RESOURCE EFFICIENCY AUDITS: KEY PERFORMANCE INDICATORS AS TOOLS TO EVALUATE POTENTIAL SAVINGS

This study highlights the essential role of **integrated resource audits** in connecting energy, water, and material efficiency strategies. By establishing a comprehensive evaluation framework, the proposed methodology facilitates the **implementation of effective resource management measures**, enhancing industrial competitiveness, sustainability, and alignment with environmental and economic objectives.

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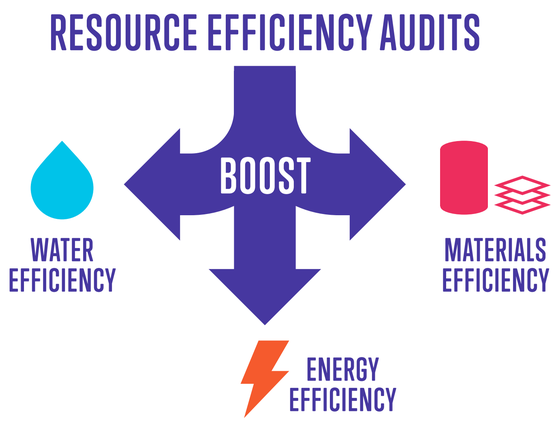
Introduction

Resource efficiency audits have the capacity to **boost the implementation of energy, water and materials efficiency measures**, therefore increasing the companies' competitiveness and diminishing the uncertainties of externalities. This work introduces a **novel integrated resource audit methodology** designed to align companies' operations with circular economy principles while promoting more efficient production processes and delivering environmental benefits.



Methodology

The starting point for a proper quantification of savings is the **definition of suitable key performance indicators** (KPIs). The resource audit methodology developed is based on the definition of KPIs, applied across different evaluation levels (D – basic resource audit to A – detailed resource audit), acknowledging that they may not be equally applicable to all companies and economic sectors. **Enterprises may advance as these indicators match their own specific production process and/or as they have data available or a specific interest.**

The defined KPIs enable the accurate quantification of potential energy, water and raw materials savings per year, while also **supporting the proposal of tailored efficiency measures for each enterprise**. They **leverage existing data**, using information collectable during a previous audit procedure, or that is already available and systematized within the companies' legal or voluntary requirements. The resource audit will start with the evaluation of level D indicators and continue assessing the remaining indicators until level A is reached.

Table 1. Evaluation levels and KPIs

Evaluation level	KPI
Level D	Energy intensity [kWh/€]
	Carbon intensity [t CO_{2e}/kWh]
	Energy specific consumption [kWh/P.U.]
	Renewable energy production [%]
	Total water consumption [m^3]
	Water consumption per GVA [m^3/€]
	Water productivity [€/m^3]
	Water costs in the total costs incurred [%]
	Waste valorization rate [%]
Level C	Water consumption/employee [m^3/employee]
	Materials productivity [€/P.U.]
Level B	Byproducts in production process [%]
	Materials specific consumption [kg/P.U.]
	Water specific consumption [m^3/P.U.]
	Water specific cost [€/P.U.]
	Energy specific cost resulting from the use of water [€/m^3]
	Specific cost of water delivered [€/m^3]
	Energy specific consumption from the water use [kWh/m^3]
Level A	Alternative water sources used [%]
	Wastewater treated and reused [%]

Results

During a resource auditing process, **potential savings and efficiency recommendations are detailed, discussed, and presented**. For that purpose, the auditing team will collect and/or measure data to effectively calculate the defined resource efficiency KPIs.

The information needed to calculate all the resource efficiency KPIs should be collected through on-site measurements, water and energy invoices direct checks, waste production maps and face to face interviews with the companies' top management and resources management (energy, water, and materials) responsible.

Conclusion

The next stage of the work will concentrate on quantifying resource efficiency through **on-site audits**, encouraging measurements to accurately quantify KPIs, fully assessing energy, water and raw materials savings' potential. This will be performed during LEAPto11 project, through pilot resource audits to be held in the food, hospitality, glass, ceramics, and textile sectors.

The development of these pilot cases is fundamental to understanding which are the **points that need to be adjusted, refined, or adapted, as well as to verify the methodology viability.**

References

[1] LEAP4SME (2022). D6.2 - Report on impact scenarios framework and strategies to boost energy audits and energy efficiency implementation. LEAP4SME project - https://leap4sme.eu/results/deliverables/

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