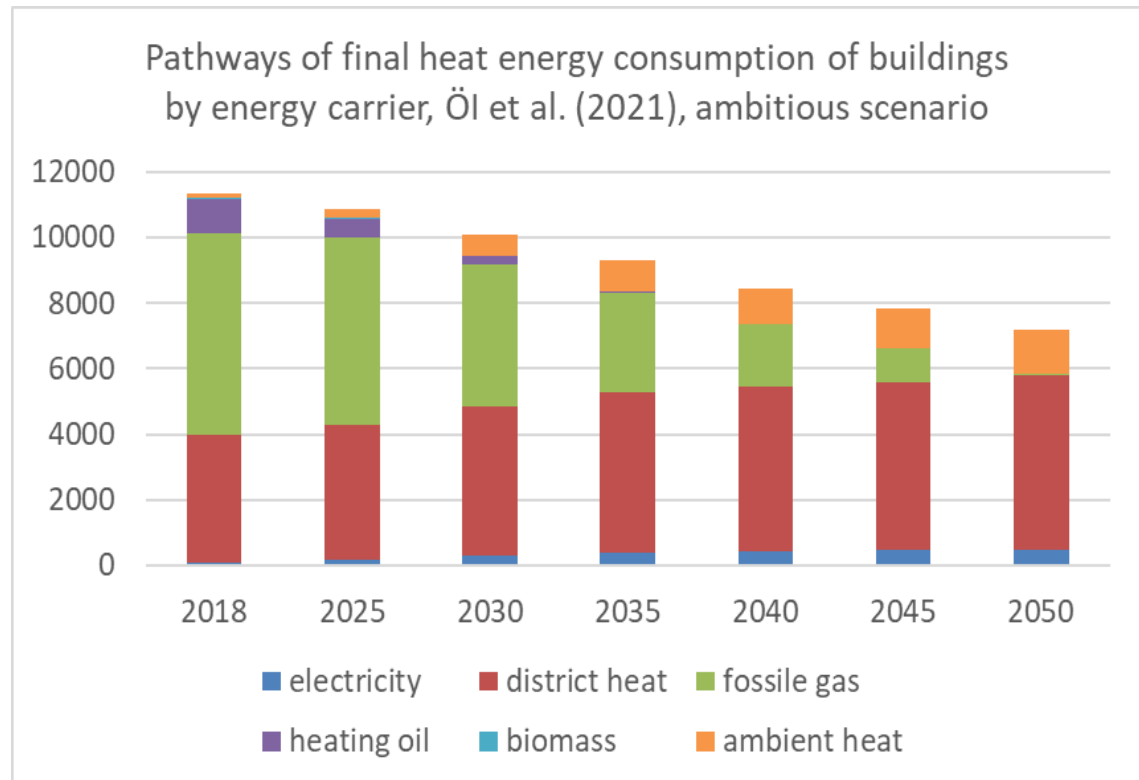
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Munich is still highly dependent on fossil fuels (gas)...

... but there is a promising outlook for the future

- ▶ **Decrease of heat consumption** (by 34% until 2050)
- ▶ **Increase of DH** (from 33% up to 70% in 2050)
- ▶ **Replacement of oil / gas boilers** mainly by (groundwater) heat pumps / local heat grids



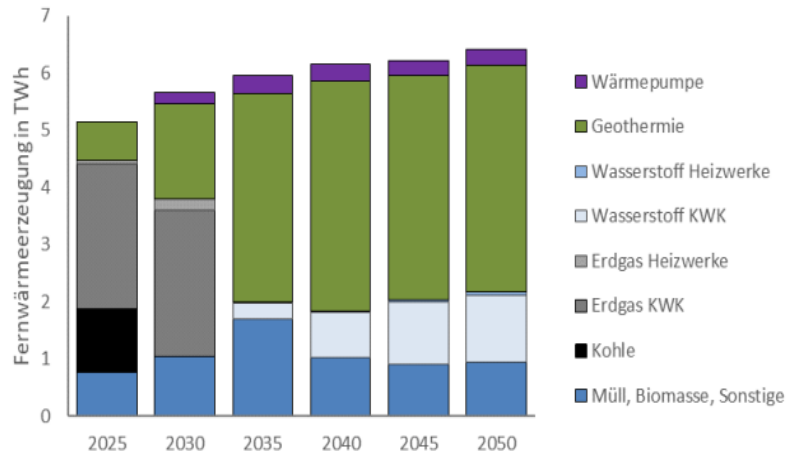
Source: Öko-Institut et al. (2022): Fachgutachten Klimaneutralität München 2035, Szenarienbericht

Munich will have to decrease building energy consumption...

... and reply on its below-surface resources

Pathways of expanding and decarbonising district heat production, SWM, based on Oil / FfF (2021)

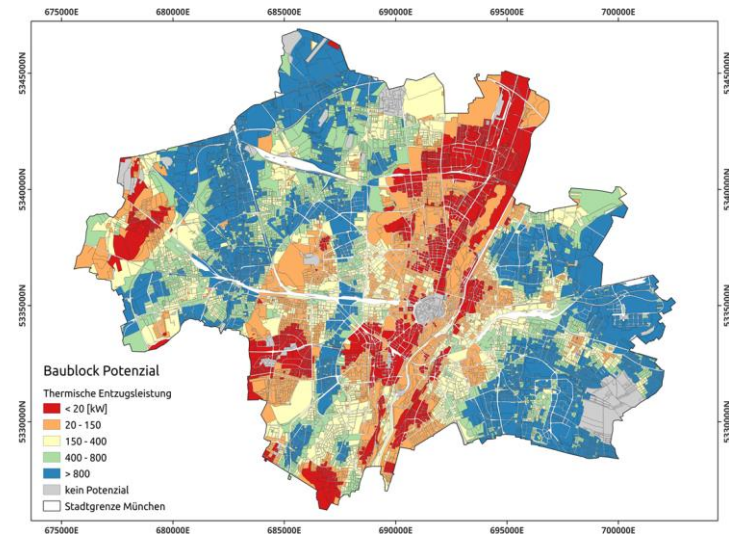
- ▶ Strong increase of deep geothermal energy in district heating (from ~12% up to 2/3 of production)



Source: Öko-Institut et al. (2022): Fachgutachten Klimaneutralität München 2035, Szenarienbericht

Potential for near surface geothermal energy using heat pumps (RKU, 2023)

- ▶ Strong increase of near-surface geothermal energy outside of the district heating area replacing oil and gas



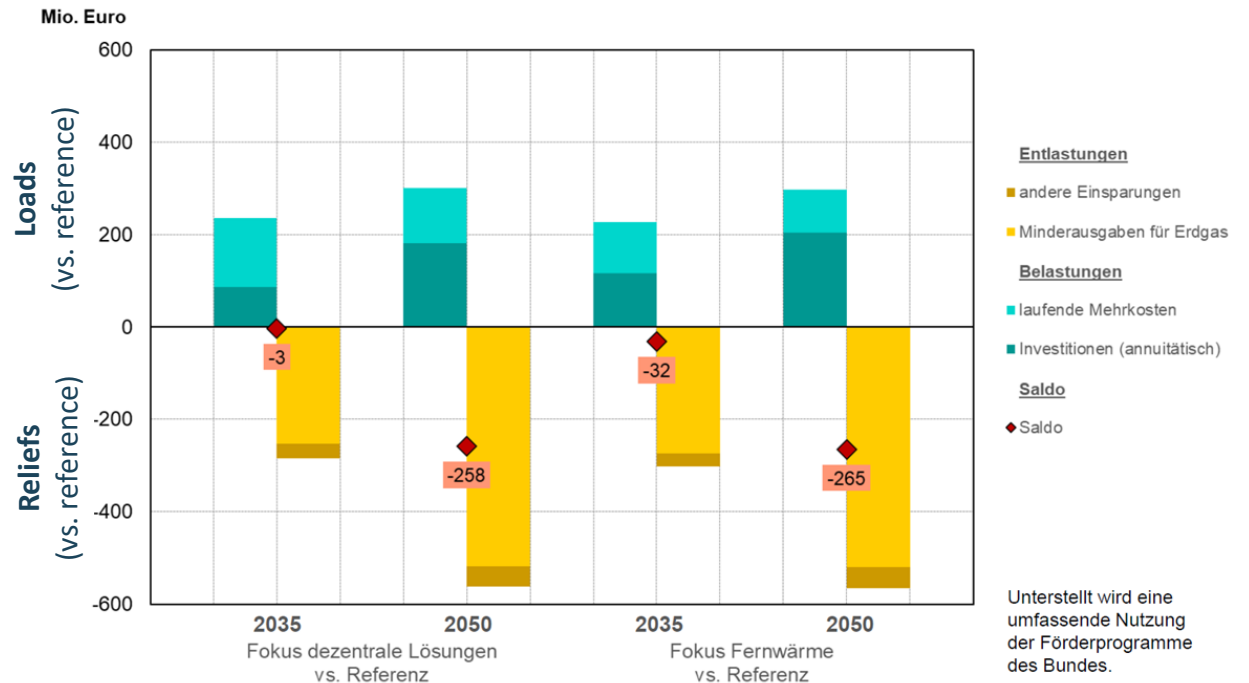
Source: Dep. of Climate and Environment (2023): Calculations based on the tool Geo.KW (developed by TU Munich)

Munich's heat transformation leads to cost savings...

... for Munich as a whole, but the city relies on high initial investments

(Internal) costs and benefits of the heat transition (relative to a reference scenario, with Munich as "little economy"):

- ▶ Rising fossil fuel prices
- ▶ Use of federal funds



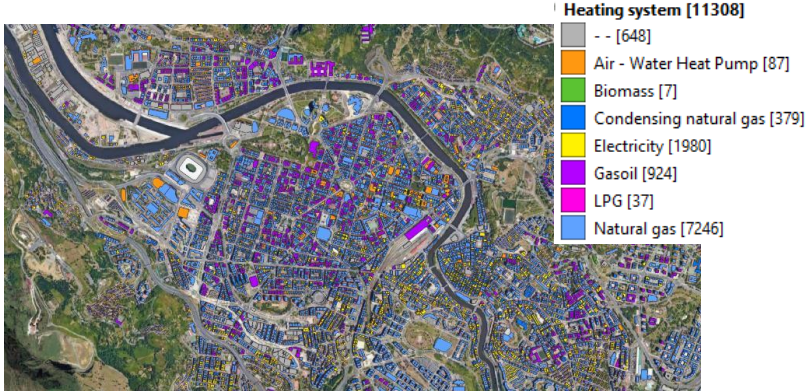
Source: Öko-Institut and FfE (2021): Klimaneutrale Wärme München 2035, Szenario Fokus Fernwärme

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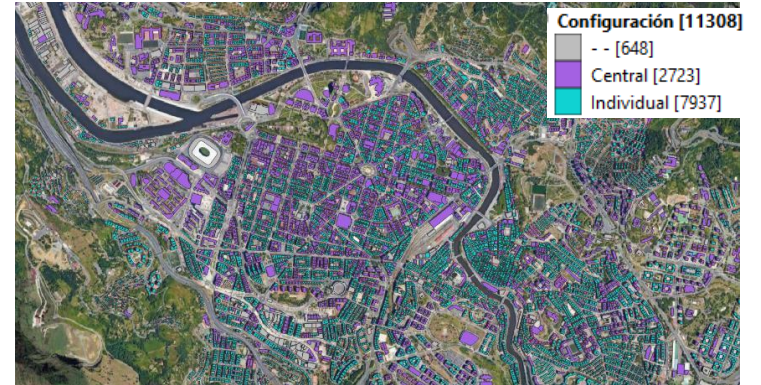
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Building Stock Modelling - BILBAO

Heating source



Heating system characteristics



Heat demand.
kWh/m2

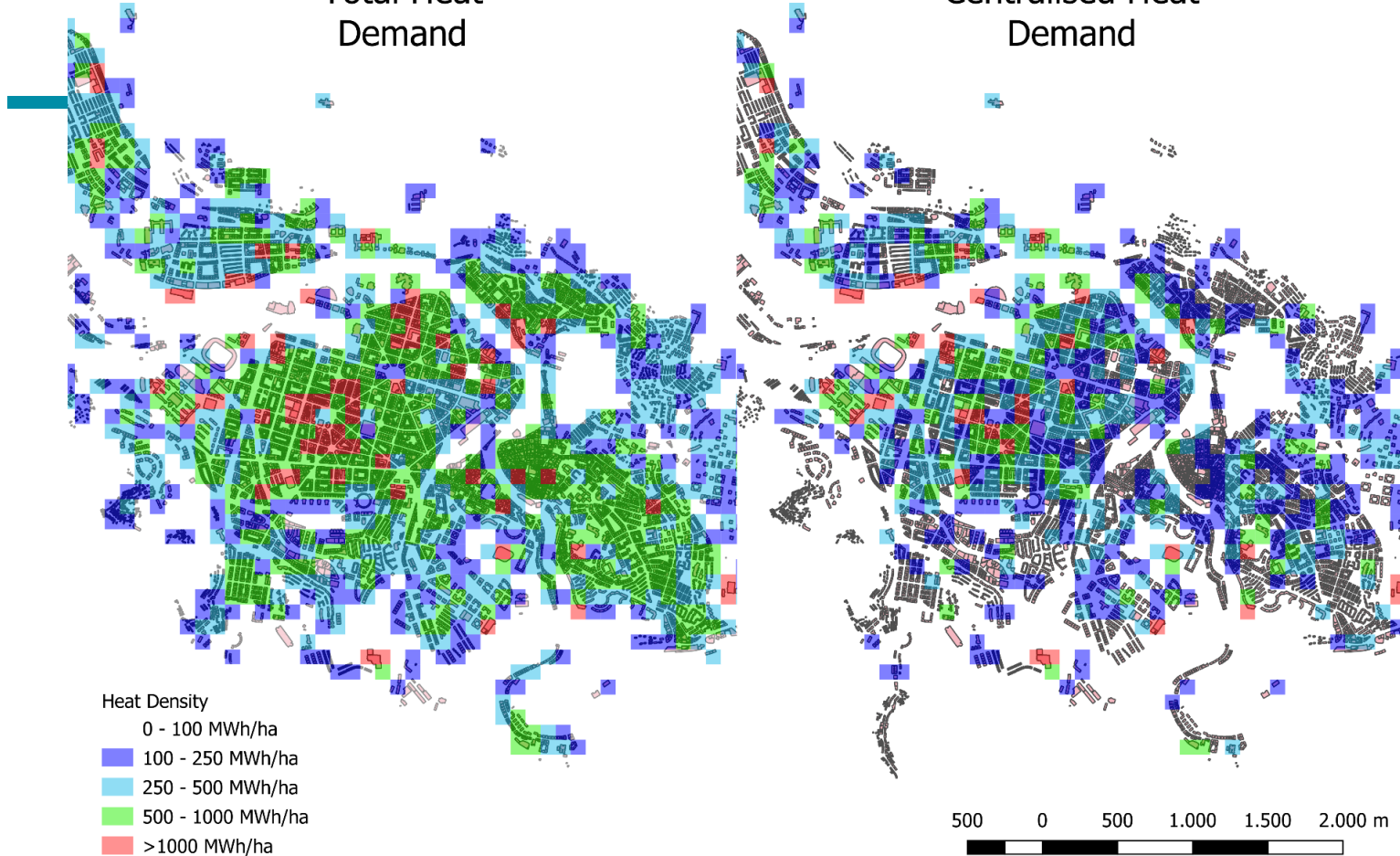
Step by step...

- City energy zoning
- Strategy to replace oil boilers
- DH pilots and feasibility studies

Heat density in Bilbao

Total Heat Demand

Centralised Heat Demand



SOME KEY POINTS RAISED BY CITIES

- Strong push for extension / densification / new DH
- Decrease of gas usage/infrastructure
- Geospatial planning and zoning of city
- Definition of transitions solutions before connection to DH

Legal framework is key but not yet available for most cities

”without clear regulation, it is impossible to reach our goals!”

Recommendations for legislative framework

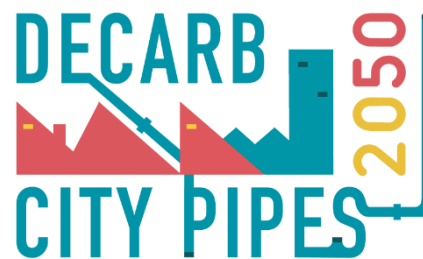
What cities need from the EU to speed up their energy transition

- ▶ Even **stronger EU support for district heating expansion** and direct electrification at the municipal level
- ▶ Encouraging rather than hindering **regulation for the phase-out of gas (distribution) networks**
- ▶ **European green gas strategy** with requirements where limited amounts of green gases shall and shall not be used.
- ▶ Investment security requires **legal technology clarity**, not “technology openness”.
- ▶ **Rules and obligation for integrated planning of energy infrastructures**



THANK YOU!

For more information, visit decarbcitypipes2050.eu
Any question? Get in touch contact@decarbcitypipes2050.eu



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