



RESEARCH ACTIVITIES



Lorenzo Miserocchi
PhD

- **ENERGY EFFICIENCY IN BUILDINGS**

Investigation of efficient technologies and advanced control strategies for HVAC systems in non-residential buildings through dynamic modelling of building-plant interactions.

- **ENERGY EFFICIENCY IN INDUSTRY**

Development of a methodological framework for measuring, assessing, and improving energy performance in industrial contexts, with applications to case studies from the food supply chain.

- **GREEN HYDROGEN APPLICATIONS**

Investigation of optimal renewable energy integration in hard-to-abate industrial sectors, focusing on techno-economic trade-offs between hydrogen combustion and direct electrification as alternative fuel-switching pathways.



ENERGY EFFICIENCY IN BUILDINGS

- **Objective**

Identification of effective cross-cutting solutions to enhance energy efficiency in non-residential buildings.

- **Scope**

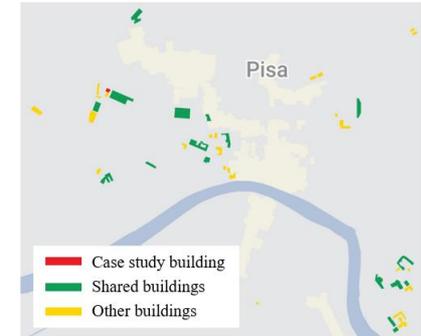
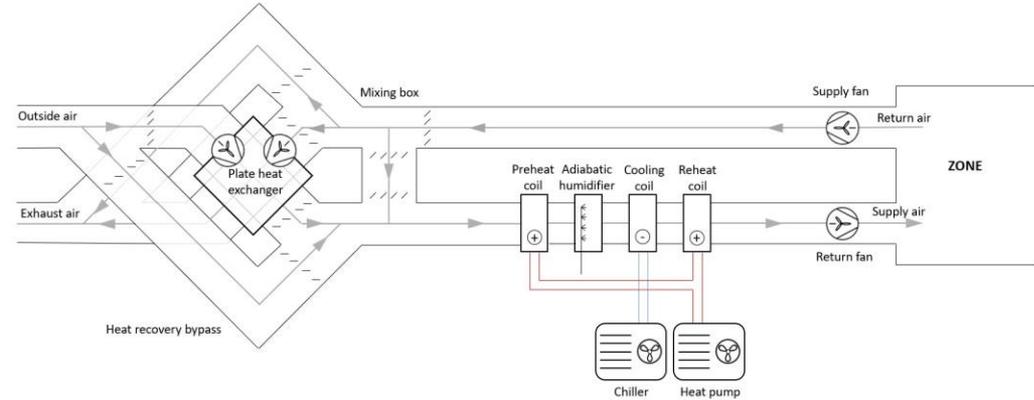
Clustering of non-residential activities according to end-uses, energy intensity, occupancy profiles, and HVAC system layouts.

- **Approach**

Integrated modelling of building-plant systems for evaluation of technological options, including heat pumps and advanced ventilation strategies.

- **Outcomes**

Quantification of energy saving potentials and generalisation to an existing building stock.





ENERGY EFFICIENCY IN INDUSTRY

- Objective**

Definition of a general bottom-up methodology for achieving energy efficiency in industrial production systems.

- Scope**

Selection of vertical farming, the dairy industry, and glass manufacturing as representative contexts from the food supply chain.

- Approach**

Systematic integration of energy performance measurement, assessment, and improvement through data analysis and energy modelling.

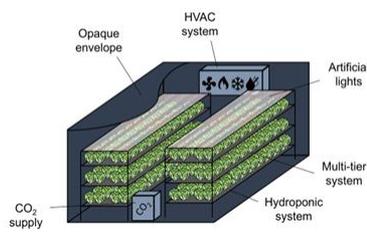
- Outcomes**

Identification of context-specific opportunities and methodological insights applicable across heterogeneous industrial sectors.

Lettuce cultivation in plant factories

10–18 kWh kg⁻¹ Electricity

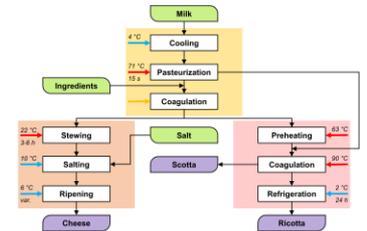
60–90% Lighting



Cheesemaking in dairy plants

5–9 MJ kg⁻¹ Electricity and natural gas

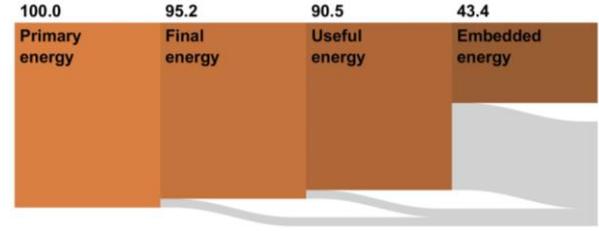
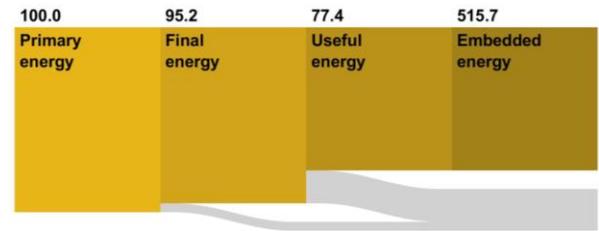
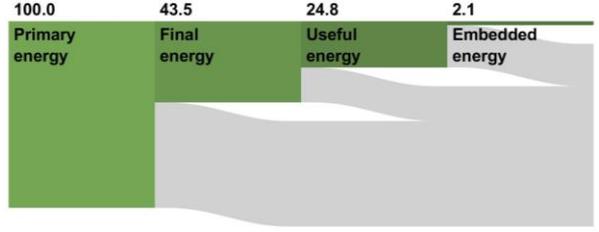
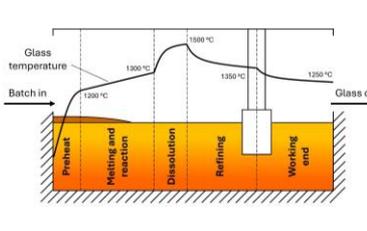
~ 50% Process heating < 100 °C



Glass bottle production in glass furnaces

4–8 MJ kg⁻¹ Natural gas and electricity

> 80% Process heating > 1000 °C





GREEN HYDROGEN APPLICATIONS

- Objective**

Assessment of the potential contribution of green hydrogen to the decarbonisation of high-temperature industrial process heat.

- Scope**

Focus on hybrid glass furnaces, where direct electrification and hydrogen use represent alternative fuel-switching pathways.

- Approach**

MILP-based optimisation of a glass furnace coupled with renewable energy generation and storage systems.

- Outcomes**

Assessment of techno-economic feasibility and characterisation of the complementary role of electrification and hydrogen.

