EUROPE AND CENTRAL ASIA

# The Sustainable Heating Transition: Challenges and Opportunities

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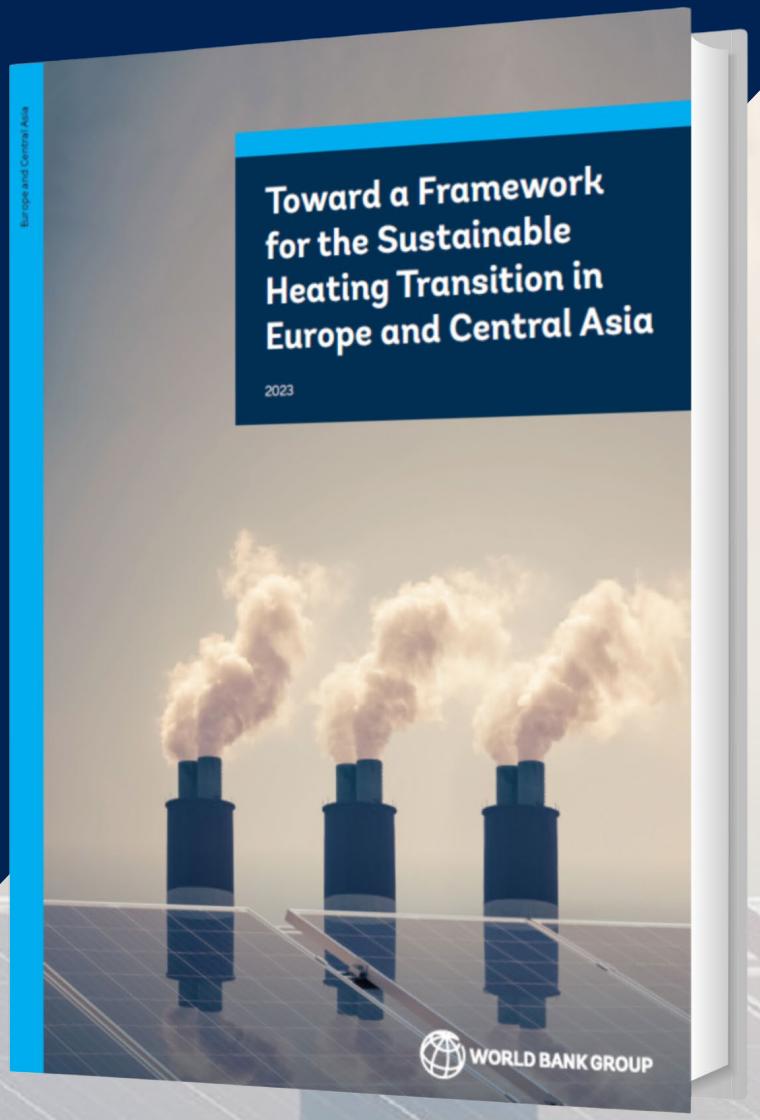


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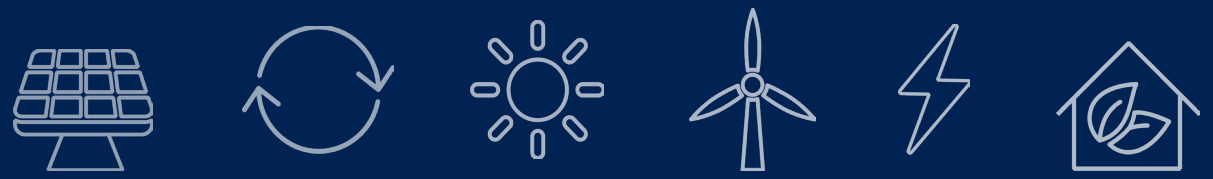


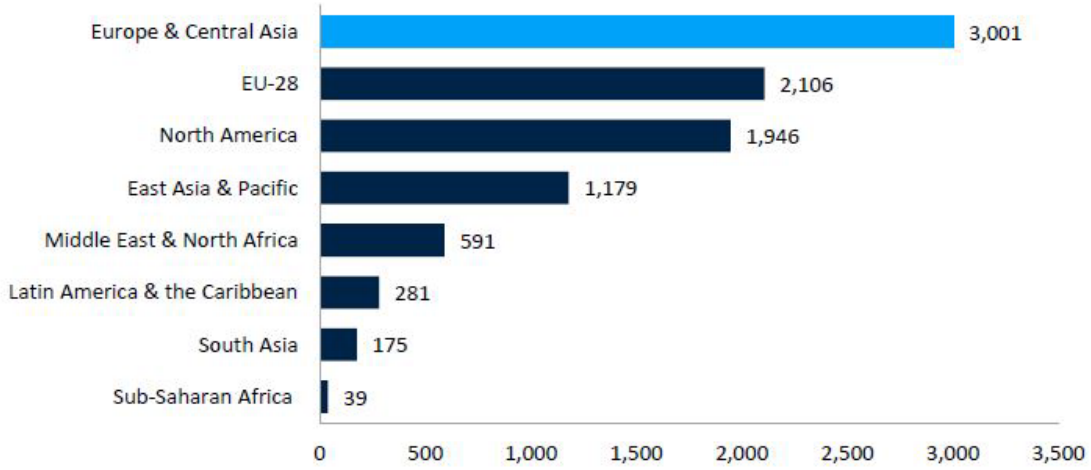
# IN THIS PRESENTATION

- Why the status quo is not sustainable
- Opportunities for improvement and investment
- Costs and benefits of the transition
- Three-pillar framework for action

# One-quarter of energy in ECA used very inefficiently for space heating

- Annual space heating accounts for **24%** of total energy demand
- Building stock is old, poorly maintained, and inefficient
- Many buildings use 2-3 times more energy per square meter than in Western Europe

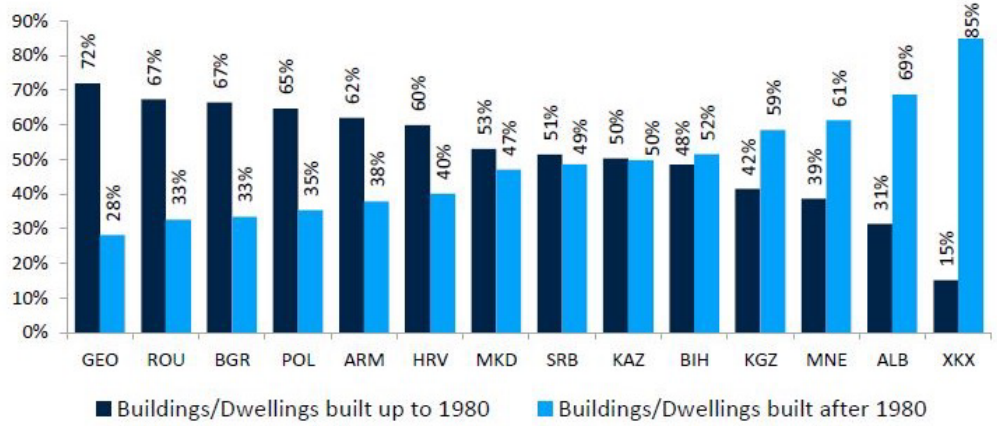
## Coldest region in the world




**Average Heating Degree Days (2000-21), weighted by population**

*Source: IEA and CMCC, Weather for Energy Tracker, 2021*

## With old building stock




**Age of Housing Stock in ECA**

*Source: World Bank*

# Heavy use of fossil fuels impacts health and environment

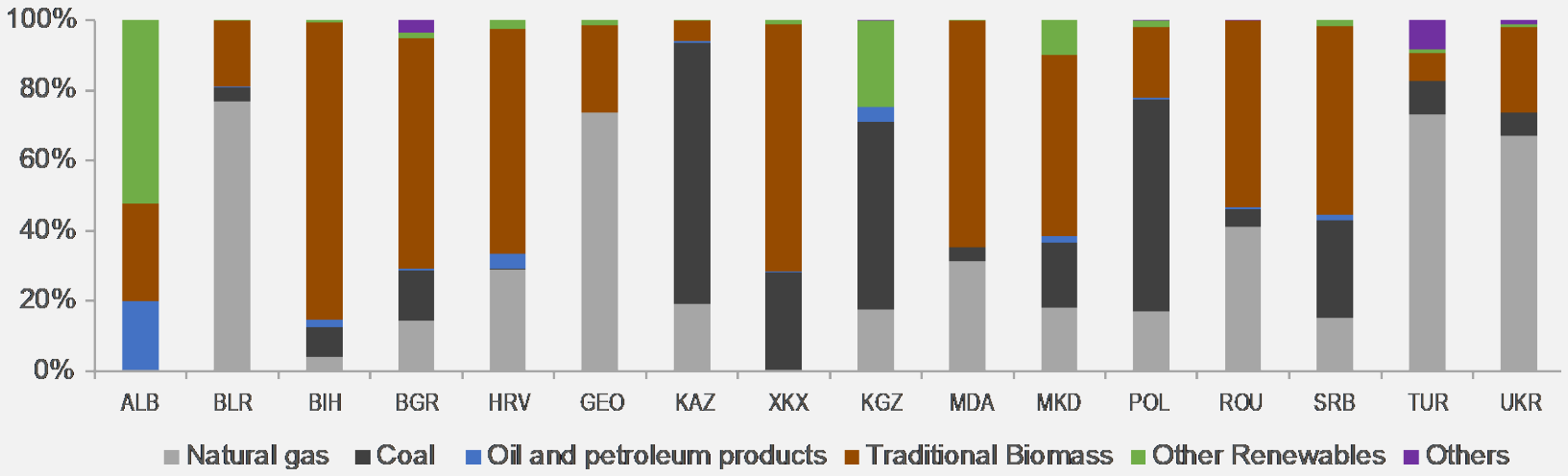
Fossil fuels (**83%**) and unsustainable biomass (**14%**) are dominant energy sources

Carbon dioxide emissions are about **22%** of total regional emissions.

Space heating is also highly polluting:

- **302,000** deaths per year
- Annual welfare cost of **$305 billion** (**7% of GDP**)

## ECA households mainly use fossil fuels for space heating




**Share of Energy Sources in Total Energy Used by ECA Households for Space Heating, by Country**

*Source: World Bank*

# Energy sector vulnerable to price fluctuations, causing high fiscal burden and hurting poor households

- Dependency on fossil fuels increases **risk of energy insecurity** and **supply disruptions**.
- In 2020, direct **fossil-fuel subsidies** totalled $115 billion.
- **1 in 3 people are energy poor** and face a stark choice: reduce heating or revert to cheaper, dirtier fuels.


# Analysis of district heating and individual heating systems

## Rapid assessment of 18 district heating utilities

Most utilities **score poorly** on financial and operational performance

| | |
|---|---|
| Good financial and operational performance | 3 utilities |
| Good financial performance | 5 utilities |
| Good operational performance | 3 utilities |
| Poor financial and operational performance | 7 utilities |

## Levelized cost analysis of residential buildings in six countries

- Least-cost options depend on fuel costs, location, and household size
- Natural gas, coal, and traditional biomass predominate where district heating is not available or reliable
- Cleaner options are generally least-cost

| Least-cost options | |
|---|---|
|  **Urban multi-family homes** | District heating, air-to-air heat pumps |
|  **Urban single-family homes** | Air-to-air heat pumps |
|  **Rural single-family homes** | Eco-design wood/pellet stoves, air-to-air heat pumps |

# Emerging range of cleaner fuels and technologies

## Cleaner **heating fuel** options

| | |
|---|---|
| Waste heat | High-tech solar collectors |
| Biomass/Biogas | Waste incineration |
| Geothermal | Waste gasification |
| Hydrogen | Biomass gasification |

## Cleaner **technology** options

| | |
|---|---|
| Heat pumps | Emerging |
| Low-temperature district heating | Common in EU |
| Heat storage | In use |
| Building-level substations | Common in EU and ECA |
| District cooling | In use on pilot basis |

District heating

Individual heating

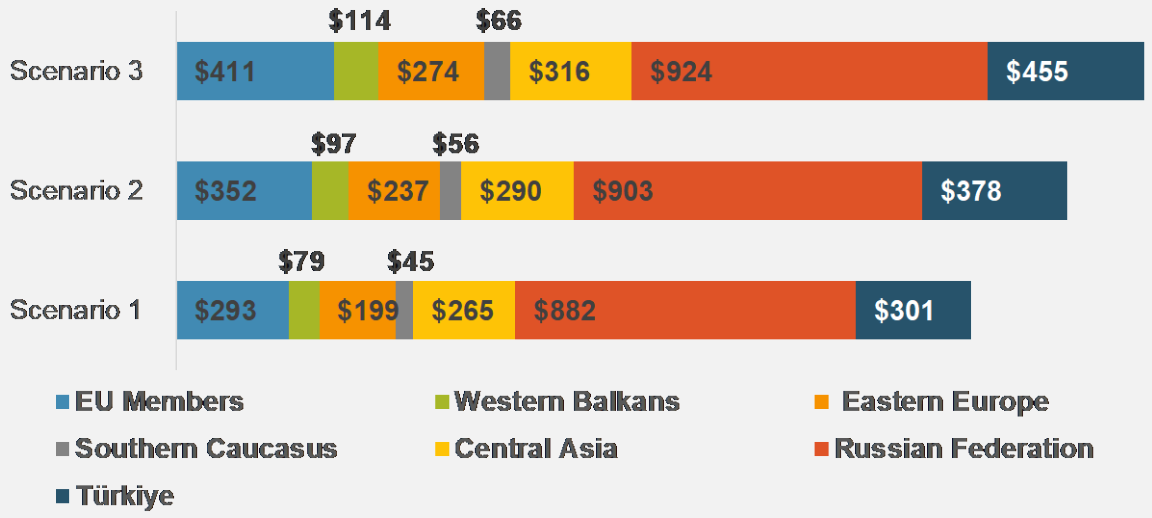
| |
|---|
| Air-to-air, air-to-water heat pumps |
| Geothermal (ground-source) heat pumps |
| Eco-wood/pellet stoves or boilers |
| Condensing gas boilers* |
| Thermal renovations (energy efficiency) |

# US$2 trillion in investment is needed, but benefits outweigh the costs

**First-order estimate:**

1. Replace all individual systems that use unsustainable fuels
2. Retrofit existing district heating systems
3. Retrofit 14 billion $m^2$ of building floor area (~106m buildings)

**Estimated total investment costs by sub-region (US$, billions)**




*Based on methodology developed by the World Bank*

- Economic net present value of transition estimated at **$402-440 billion**, with economic internal rate of return of **9-10.14%.**
- Government subsidies of **59%-68%** of the total transition costs may be needed (1.3% of GDP or about ~50% of fossil fuel subsidies if maintained through 2050).

# A comprehensive government response is needed to overcome barriers

## Barriers

- Multi-jurisdictional responsibilities
- Unregulated markets for solid heating fuels
- Uneven access to network infrastructure
- Uneven prevalence of building-level hot water plumbing
- Lack of qualified service providers
- Lack of consumption-based billing for district heating

These are in addition to typical energy efficiency technical, financial, institutional and behavioral barriers.

## Mix of policy and program measures needed

### Reforms

- Power and heating (e.g., pricing, biomass certification)
- Energy-efficiency codes and standards
- Air quality regulations and enforcement
- Business support and training

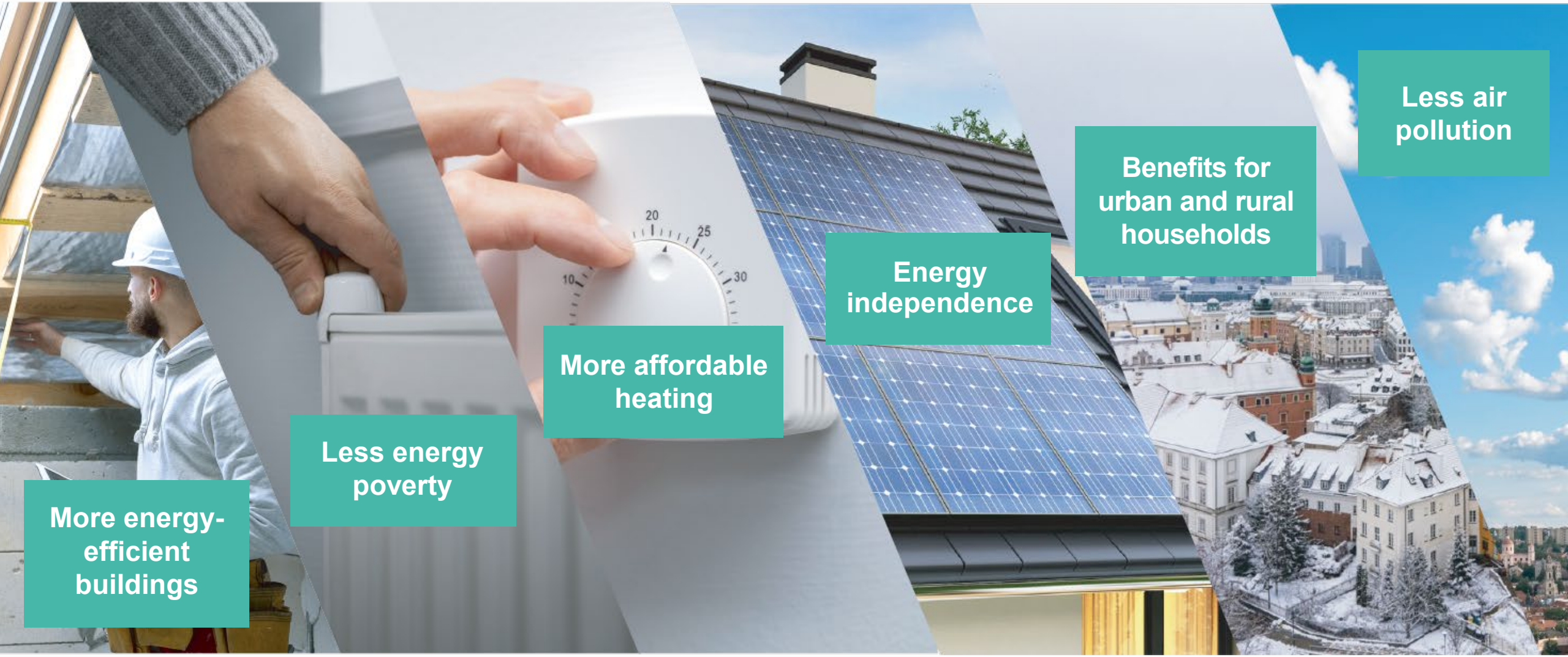
### Financial instruments

- Tax credits, rebates, and exemptions
- Investment grants and subsidies
- Commercial loans and/or guarantees
- Utility programs (demand-side management)

### Complementary interventions

- Market studies
- Outreach and behavior change
- Technical information and training
- Program monitoring, evaluation, and reporting

# Transitioning to sustainable heating by 2050 could bring



# Three-pillar framework for transition to sustainable heating

| 1 | 2 | 3 |
|---|---|---|
| **REDUCE DEMAND** by improving energy efficiency in buildings and changing behaviors | **DECARBONIZE DISTRICT HEATING** | **PROMOTE CLEAN INDIVIDUAL HEATING** for peri-urban and rural areas with low heating demand |
| Long-term renovation strategies | Analyze economic viability of utilities | Assess clean heating options and analyze consumer behavior and gender gap |
| Financing and incentives for existing buildings | Identify service improvements | Identify economical alternatives to current individual heating |
| Building codes and performance certificates for new buildings | | Develop programs |

**National sustainable heating planning & roadmaps**

# THANK YOU