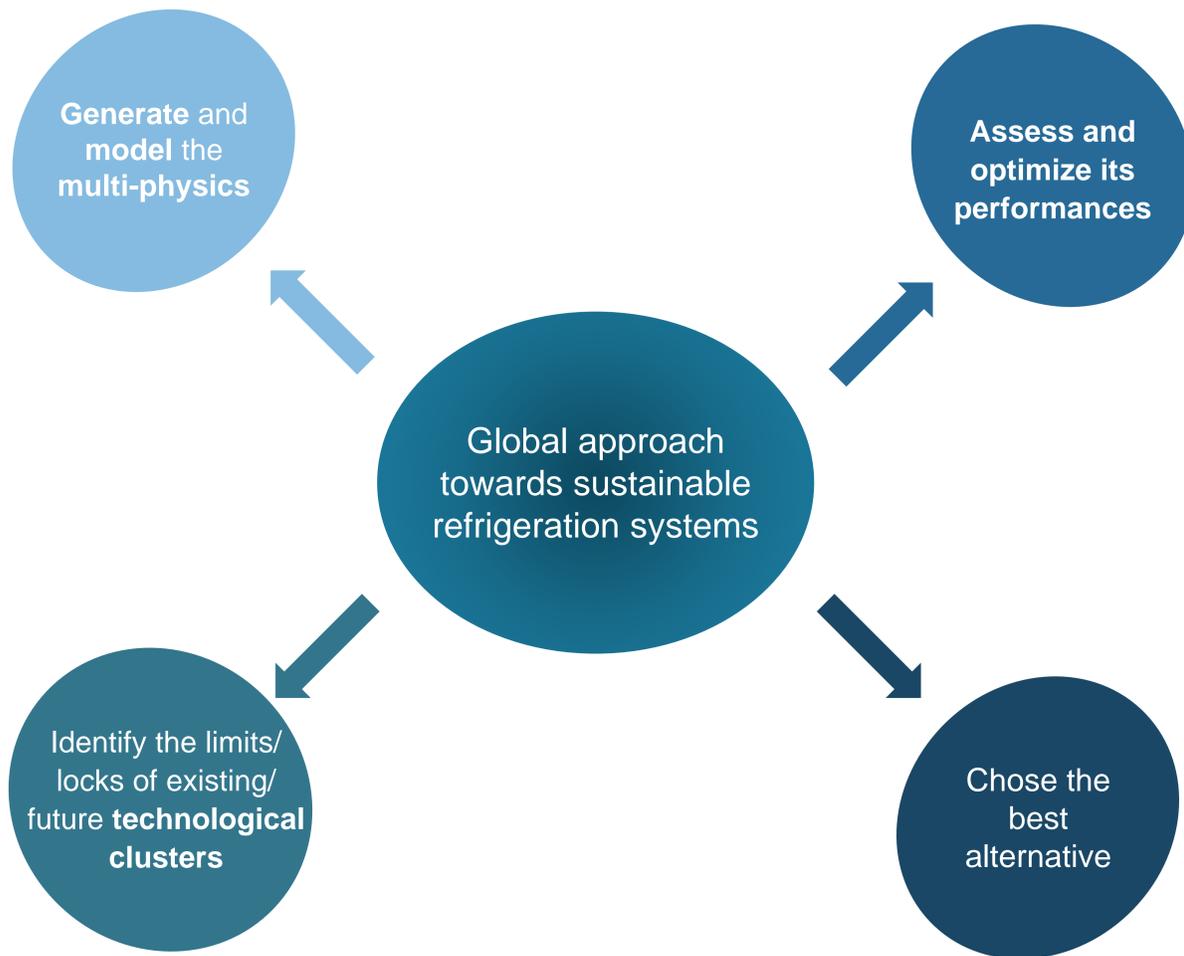


## Context

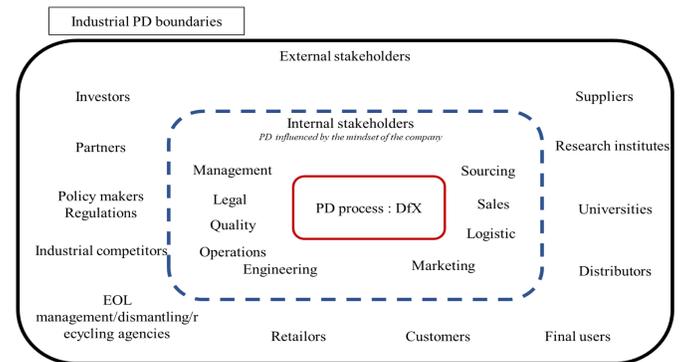
As the earth population increases, the consumption of products and systems in every field is in constant growth. Cold is needed in multiple domains such as food industry, pharmaceutical domains, buildings, markets, transport... The **importance of the refrigeration industry is expected to increase** due to the global warming and the further growing of cooling needs. Thus, the role of the refrigeration industry in global economy will be developing [1].



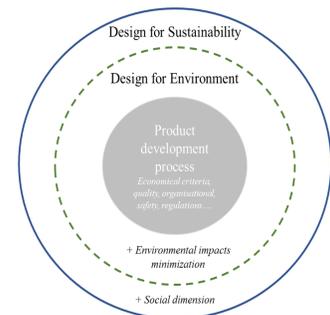
## Research objectives



## Industrial sustainability



Product development context [2]

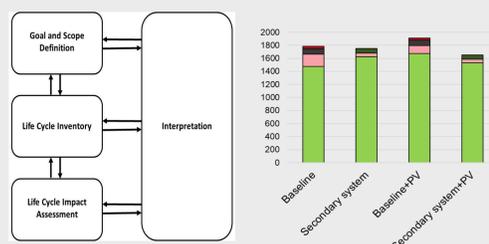


Relations between product design development, eco-design and Design for Sustainability

## Preliminary results

### 1. Environmental impacts assessment

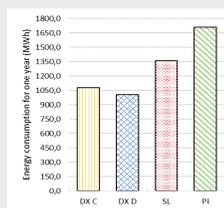
→ Using LCA method [3]



*Contribution: Life cycle assessment of hypermarket refrigeration system: effects of location and choice of architecture, AvniR conference, 6 November 2019*

### 2. Energy consumption evaluation

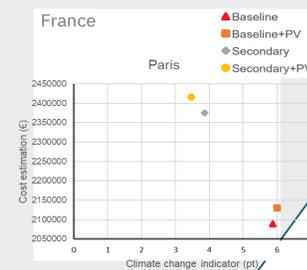
→ Comparison of different system architectures and technologies



*Contribution: Energy performances assessment of refrigeration systems in a supermarket for sustainable design recommendations, 27th CIRP Life Cycle Engineering (LCE) Conference, submitted.*

### 3. Multi-criteria analysis

→ Cost and environmental assessment for decision making



## Conclusions and work perspectives

Depending on the location of the system (outside temperature, climate, population around...), its size, the seniority, **general recommendations cannot be relevant** for every food retail store even in the same country as the type of architecture, technology and expectations are different. The perspectives of this work is to **generalize and automatize the calculus** to give adapted recommendations for refrigeration systems for **new system design or renovation** due to the **upcoming regulations** on cold production systems.

## References

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- [2] J. Majava, J. Harkonen, and H. Haapasalo, 'The relations between stakeholders and product development drivers: Practitioners' perspectives', International Journal of Innovation and Learning, vol. 17, pp. 59–78, Jan. 2015
- [3] E. Cagno, A. Neri, M. Howard, G. Brenna, and A. Trianni, 'Industrial sustainability performance measurement systems: A novel framework', Journal of Cleaner Production, vol. 230, pp. 1354–1375, Sep. 2019
- [4] ISO 14044, 'Environmental management -- Life cycle assessment -- Requirements and guidelines', 2006