ICCEE

Improving Cold Chain Energy Efficiency
in food and beverage sector

ICCEE in short, Energy efficiency in the value chain

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The project and the partners

Improving Cold Chain Energy Efficiency in the food and beverage sector

Facilitation

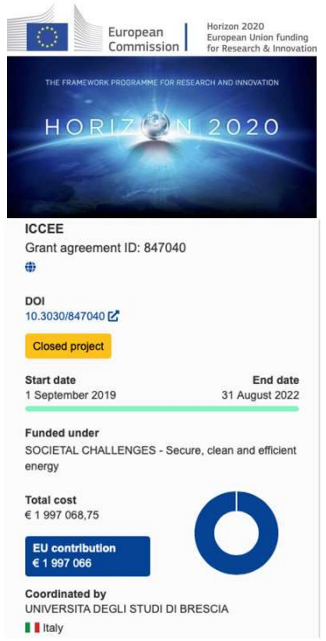
- Promote the dissemination of energy efficiency measures within the cold chains in the food and beverage sector with a focus on SMEs through the provision of tools and interactive formats

Holistic perspective

- Holistic project approach that goes beyond an individual company perspective to entire supply chains, whereby overarching potentials for action are to be identified and better leveraged

Accelerate investments

- Using the developed formats, the project aims to accelerate the implementation of energy efficiency opportunities through actual investments.



Business case: Refrigeration

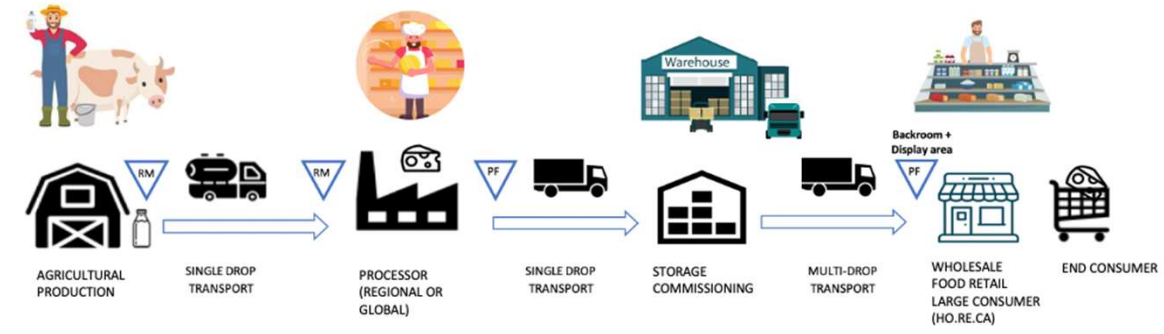
- Refrigeration is vital for preserving the quality of food and beverage.
- Currently only 10% of the food produced is properly refrigerated and up to 30% is lost before it reaches the home refrigerator
- Wastes in the cold chain can occur at different stages of the value chain:
  - storage of raw materials
  - packaging and processing
  - distribution and transport
  - refrigerated or frozen storage and display at the point of sale.

"An improved global cold chain would allow a reduction of almost 50% of the CO2 emissions of the current cold chain."

Food & Beverage Cold Supply Chains




Cold chains consist of environmentally controlled logistics chains aiming at preserving the quality of perishable goods, connecting processing, storage, and distribution activities from farm to fork.



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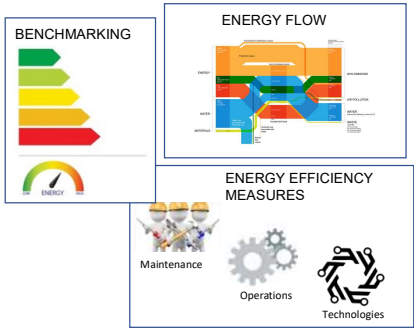
Two-pillar Approach



TOOL

DEVELOP AND APPLY AN **ANALYTICAL ENERGY EFFICIENCY TOOL** TO SUPPORT AND **FACILITATE INVESTMENT DECISION-MAKING**

Allow users to estimate the energy & environmental performances of a **cold chain** and its actors and provide:

- suggestions for specific EEM investment
- benchmarking
- what-if analysis

CAPACITY BUILDING PROGRAMME

A **CAPACITY BUILDING PROGRAMME** AND CREATING A **COMMUNITY TO ACCELERATE CHANGE** IN THE ENERGY CULTURE OF THE FOOD & BEVERAGE SECTOR

4 main themes:

- Supply chain
- LCA and LCC
- NEBs and behavioural aspects
- Financial aspects and funding opportunities

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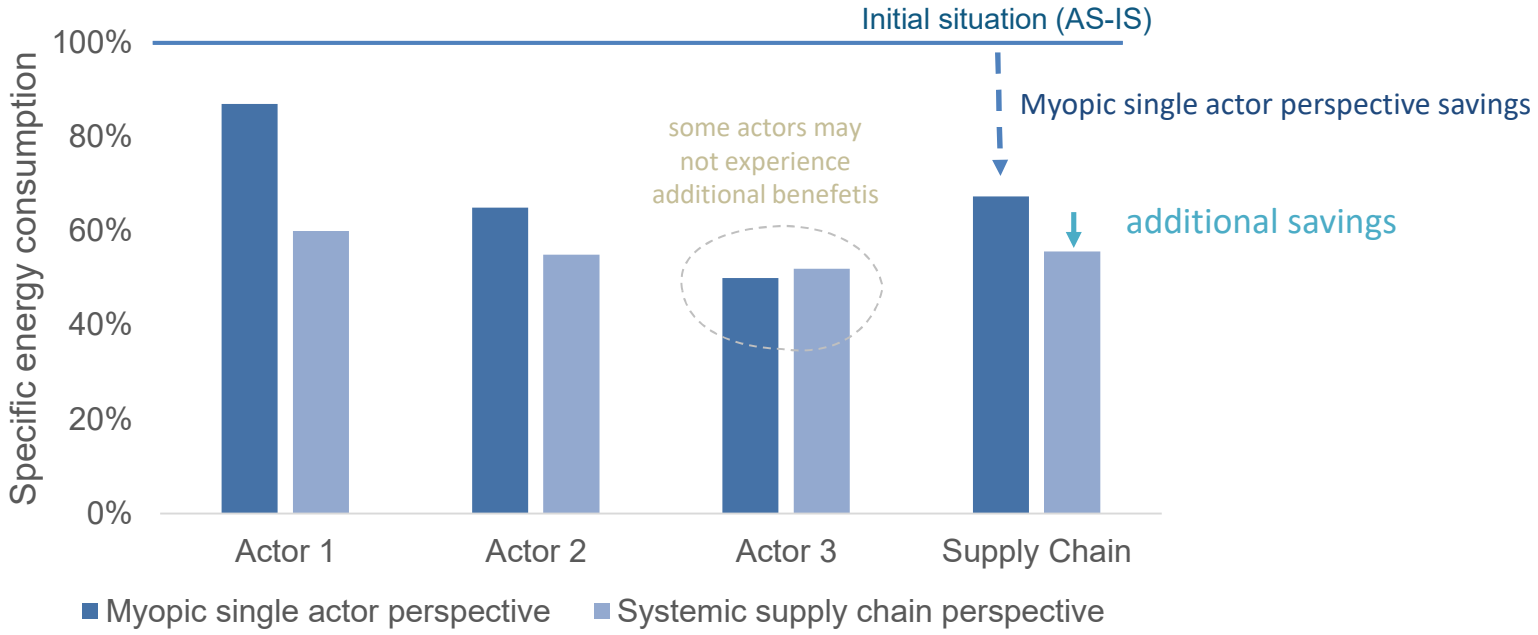
Cold chain business model



- Additional energy efficiency measures
- Harmonise interventions
- Increased energy efficiency implementation rate due to lower barriers

ICCEE-Toolbox: Coverage from 7 angles

Tool #0: Guidance

Do you want to know more about solutions and funding for energy-efficient CSCs?

Tool #6: Multi-criteria analysis tool (MCDA)

Did you already take a look at the CSC and LCA tools and do you want to know more?

Tool #1: Cold supply chain tool (CSC)

Do you want to analyze your CSC's energy consumption and prevent food quality losses?

Tool #5: Non-energy benefit evaluator (NEB)

Do you wonder how to analyze non-energy benefits in a structured manner?

Tool #2: Life cycle assessment tool (LCA)

Do you want to understand the environmental impact of your CSC?

Tool #4: Benchmarking non-energy benefits (BEN)

Are you interested in other factors relevant for decision making on CSC energy performance?

Tool #3: Life cycle costing tool (LCC)

Do you wonder about the economic benefit from energy efficiency measures?

- Printable and available in **8 languages**
- Available for **free** on project website
- Tutorial on YouTube

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Business model validation

To assess to which extent the ICCEE national trainings supported reaching companies' energy efficiency and sustainability targets, ICCEE asked participants for an estimation. With nearly 100 answers, the total estimated savings and triggered investments are as follows (conservative estimation).

	2025	2030
How many MWh of electrical savings do you expect to obtain with these measures?	1735 MWh/ year	2010 MWh/ year
How many MWh of thermal savings do you expect to obtain with these measures?	1715 MWh/ year	2730 MWh/ year
What would be the overall investment triggered?	42.81 M€	48.2 M€

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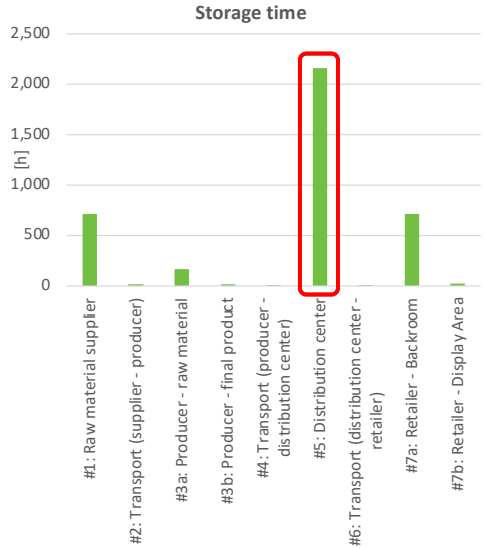
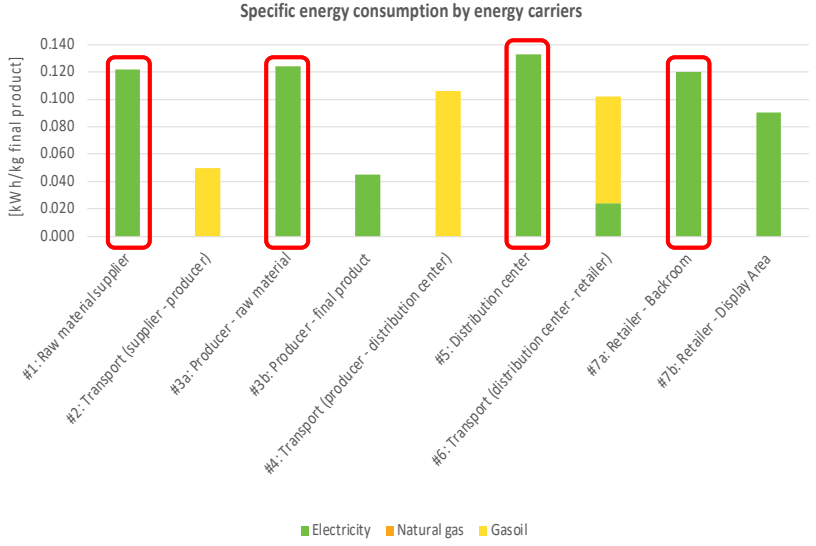
Fruit & vegetables case study

FROZEN FRUIT





Fruit & vegetables case study - Possible Interventions

Supply chain stage	Energy efficiency measure	Category	Objective
Producer – PF warehouse DC	Faster replenishment (smaller lot size) Use of smart/automatic control system	Management Monitoring and control	↓ refrigeration load requirement and energy consumption
Raw material supplier	Faster replenishment (smaller lot size)	Management	↓ quality losses, refrigeration load requirement and energy consumption
Retailer – Display Area & Backroom	Separated compartments warehouse Improved insulation (reduction of air infiltration of rooms and display area, e.g., by ensuring that door can be closed)	Building	↓ refrigeration load requirement, air infiltration, and energy consumption
Transport Producer – DC DC – Retailer	Alternate means of transport (e.g. portable refrigerated units for LTL) Improved insulation of trucks (e.g., air curtain)	Transport Transport	↓ fuel consumption (↓ air infiltration → ↓ refrigeration load)
Cold chain	Adjustment of cooling temperature (e.g., -18°C all over the chain instead of -24°C and -20°C)	Management	↓ temperature abuses and energy consumption

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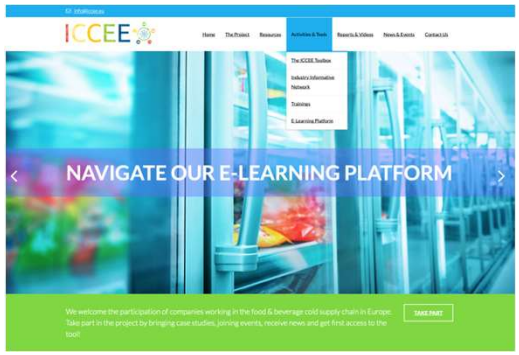
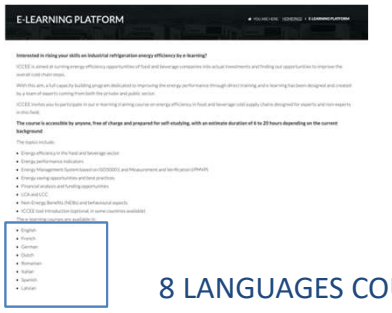
Industry Informative Network & e-learning platform





8 LANGUAGES COURSE
free available

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Peer-reviewed papers and scientific publications

Energy efficiency from farm to fork? On the relevance of non-energy benefits and behavioural aspects along the cold supply chain

PAPER ID: 292878
DOI: 10.18462/iir.icce.2020.292878
Improving Cold Chain Energy Efficiency: EU H2020 project for facilitating energy efficiency improvements in SMEs of the food and beverage cold chains

Comparison of Cooling Technologies for Transport Logistics

Environmental and Climate Technologies
2022, vol. 26, no. 1, pp. 428–440
https://doi.org/10.2478/rtuect-2022-0033
https://content.sciendo.com
sciendo
The ICCEE Toolbox. A Holistic Instrument Supporting Energy Efficiency of Cold Food and Beverage Supply Chains

2021, vol. 25, no. 1, pp. 343–355
https://doi.org/10.2478/rtuect-2021-0025
https://content.sciendo.com
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Effects of Energy Efficiency Measures in the Beef Cold Chain: A Life Cycle-based Study

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Thank You!