

# LEAP 4

ENERGY AUDIT POLICIES  
TO DRIVE ENERGY  
EFFICIENCY

## Supporting small businesses in the net-zero age: traditional methods, innovative approaches and ongoing initiatives

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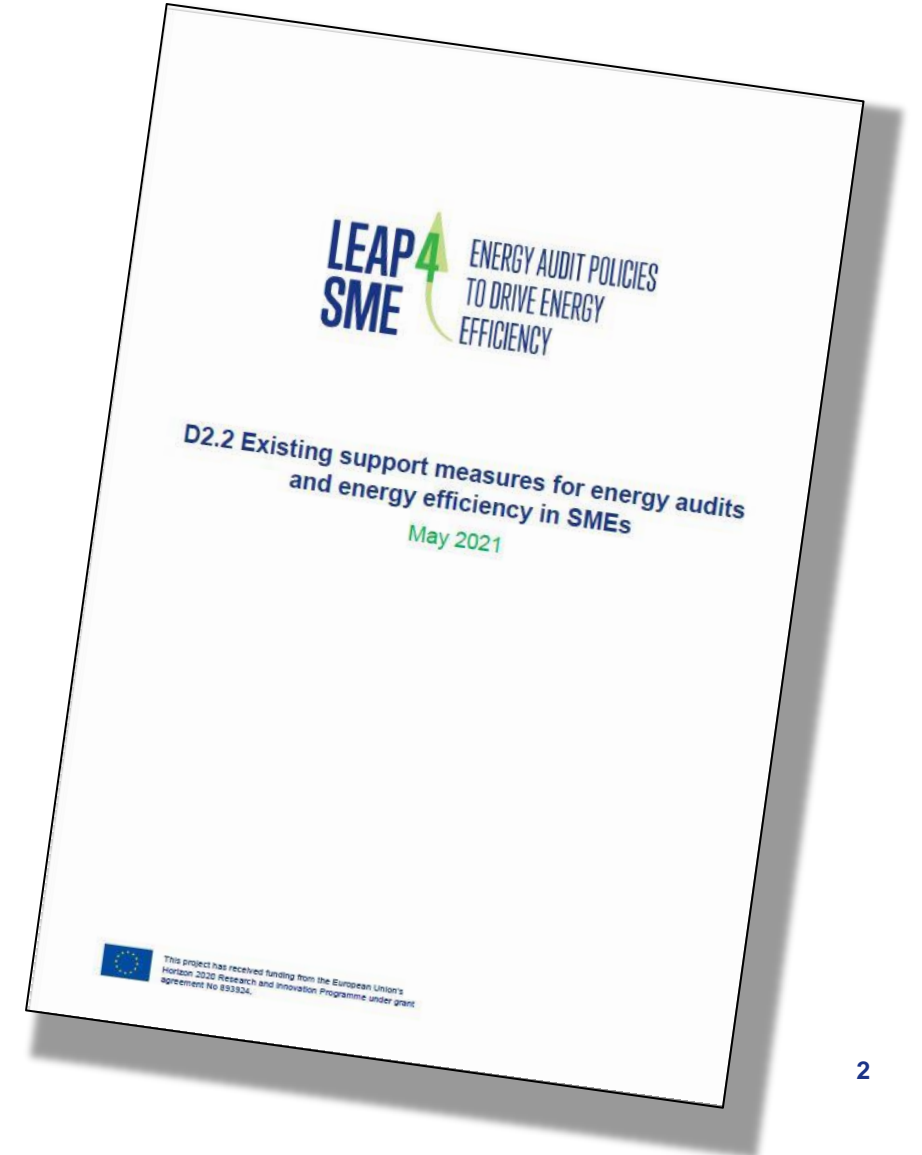


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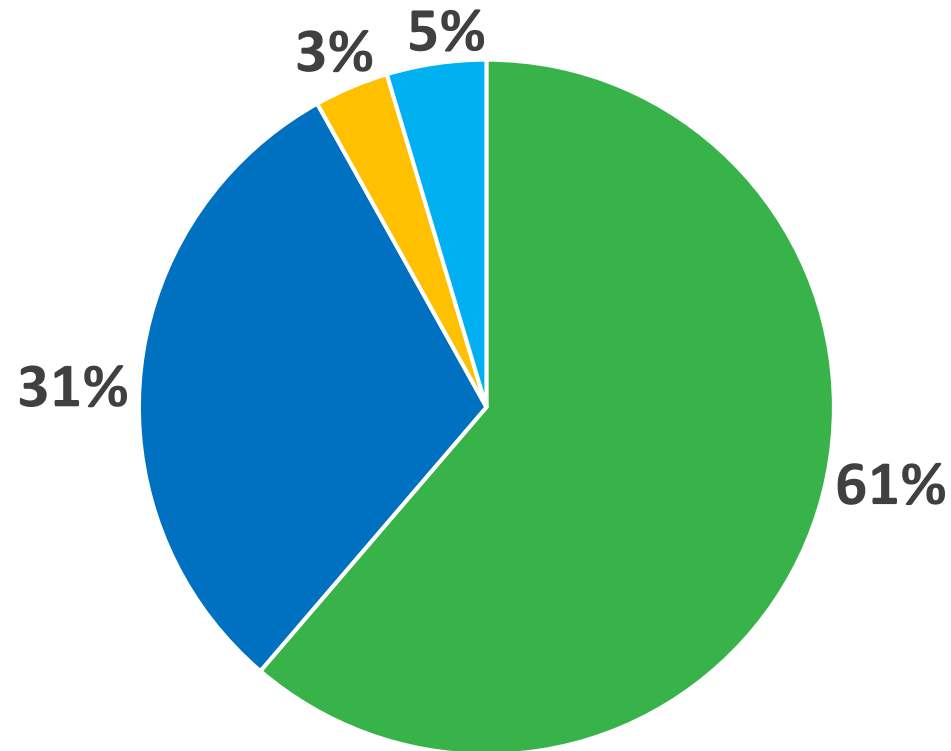


# Existing support measures for SMEs

- Report completed in May 2021
- **Aim:** Present overview of policies and programmes in place to support SMEs across EU
- **Target audience:** policy makers, policy implementers, energy services sector, other organisations supporting SMEs



# National support measures for SMEs

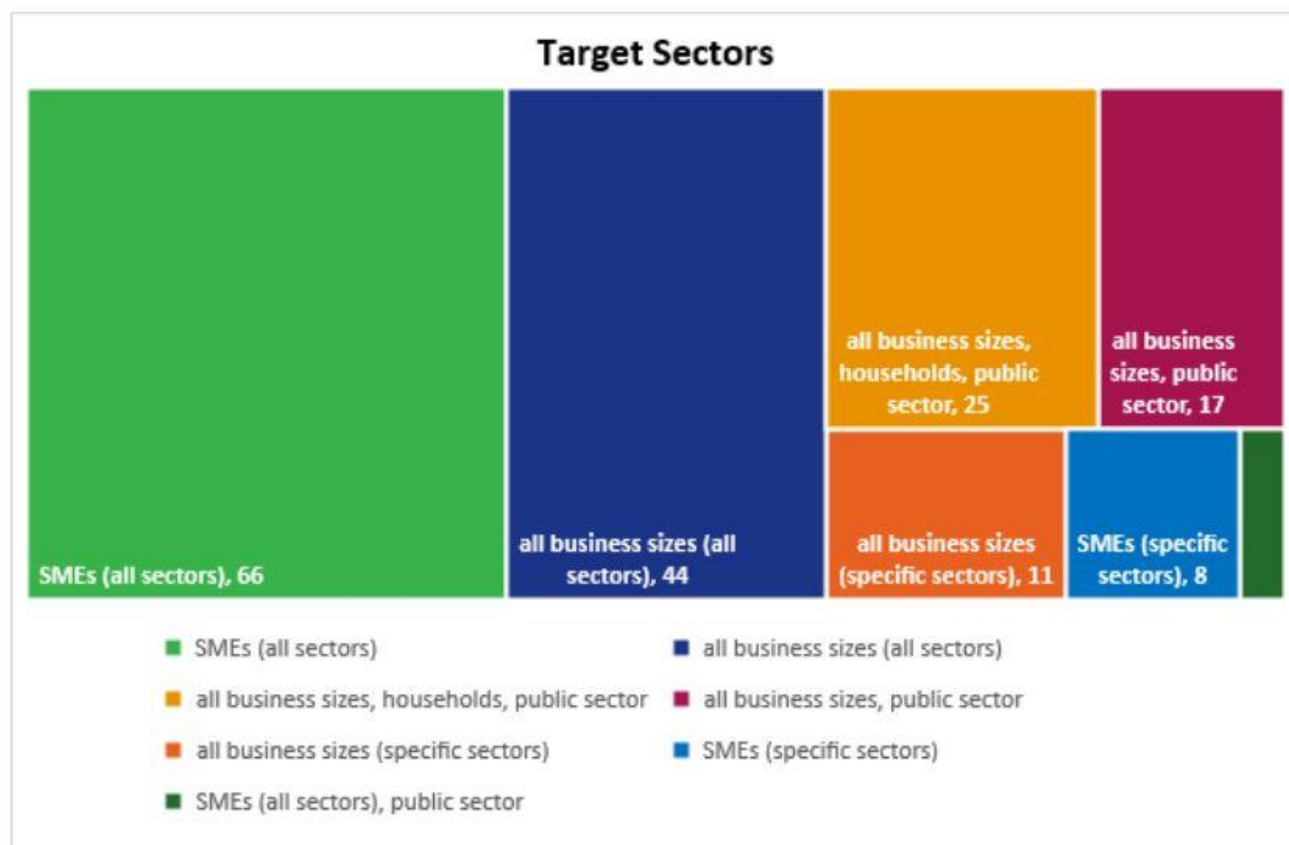


**173** policy instruments identified across **nine countries**.

Financial support (61%)  
Information/advice (31%)  
Regulations (3%)  
National plans or strategies (5%)

■ Financial support   ■ Information/advice   ■ Regulation   ■ National plan/strategy

# Target sectors



Majority (66) of policies solely targeted at SMEs in all sectors

A significant number also covered large businesses and SMEs in all sectors (44)

Other policies were targeted at specific sectors

# Which policies and programmes were most successful?

- Integrated programmes
- Programmes with longevity
- Targeted at specific sectors
- Reduced complexity
- Effective communications and engagement

# What are the barriers for SMEs?

- The SME energy audit market is less standardised
- Most common barriers are:
  - Financial
  - Organisational
  - The way support programmes are designed
- Impact these barriers have on SMEs can differ depending on their size

# How do we overcome these barriers?

- Emphasize both the **energy-related and non-energy related benefits**
- **Strong networks** of local government representatives, SMEs and auditors
- Standards for auditors and **set minimum quality standards** for audits
- Link audits to **holistic support** programmes
- Provide **long-term policies** and support programmes

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**What else should be considered  
when promoting energy efficiency  
and audits?**

**A behavioural change perspective**

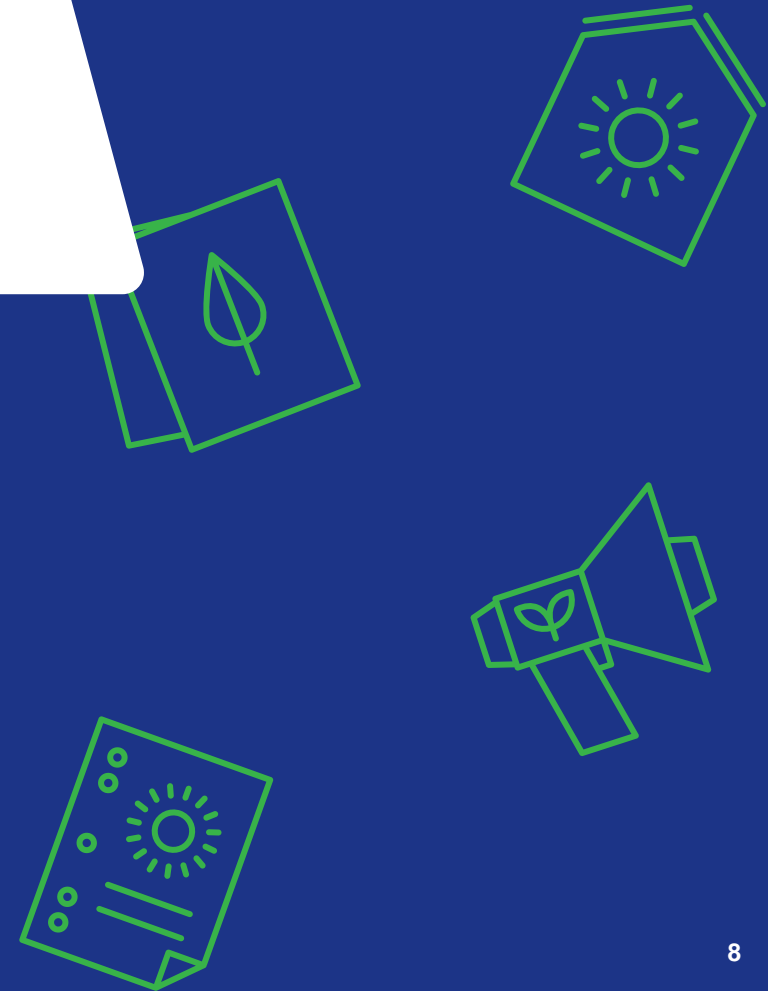


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# SME decision-making

- Research has identified factors that can be a barrier and motivate SMEs to invest in energy efficiency
- The [perceived] barriers and drivers that can influence decisions-making exist at different levels
- Focus of ongoing research is on internal stakeholder(s) behaviour



- **Macro**
  - Market
  - Regulation
  - Technology



- **Meso**
  - Characteristics
  - Processes
  - Strategies



- **Micro**
  - Individual and employee attributes

# Research questions & approach

**How do internal stakeholders influence SME decisions to invest in energy efficiency?**



To what extent do internal stakeholders influence SME decisions to invest in energy efficiency?



What does this mean for SME policy and programme design?

## Methodology

### Rapid evidence assessment

**26 papers** reviewed

**Sector focus:** Construction (1), Horticulture (1), Hospitality and retail (1), Manufacturing (18), other (5)

**Location:** Europe (20), International (3), not specified (3)

**Sample size of studies:** Between 20 and 1000 businesses

### Expert interviews

**5** experts from academia

**1** SME support practitioner

All experts work in the **European** context

# Behavioural factors to consider when promoting investment in energy efficiency among SMEs

## Professional/ industry-related

- Network participation and access to energy efficiency experts
- Increase in internal competencies
- Prevailing technologies

## Personal/ employee attributes

- Management sensitivity to energy efficiency
- Great ambition and entrepreneurial mind
- Pride in work
- Positive working relationships
- Variety and challenge

# Qualitative results from expert interviews

- Engage with their priorities and values
  - Find out what's important to them and their business model
  - Widen the scope of engagement to climate change more broadly
  - Non-energy benefits
- Event-driven interventions and support
  - Growth milestones, expansions and diversification
  - Contract renewals, if applicable
  - Maintenance and repair services
- Knowledge and awareness of issues
  - Improvement option and availability of public and private funds

*What type(s) of audit best suit their needs?*

*When and what are there opportunities to engage?*

*What information and support is relevant and needed?*

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## Analysis of multiple benefits and proposed set of non-energy KPIs

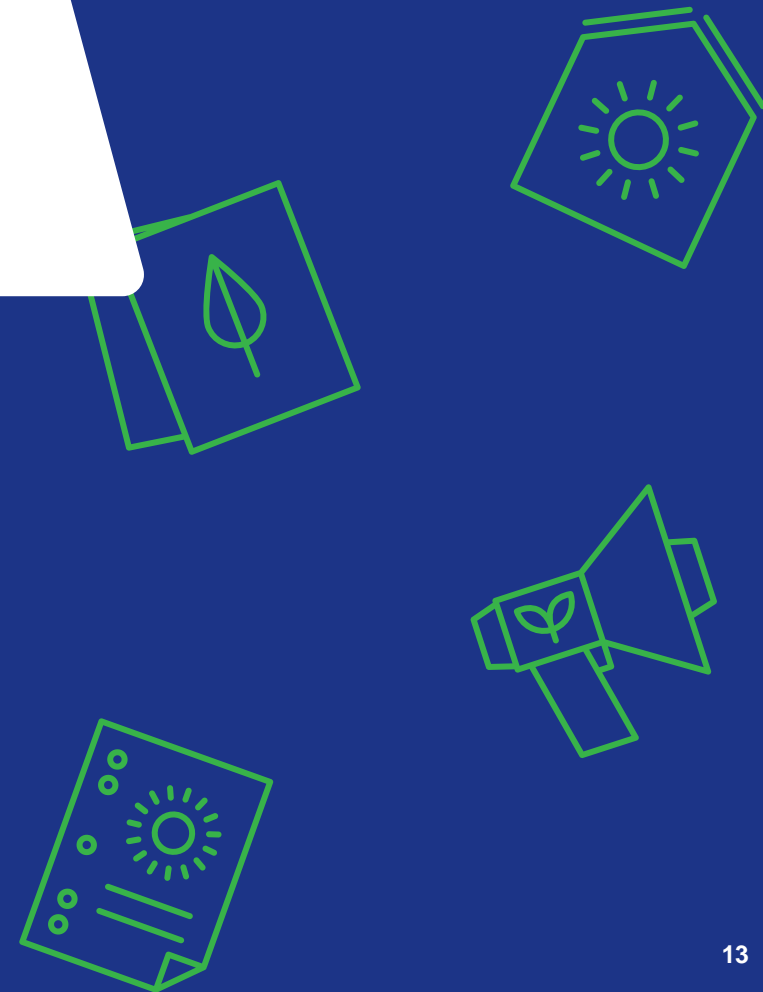


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# Literature review analysis of multiple benefits

## Main findings (1/4)

- **Energy audits** do not result in energy savings *per se*: energy efficiency measures **should be supported** to be implemented.
- **Energy management systems** could provide a **structure** to overcome some of the barriers that limit the uptake of the efficiency measures.
- **Non-energy benefits (NEBs)** can counterbalance acknowledged barriers and increase the priority level for energy efficiency investments against others.

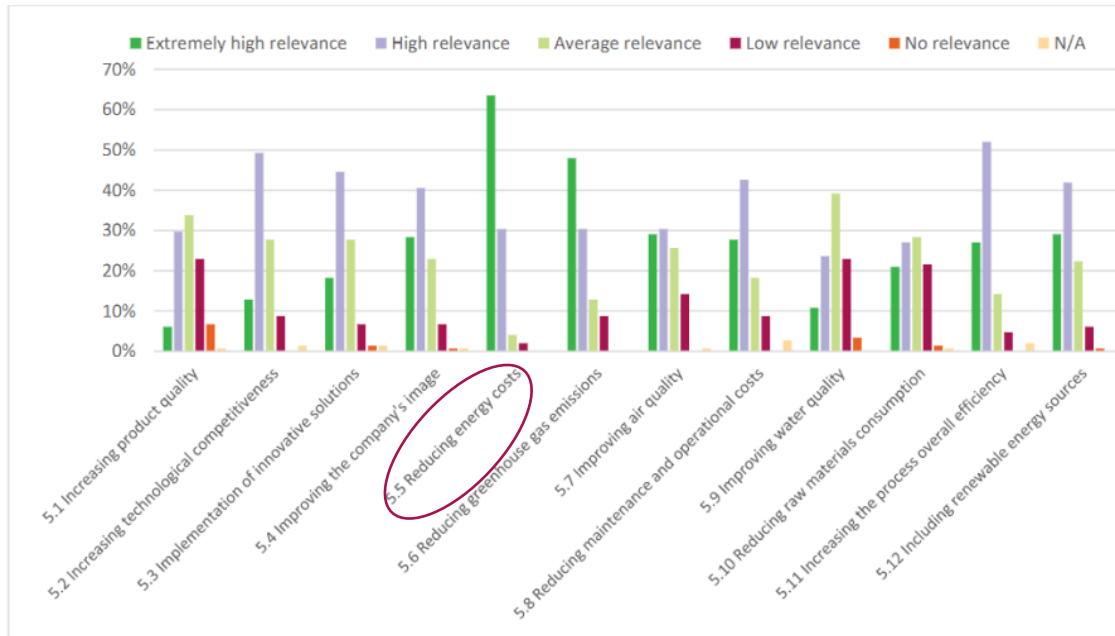
# Literature review analysis of multiple benefits

## Main findings (2/4)

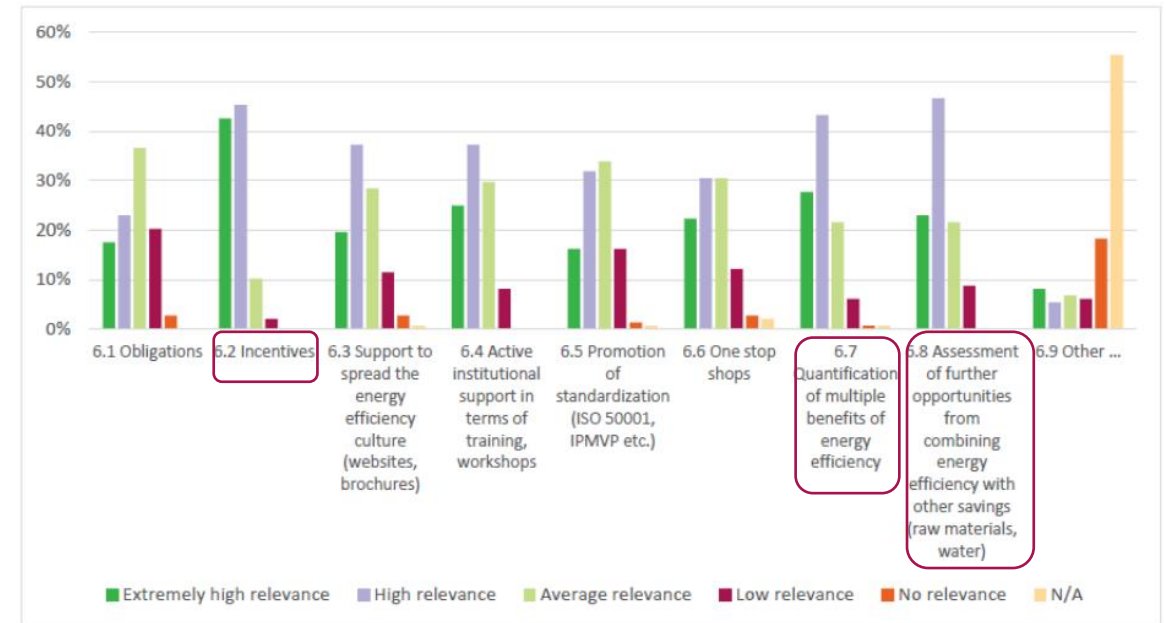
- **NEBs are seldom considered** when energy efficiency measures are evaluated. Therefore, gains are often underestimated or neglected.
- The combination between energy efficiency and **resources efficiency** (water and/or materials efficiency) is also neglected, reducing the potential for continuous energy efficiency improvements.
- The interest of companies in NEBs and resource efficiency is evident, and **real added value** can derive from their study, with impact in **financial metrics of energy efficiency investments**.

# Literature review analysis of multiple benefits

## Main findings (3/4)



**Figure 1** - Which co-benefits in your opinion can reasonably emerge from energy efficiency implementation measures in SMEs?” (Source: LEAP4SME, December 2021)



**Figure 2** - To increase the implementation of the recommended measures for SMEs do you think it is better to concentrate the efforts on... (Source: LEAP4SME, December 2021)



# Literature review analysis of multiple benefits

## Main findings (4/4)

- IEA (IEA, 2014) estimated that if quantified and monetised, the inclusion of NEBs can **shorten payback times by around 50%**
- Wagner (Wagner et al., 2020) showed that the consideration of monetizable multiple benefits may **reduce the payback time of energy efficiency measures by up to 40–85%**
- Ozbugday et al., 2020 concluded that if an SME spends at least **1% of its annual turnover on resource efficiency investments** (average), then it is **13% to 18% more likely to have a better sales growth performance** in comparison to an SME with similar characteristics that does not do the same.

# Literature review analysis of multiple benefits

## However,

- NEBs integration within the common energy audit procedures creates the need to **define suitable KPIs**, able to create a basis for decision making and efficiency measures implementation, **supported by data**.
- It is difficult to find literature that collects KPIs related to the **multiple dimensions of resource efficiency** (namely water, materials, and water-energy nexus) in an **integrated way**.

# Proposed set of non-energy KPIs

## Therefore, there was the need to propose...

- A **new set of KPIs** that uses data easily collectable during an audit procedure, or that is already systematized within the companies' legal or voluntary requirements is proposed (e.g., ISO standards, environmental licensing, etc.) was proposed.
- These intended to assist the quantification of NEBs resulting from energy audits, namely, contributing to the **comparison of resource consumption levels**.
- Divided into **six main groups**: water consumption, water intensity, water sources, water cost, materials use and water-energy nexus.

# Proposed set of non-energy KPIs

Group	Indicator	Description
Water Consumption	Total water consumption	Total yearly water consumption within the company [m <sup>3</sup> ]
Water Intensity	Water consumption per GVA	Total yearly water consumption within the company per its Gross Value Added [m <sup>3</sup> /€]
	Water specific consumption	Total yearly water consumption within the production process per annual production: water consumption per unit of product [m <sup>3</sup> /P.U.]
Water Sources	Water consumption per employee	Total yearly water consumption within the company per employee [m <sup>3</sup> /employee]
	Share of alternative water sources used	Total yearly water consumption from alternative sources per total yearly water consumption within the company [%]
Water cost	Share of wastewater treated and reused	Total yearly treated and reused wastewater per total yearly wastewater produced [%]
	Share of water costs in the total costs incurred	Total yearly water costs per total yearly company costs [%]
	Water specific cost	Total yearly costs concerning water used within the production process per annual production [€/P.U.]
Material use	Water productivity	Gross value added per total yearly water consumption [€/m <sup>3</sup> ]
	Materials specific consumption	Total yearly materials consumption per annual production [kg/P.U.]
	Waste valorization rate	Waste valorization per annual waste production [%]
	Share of byproducts in production process	Quantity of byproducts per total yearly production [%]
	Materials productivity	Gross value added per total yearly material consumption [€/kg]

Group	Indicator	Description
Water-energy nexus	Energy specific cost resulting from the use of water	Cost of energy consumed per total yearly water consumption [€/m <sup>3</sup> ]
	Specific cost of water delivered	Cost of water delivered to the consumer [€/m <sup>3</sup> ]
	Energy specific consumption of the water use	Total yearly energy consumption resulting from the use of water [kWh/m <sup>3</sup> ]

# Quantification framework

- The **information to calculate** these KPIs should be collected through:
  - ✓ On-site **measurements**
  - ✓ Water and energy **invoices direct checks**
  - ✓ Face to face **interviews with companies' top management** and resources management (energy, water, and materials) responsible
- **Nevertheless**, the definition of a quantification framework based on **desk research** (national and international databases) is also feasible – **with limitations** (lack of data regarding SME's, scattered and most of the times not updated databases, etc).

# Quantification framework

- Also, considering the **comments received** from external stakeholders and consortium members related to:
  - ✓ Overall **number of KPIs**
  - ✓ KPIs **applicability** to companies from all sectors
  - ✓ **Data collection** procedures to assess them

**Different levels of KPIs' evaluation were drafted:**

**level D** the most elementary, **level A** the one where the higher number of KPIs are applicable

# Quantification framework

Evaluation level	KPI
Level D	Total water consumption [m <sup>3</sup> ]
	Water consumption per GVA [m <sup>3</sup> /€]
	Water productivity [€/m <sup>3</sup> ]
	Share of water costs in the total costs incurred [%]
	Waste valorization rate [%]
Level C	Water consumption/employee [m <sup>3</sup> /employee]
	Materials productivity [€/P.U.]
Level B	Share of by-products in production process [%]
	Materials specific consumption [kg/P.U.]
	Water specific consumption [m <sup>3</sup> /P.U.]
	Water specific cost [€/P.U.]
	Energy specific cost resulting from the use of water [€/m <sup>3</sup> ]
	Specific cost of water delivered [€/m <sup>3</sup> ]
Level A	Energy specific consumption from the water use [kWh/m <sup>3</sup> ]
	Share of alternative water sources used [%]
	Share of wastewater treated and reused [%]

- Enterprises advance as the **KPIs apply to their own specific case and/or as they have data available or interest.**
- As the framework evaluation level increases, it is harder to find literature values to perform KPIs' quantification **without on-site measurements or direct contact with the company.**

# Quantification framework

- It was performed a **theoretical evaluation** of the core KPIs scenario (**level D**):
  - ✓ The core indicator is **total water consumption**: simple to monitor and act → small and/or indirect interventions will have impact on it.
  - ✓ **Baselines definition** for water and energy consumptions and associated costs → lack of data, assumptions necessary.
  - ✓ **Energy costs** associated with pumping and distribution of self-supply water were not considered.
  - ✓ **Water use costs** associated with the production process were not considered → values cannot be found in literature.



# Scenario definition

Water efficiency potential*	Energy prices	Energy mix	SMEs' sector**
30%	Micro enterprises	100% electricity	Service sector
40%	Small enterprises	50% electricity + 50% natural gas	Production processes with hot water use
50%	Medium enterprises	100% natural gas	Production processes with reduced hot water use

\* Based on literature

\*\* Service sector: 14% energy consumption for heating water; Prod. proc. with hot water use: 30% energy consumption for heating water; Prod. proc. with reduced hot water use: 5% energy consumption for heating water.

# Total water consumption (e.g.)

## SMEs with production processes that use hot water

**Table 1** - Total water consumption and savings baseline (average values per SME, per year, in Europe)

Baseline		Savings		
Total water consumption [m <sup>3</sup> ]	Energy consumption associated with hot water [toe]	Water savings potential [%]	Water savings [m <sup>3</sup> ]	Energy reduction associated with water savings [toe]
278.5	0.0069	30%	83.6	0.0021
		40%	111.4	0.0027
		50%	139.3	0.0034

**Table 2** - Water and energy savings per enterprise dimension and energy mix (average values per SME, per year, in Europe)

Savings (Water + Energy) [€]								
Micro enterprises			Small enterprises			Medium enterprises		
100% Electricity	50% E.- 50% NG	100% NG	100% Electricity	50% E. - 50% NG	100% NG	100% Electricity	50% E. - 50% NG	100% NG
298.7	296.4	294.0	297.2	295.5	293.8	296.5	295.0	293.5
398.3	395.1	392.0	396.2	394.0	391.7	395.3	393.3	391.3
<b>497.8</b>	<b>493.9</b>	<b>490.0</b>	<b>495.3</b>	<b>492.4</b>	<b>489.6</b>	<b>494.1</b>	<b>491.6</b>	<b>489.2</b>

# Main conclusions

- The quantification performed should be **analysed carefully**, as it is based on proxy values and strong assumptions.
- Savings potential is higher for **micro enterprises** – energy prices are higher when compared with small and medium enterprises.
- Savings potential is being mainly influenced by the **water prices**.

**Quantification constraints may be overcome through on-site measurements and direct contact with the enterprises → fully assess energy, water and raw materials saving potential.**

# Thank you for your attention!

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