



# Integrating EE1st in comprehensive assessments on heating and cooling

Christos Tourkolias

CRES

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## Aim 1

Assess the **contribution of the energy efficiency and RES interventions** compared to **additional investments for natural gas or other conventional fuel infrastructure** in terms of costs and benefits avoiding the potential problem of **stranded assets** and the triggered consequences in the case that the cost-benefit impacts of the natural gas or other conventional fuel infrastructure would not be justified

## Aim 2

Identify the **demand-side resources that could partly or fully substitute the natural gas or other conventional fuel infrastructure** and compare them with other types of planned infrastructures more energy efficient and beneficially for the whole society

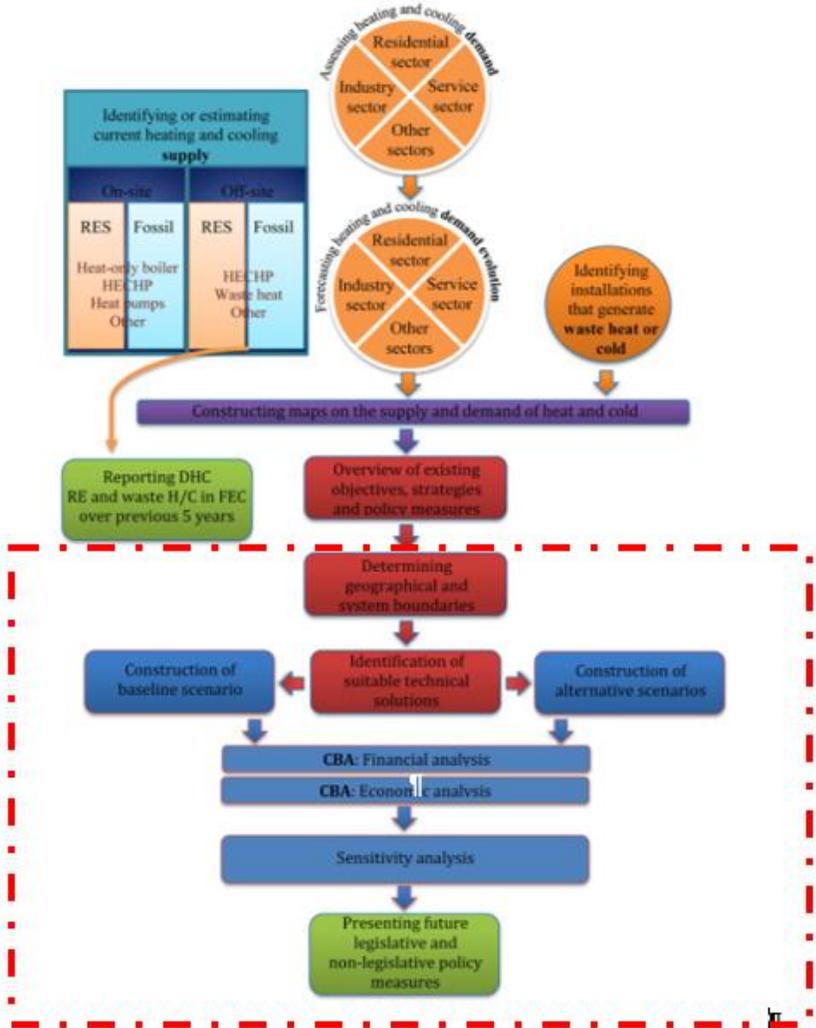
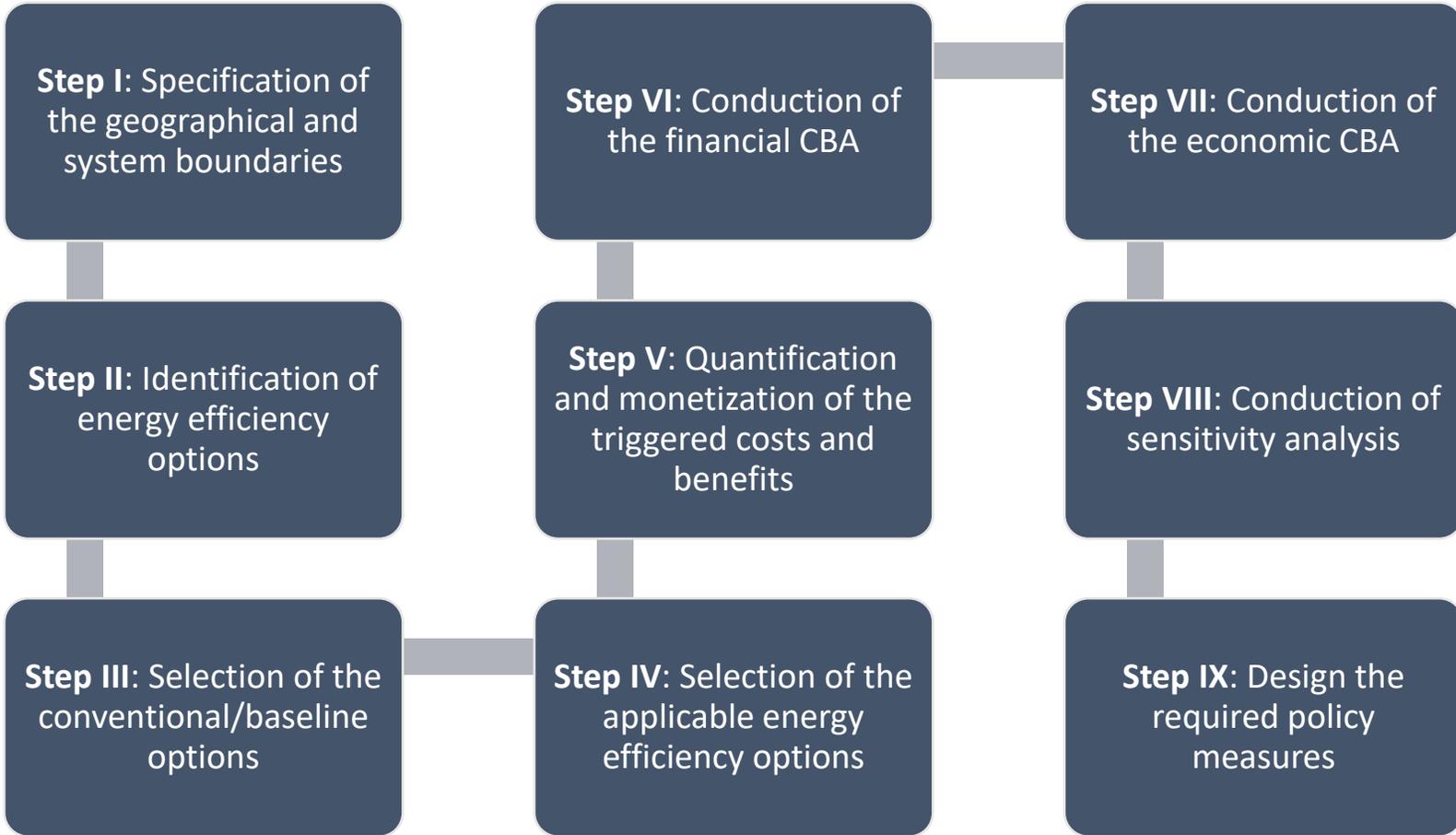


**Compliance with the provisions of EED Article 25 and enhancement of the National Energy and Climate Plan**



- 1) **How the discussion is framed**
  - ✓ overall approach to consider options to meet energy & climate objectives → starting from the energy needs
- 2) **How options are assessed / compared**
  - ✓ using a systemic approach with a scope of analysis beyond energy prices
  - Illustrated in the Greek case
- 3) **How the decision is made & justified**
  - ✓ reversing the burden of proof
  - EE options often 'no-regret', so the other options should demonstrate if they are more beneficial to the society

# Conduction of CBA



Commission Recommendation (EU) 2019/1659 of 25 September 2019 on the content of the comprehensive assessment

➤ Co-implementation with the main stakeholders



<b>Option 0:</b> Installation of natural gas boiler
<b>Option 1:</b> Interventions in the building envelope so as to reduce the energy demand
<b>Option 2:</b> Installation of aérothermal heat pumps
<b>Option 3:</b> Installation of geothermal heat pumps
<b>Option 4:</b> Installation of biomass boiler
<b>Option 5:</b> Installation of PV system for auto consumption
<b>Option 6:</b> Installation of aérothermal heat pump combined with PV system (net billing scheme)
<b>Option 7:</b> Installation of geothermal heat pump combined with PV system (net billing scheme)
<b>Option 8:</b> Installation of aérothermal heat pump combined with interventions in the building envelope
<b>Option 9:</b> Installation of geothermal heat pump combined with interventions in the building envelope
<b>Option 10:</b> Installation of aérothermal heat pump combined with interventions in the building envelope and PV system (net billing scheme)
<b>Option 11:</b> Installation of geothermal heat pump combined with interventions in the building envelope and PV system (net billing scheme)

# Main types of positive and negative types of externalities



Air quality and health impacts

Security of energy supply to consumers

Investments and/or savings in energy infrastructure

Circular economy and resource efficiency

Broader environmental impacts

Industrial competitiveness

Growth and jobs



Figure 2-1 EU27 and G20 average (production weighted) external cost of electricity per technology in €<sub>2018</sub>/MWh

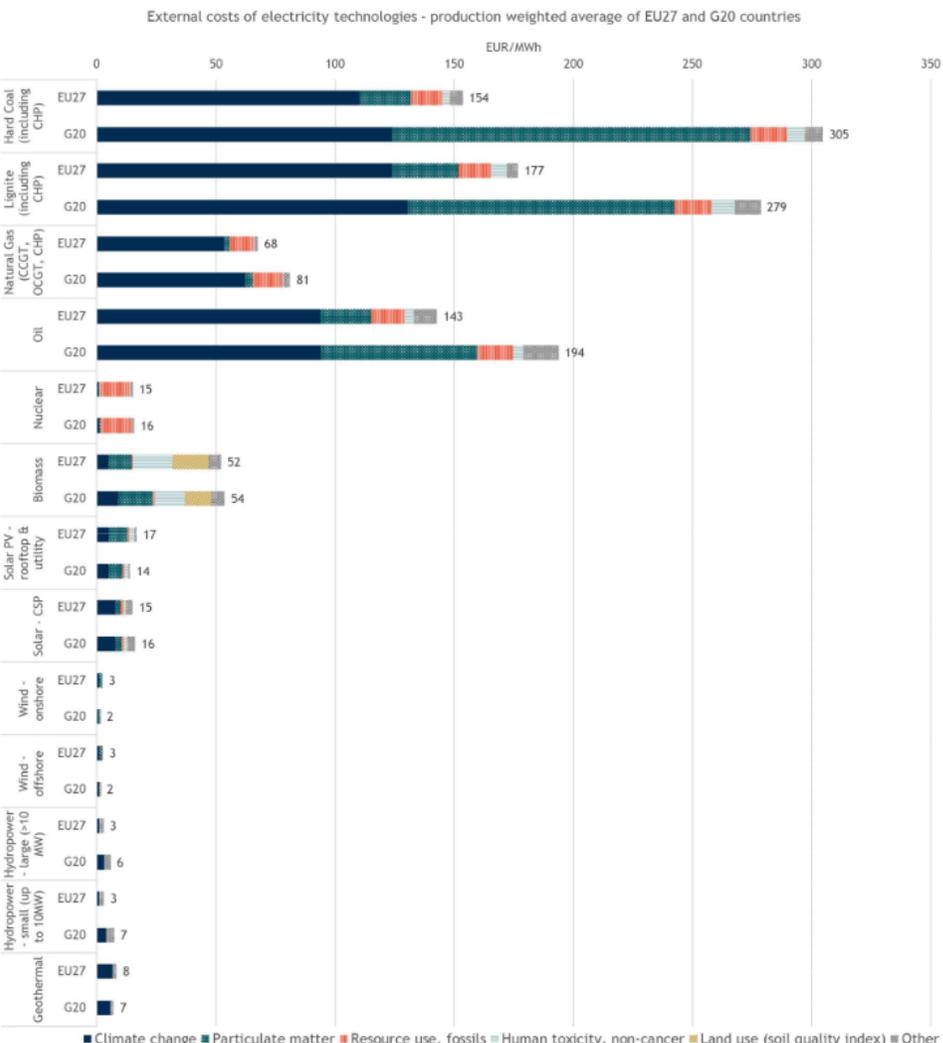
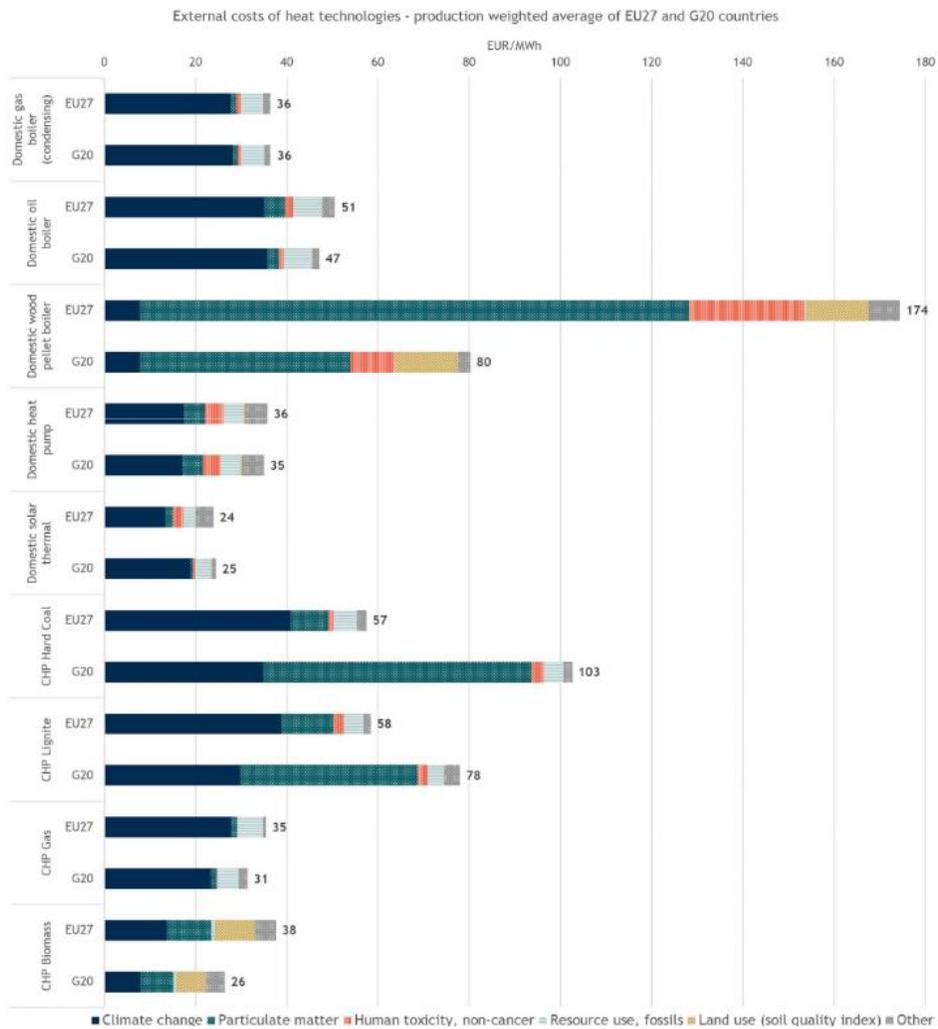


Figure 2-4 EU27 and G20 averages (production weighted) external cost of heat per technology in €<sub>2018</sub>/MWh



**Πηγή:** Trinomics, 2020. Final Report External Costs Energy costs, taxes and the impact of government interventions on investments.



## ❑ Multiple benefits

multiple benefits	Assumed percentage improvement (user selected)	Achievable percentage improvements in productivity in offices (default)
Temperature (reduced overheating av. over year)	7%	7-12%
Indoor Air Quality improvement	3%	3-6%
Light improvement	3%	3-6%
Noise reduction	2%	1.7-3%

Πηγή: EEFIG, 2021. Multiple Benefits of Energy Efficiency Investments for Financial Institutions.

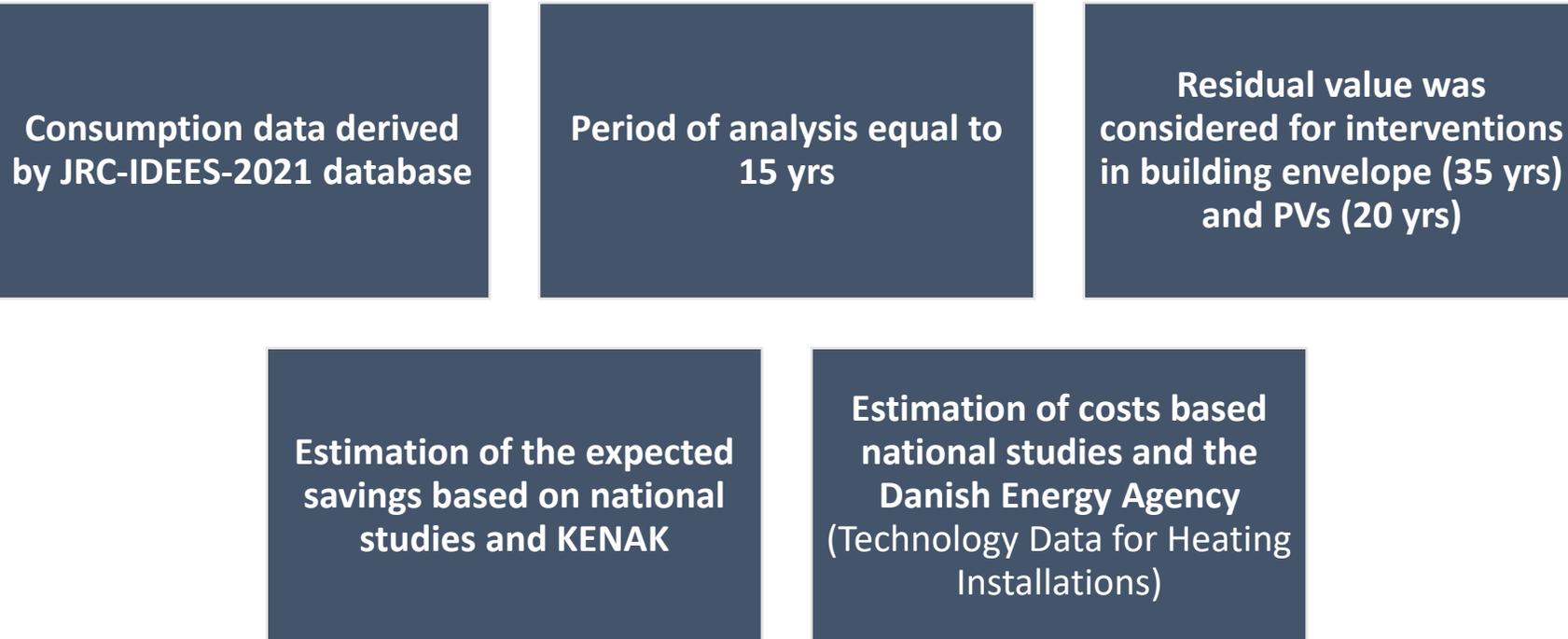
## ❑ Macroeconomic benefits and energy security

	Indicator	Unit	Coefficient
<b>Economy</b>	GDP	€billion/Mtoe	0.93
	Employment	thousands jobs/Mtoe	6.61
	Energy security (fossil fuel imports)	€billion/Mtoe	0.38
	Investments in the mining sector	€million/Mtoe	-8.35
	Investments in the construction sector	€million/Mtoe	16.13
	Investments in manufacturing sector	€million/Mtoe	94.71
	<b>Society</b>	Household energy expenditure	€billion/Mtoe
Household transport expenditure		€billion/Mtoe	-0.45
Firm energy expenditure		€billion/Mtoe	-0.43
<b>Environment</b>	CO <sub>2</sub> emissions	MtCO <sub>2</sub> /Mtoe	-1.82
	GHG emissions	MtCO <sub>2</sub> /Mtoe	-2.67
	Air pollution damages	€billion/Mtoe	-0.19

Πηγή: Cambridge Econometrics, 2022. 2030 EU energy efficiency target: The multiple benefits of higher ambition. Report for Coalition for Energy Savings.

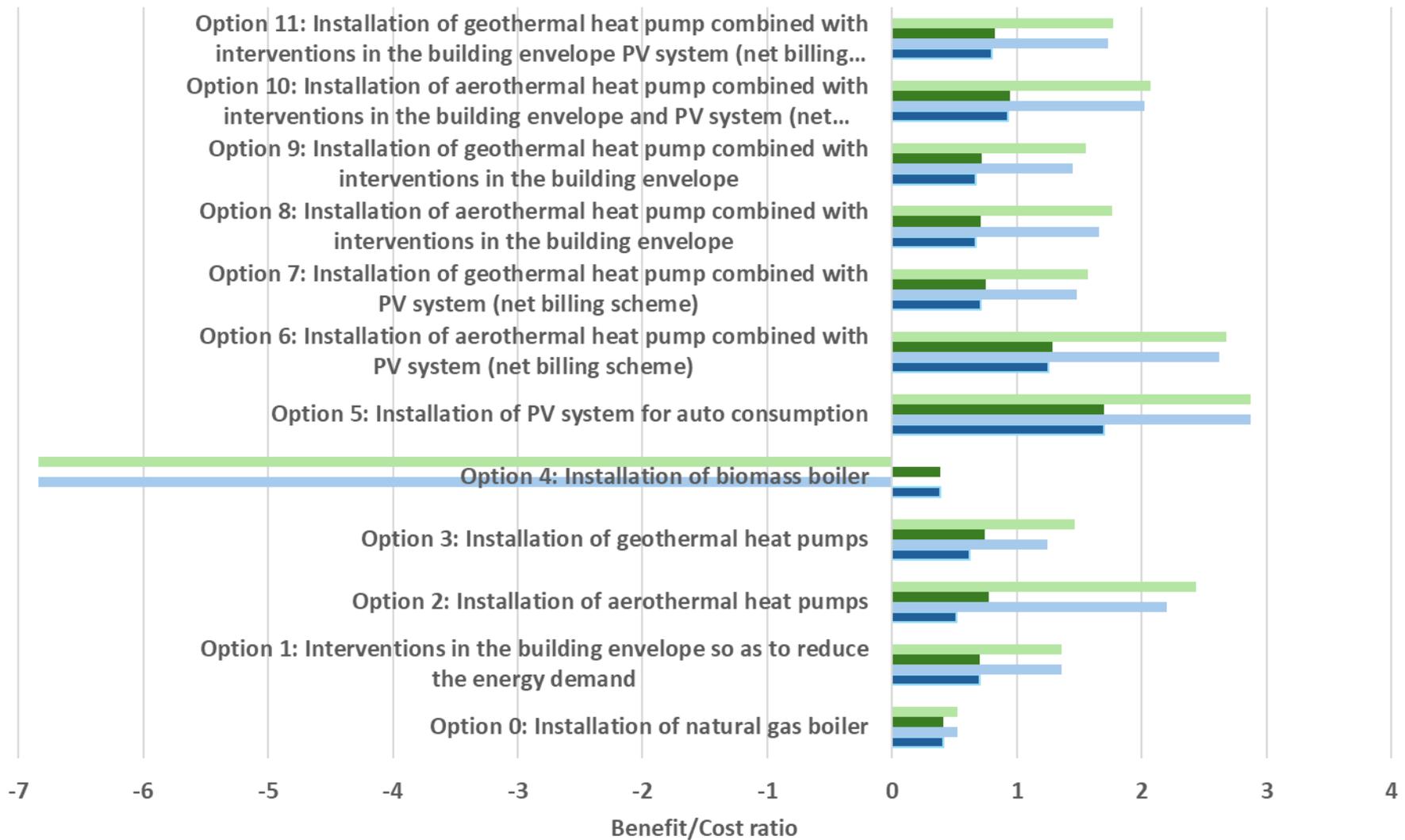


Examined options	Positive externalities	Negative externalities
<b>Option 0: Installation of natural gas boiler</b>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the avoided consumption of the baseline fuels for heating</li> <li>• Macroeconomic impacts</li> <li>• Multiple benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the consumed natural gas</li> </ul>
<b>Option 1: Interventions in the building envelope</b>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the avoided consumption of the baseline fuels for heating and cooling</li> <li>• Macroeconomic impacts</li> <li>• Energy Security</li> <li>• Multiple benefits</li> </ul>	-
<b>Option 2: Installation of aerothermal heat pumps</b>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the avoided consumption of the baseline fuels for heating and cooling</li> <li>• Macroeconomic impacts</li> <li>• Energy Security</li> <li>• Multiple benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the increased electricity consumption due to heat pump</li> </ul>
<b>Option 4: Installation of biomass boiler</b>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the avoided consumption of the baseline fuels for heating and cooling</li> <li>• Macroeconomic impacts</li> <li>• Energy Security</li> <li>• Multiple benefits</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the consumed biomass</li> </ul>
<b>Option 5: Installation of PV system for auto consumption</b>	<ul style="list-style-type: none"> <li>• Environmental and health from the avoided consumption of the electricity from the grid</li> </ul>	<ul style="list-style-type: none"> <li>• Environmental and health impacts from the construction and transportation of the PV systems</li> </ul>





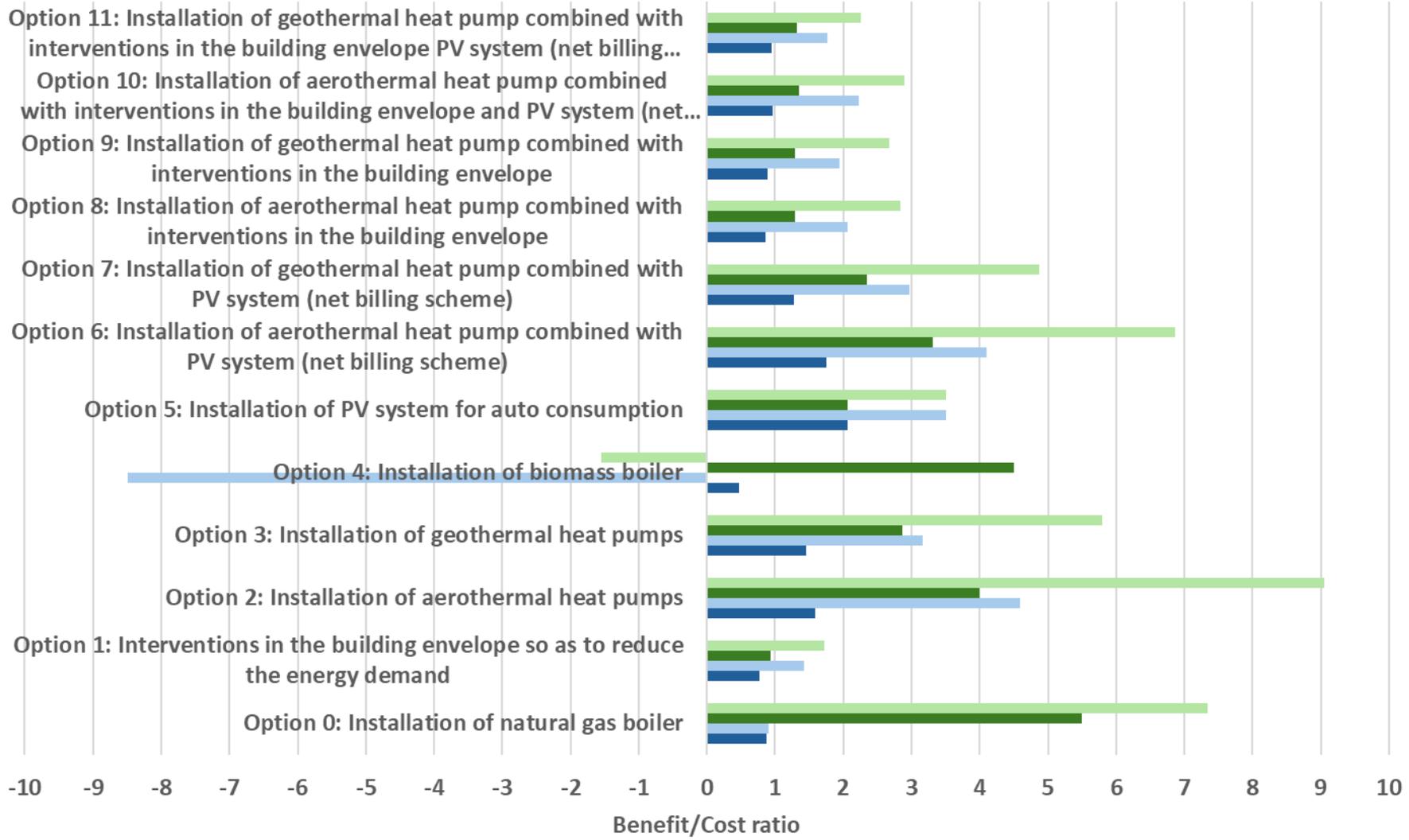
### Application of EE1st principle in residential sector



■ HPs for heating and cooling - Economic analysis 
 ■ HPs for heating and cooling - Financial analysis  
■ HPs for heating - Economic analysis 
 ■ HPs for heating - Financial analysis



### Application of EE1st principle in tertiary sector

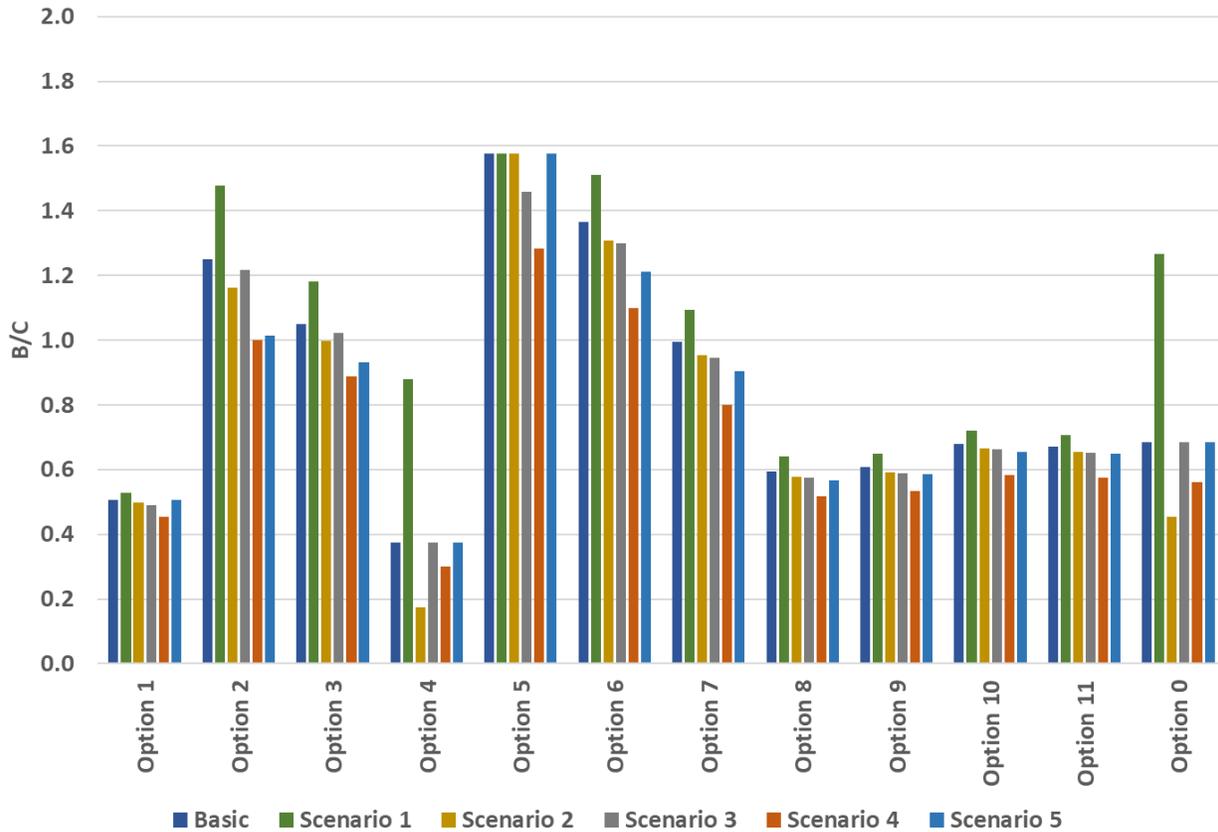


■ Electricity as baseline - Economic analysis  
 ■ Electricity as baseline - Financial analysis  
■ Heating oil as baseline - Economic analysis  
 ■ Heating oil as baseline - Financial analysis

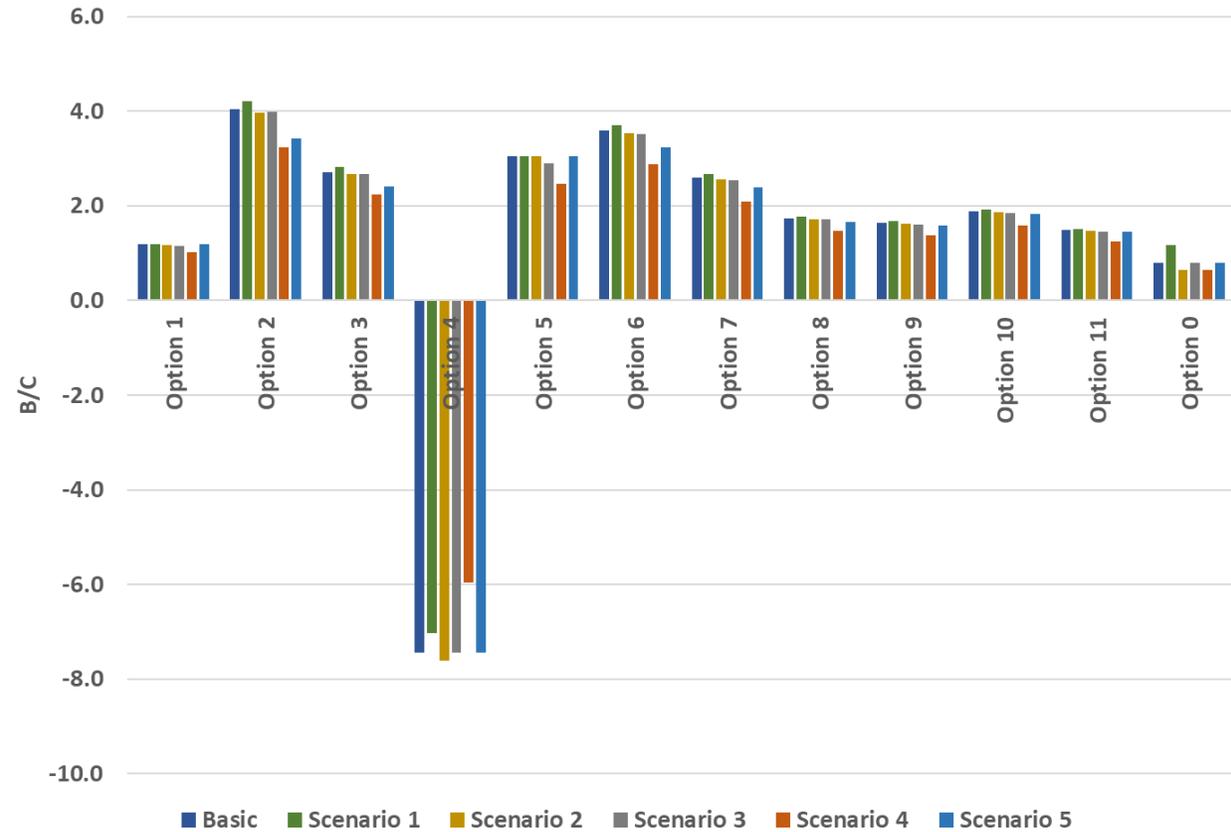


Examined scenarios	Assumption
Scenario 1	25% increase of heating oil price
Scenario 2	10% decrease of heating oil price
Scenario 3	15% decrease of electricity price
Scenario 4	25% increase of investment costs
Scenario 5	20% reduction of COP and EER values for heat pumps

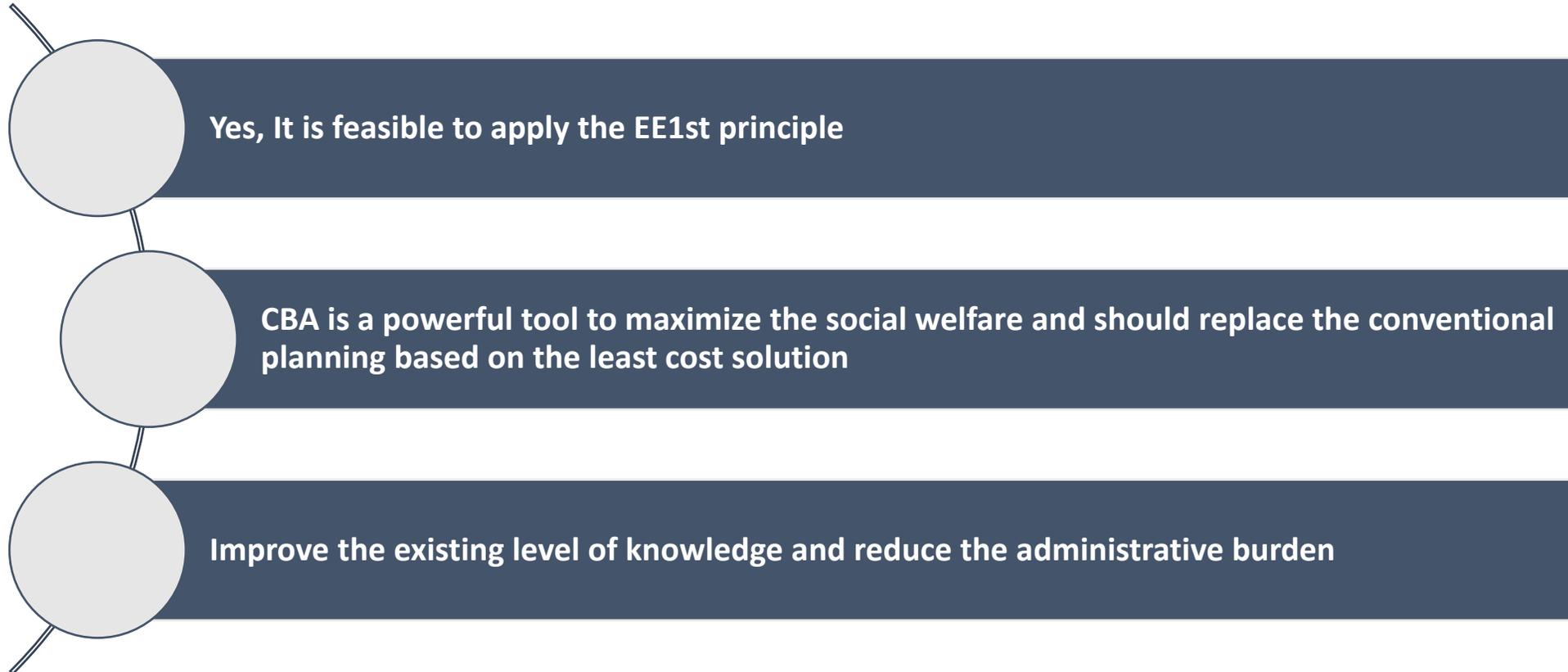
Sensitivity analysis - Financial CBA



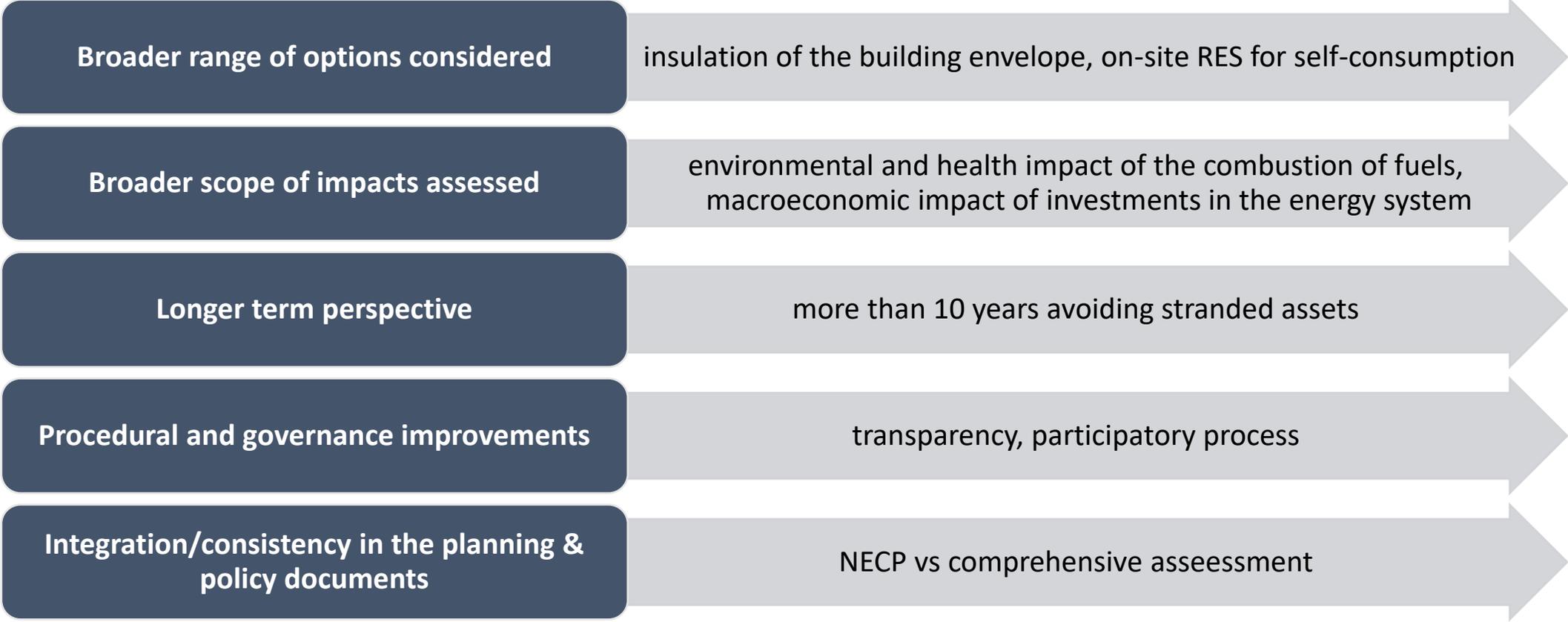
Sensitivity analysis - Economic CBA



# Main conclusions for the general application of the EE1st principle



# Main conclusions for the application of the EE1st principle in the heating and cooling plans





**Address data limitations**

**Selection of the right types of positive and negative externalities**

**Difficulties in valuating non-market benefits and costs**

**Quantification of the externalities related to energy poverty and assessment of the distributional effects**



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**Disseminate the derived benefits from the implementation of the EE1st principle and create trust**

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**Ensure transparency during the application of the EE1st principle**

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**Standardize the procedure for applying the EE1st principle**

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**Prepare targeted guidelines for the required steps**

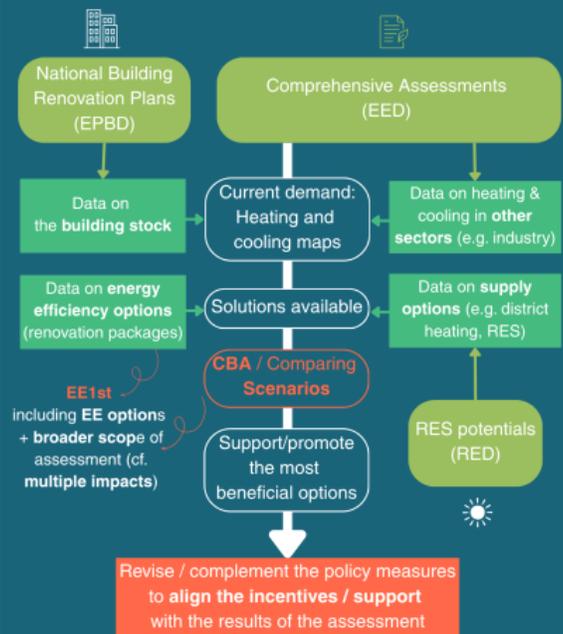
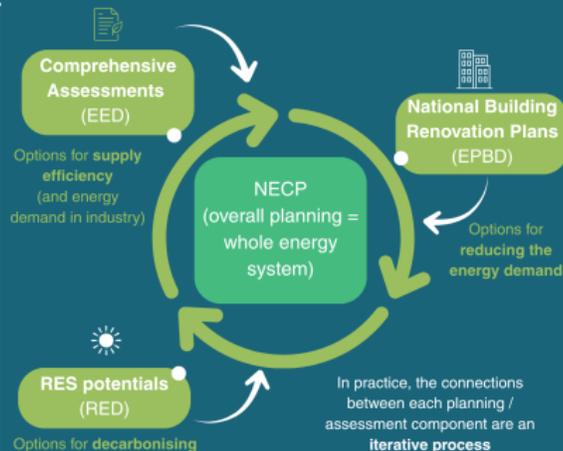
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**Utilize existing tools**

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**Provide national estimates for the utilized types of externalities**

## Connecting the dots for an integrated planning



CBA: Cost-Benefit Analysis  
 EED: Energy Efficiency Directive  
 EE1st: Energy Efficiency First  
 EPBD: Energy Performance of Buildings Directive  
 NECP: National Energy and Climate Plan  
 RED: Renewable Energy Directive  
 RES: Renewable Energy Sources

# Infographics

## Assessment for national heating and cooling plans

## Plug EE1st in

### 1 Overview of heating and cooling



What's the status quo?

Forecast of trends (future demand and supply)

How would it evolve?

To what extent are energy efficiency improvements considered?

### 2 Objectives, Existing Strategies and Policy Measures

What are the options available?

Are current policies promoting the most beneficial options and aligned with long-term goals?

### 3 Analysis of the economic potential for efficiency in heating and cooling

Using cost benefit analysis

How do available options compare?



Comparing with demand-side options assessed in the National Building Renovation Plans (or Cost Optimal Studies)

Considering multiple impacts in the scope of analysis

### 4 Potential New Strategies and Policy Measures

What is the new plan?

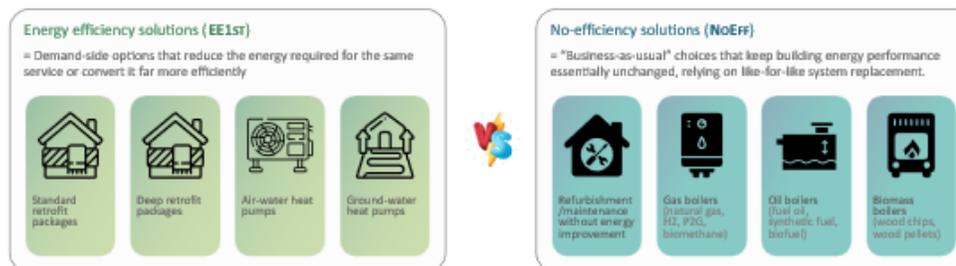
How can the most beneficial actions or groups of actions be promoted / prioritized?

<https://ee1st.eu/resources/set-of-infographics-from-plugging-energy-efficiency-first-in-heating-and-cooling-plans-why-and-how-enefirst-webinar/>



## Welcome to the Enefirst+ Cost-Benefit Analysis Tool

The CBA tool compares “EE1st” and “NoEff” options to reveal the added value of energy efficiency in local heating planning

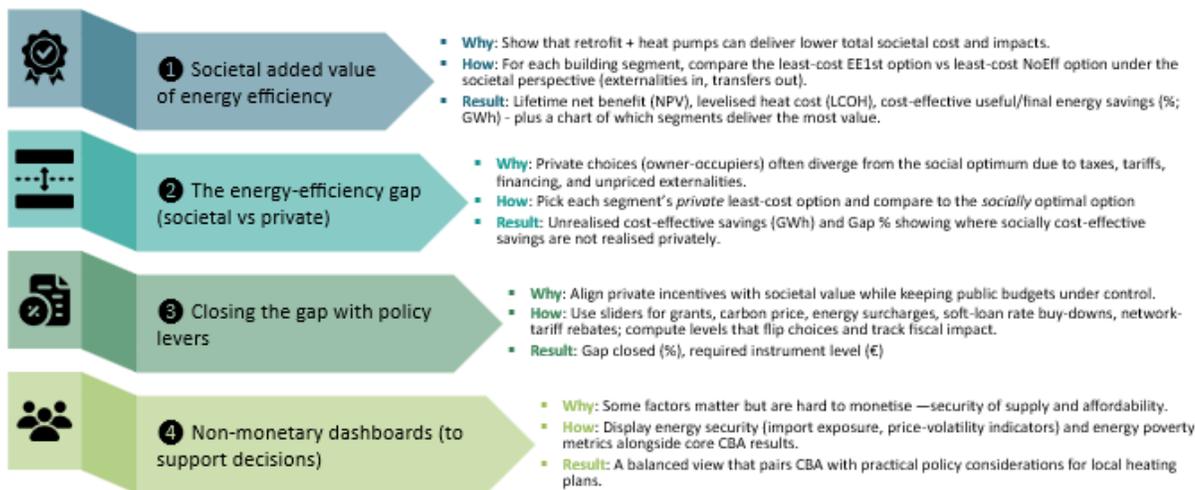


## Making Informed Decisions

### A Practitioner’s Guide to Capturing the EE1st Principle in Cost-Benefit Analysis



### Tool outputs and corresponding sheets



Cost-Benefit Analysis

Energy Efficiency Gap & Policy

Non-monetary effects

**Start**

*By clicking on Start, automatic calculations are disabled. This ensures a swifter and smoother tool experience, in particular when adjusting policy options. You can revert this change at any time by clicking on **Formulas > Calculation Options > Automatic**.*



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# Thank you!

Name: Christos Tourkolias  
Organisation: CRES  
Email: [ctourkolias@cres.gr](mailto:ctourkolias@cres.gr)



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