UniBa | UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

Sapere senza confini.

DEMDI | Dipartimento di Economia Management e Diritto dell'Impresa

# Life Cycle Assessment for sustainability management in business

Prof. Dr.-Eng. **Carlo Ingrao**

A society can be considered as sustainable when it lives in symbiosis with the environment and the people, respects all living beings, does not use more resources than it can produce, and does not generate more waste and emissions than it can absorb.

In other words, a society that is in line with the «Earth's carrying capacity»

# Sustainability

According to the UCLA Sustainability Committee, sustainability is defined as:

"**The integration of environmental health, social equity and economic vitality in order to create thriving, healthy, diverse and resilient communities for this generation and generations to come.**

**The practice of sustainability recognises how these issues are interconnected and requires a systems approach and an acknowledgement of complexity."**

# Sustainability

Sustainability can be understood as the process of change in which:

- the exploitation of resources;
- the investment plan;
- the orientation of technological development; and
- the institutional changes

are all tuned in and enhance the current and future potential to meet human needs and aspirations.

Sustainability in business **refers to a company's strategy and actions to reduce adverse environmental and social impacts resulting from business operations in a particular market.**

An organization’s sustainability practices are typically analyzed **against environmental, social and governance (ESG) metrics**.

Sustainability can be achieved through six steps going from materiality analysis up to certification, passing through collecting data and setting targets.

# Why's sustainability important?!

Sustainability is a business imperative and should be core to the strategy and operations of every business. The reasons for this are both ethical and financial:

- **Employees are increasingly looking for mission-driven, purpose-led employers who care about the planet when deciding where to work** → 71% of employees and employment seekers say that environmentally sustainable companies are more attractive employers.

- **Consumers are willing to pay a premium for goods from brands that are environmentally responsible** → 80% of consumers indicate sustainability is important to them.

- **Governments, investors, employees and customers are demanding new levels of enterprise accountability, including actions to address climate change.**

- **Many of the world's top economies have or are developing corporate disclosure requirements around environmental impact, driving businesses to curb GHG emissions.**

- **The rise of ESG investment criteria and sustainable investing means that a sustainable business is inherently more attractive to the rising numbers of responsible investors. Investment in ESG assets may reach USD 53 trillion by 2025, representing over a third of global assets.**

# So, it is clear that sustainable development is the guiding principle of sustainability

## The concept of sustainable development

In 1987, the United Nations Brundtland Commission defined sustainability as

**“meeting the needs of the present without compromising the ability of future generations to meet their own needs.”**

Such a definition is globally known as

the «1987 Bruntland definition».

Today, there are almost 140 developing countries in the world seeking ways of meeting today their development needs, but with the increasing threat of climate change, concrete efforts must be made to ensure that that does not negatively affect future generations.

Sustainability – and so sustainable development - **presumes that resources are finite**, and **should be used conservatively and wisely** with a view to long-term priorities and consequences of the ways in which resources are used.

So, it is understood that a lot of attention is paid upon the importance of using the today's stock of resources making sure to preserve the quality, availability and integrity of those resources for the generations to come…**our children and our grandchildren!**

# Sustainable development and the thermodinamics laws

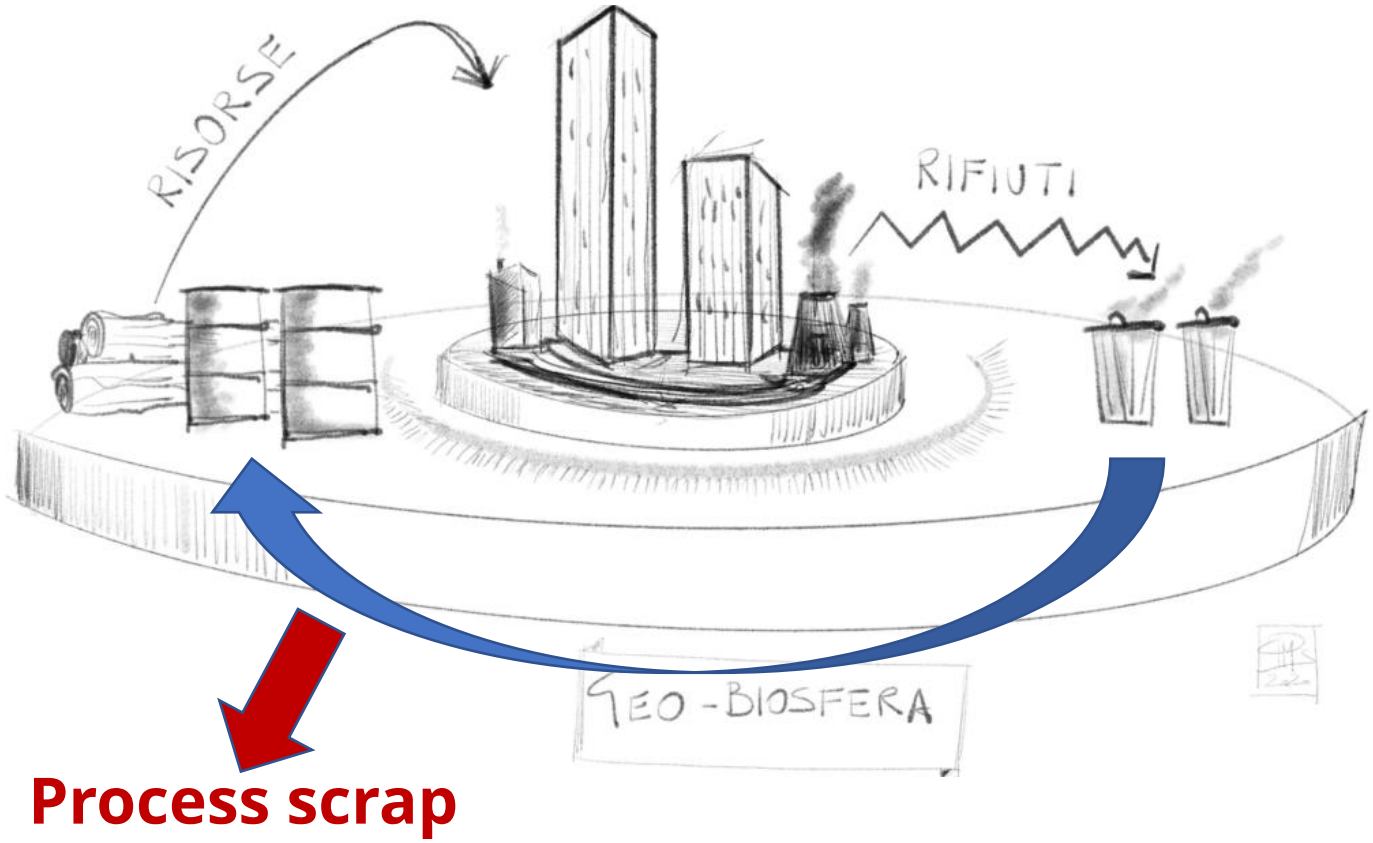
The principles of thermodynamics can be summarised in the following concepts:

- **nothing is created and nothing is destroyed, everything is transformed;**
- **it is impossible in nature to achieve a spontaneously reversible process, since every transformation leads to a constant degradation of the resources, both mass and energy, that are used in a process.**
- **There is therefore a 'tax to pay' that is called entropy, which can be considered as a measure of the waste from a transformation;**
- **non-spontaneous processes are therefore those that need work (energy) in order to occur, and generate entropy, i.e. waste, as it is impossible to achieve a process that is 100 per cent efficient**.

It is therefore clear that there is a big misconception that sustainability can actually allow humans to live while leaving the planet as it was before we found and used it.

Furthermore, efficiency and irreversibility suggest to us that no matter how technically good we may be at implementing a process on Earth, we will never be perfect and that imperfection is nothing more than our pollution of the planet.

**At this point, it is essential to act to minimise pollution by improving the efficiency of the transformation processes we put in place, through innovative sustainable solutions.**

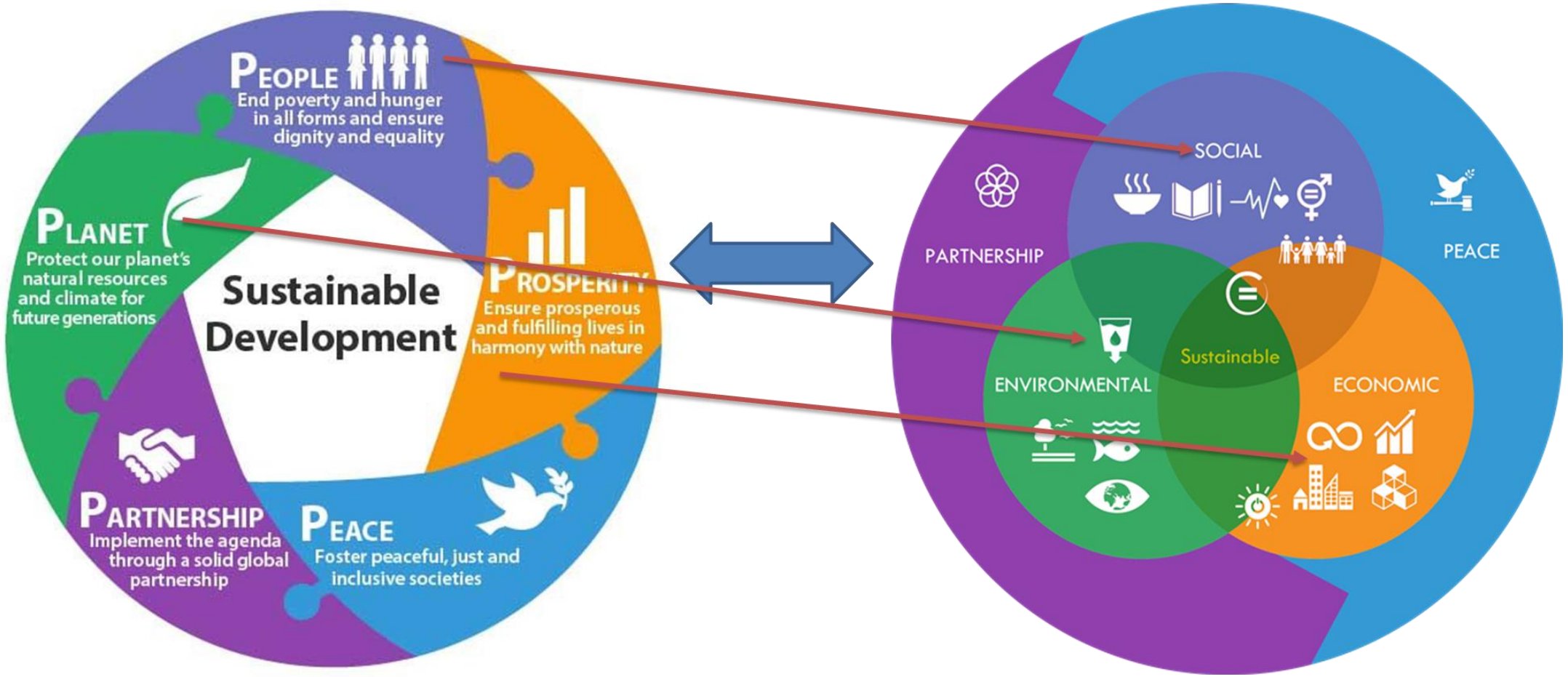



**Even if one wanted to reverse the cycle to obtain new secondary raw materials, as happens in recycling processes, there would always be waste to be treated, as by the third thermodynamics principle entropy can tend to zero but never be zero.**

https://www.informazioneambientale.it/lo-sviluppo-sostenibile-principi/

# Sustainable development and sustainability

The ‘five elements’ of sustainable development, converge in the three ‘pillars’ of sustainability, with an integrated holistic approach

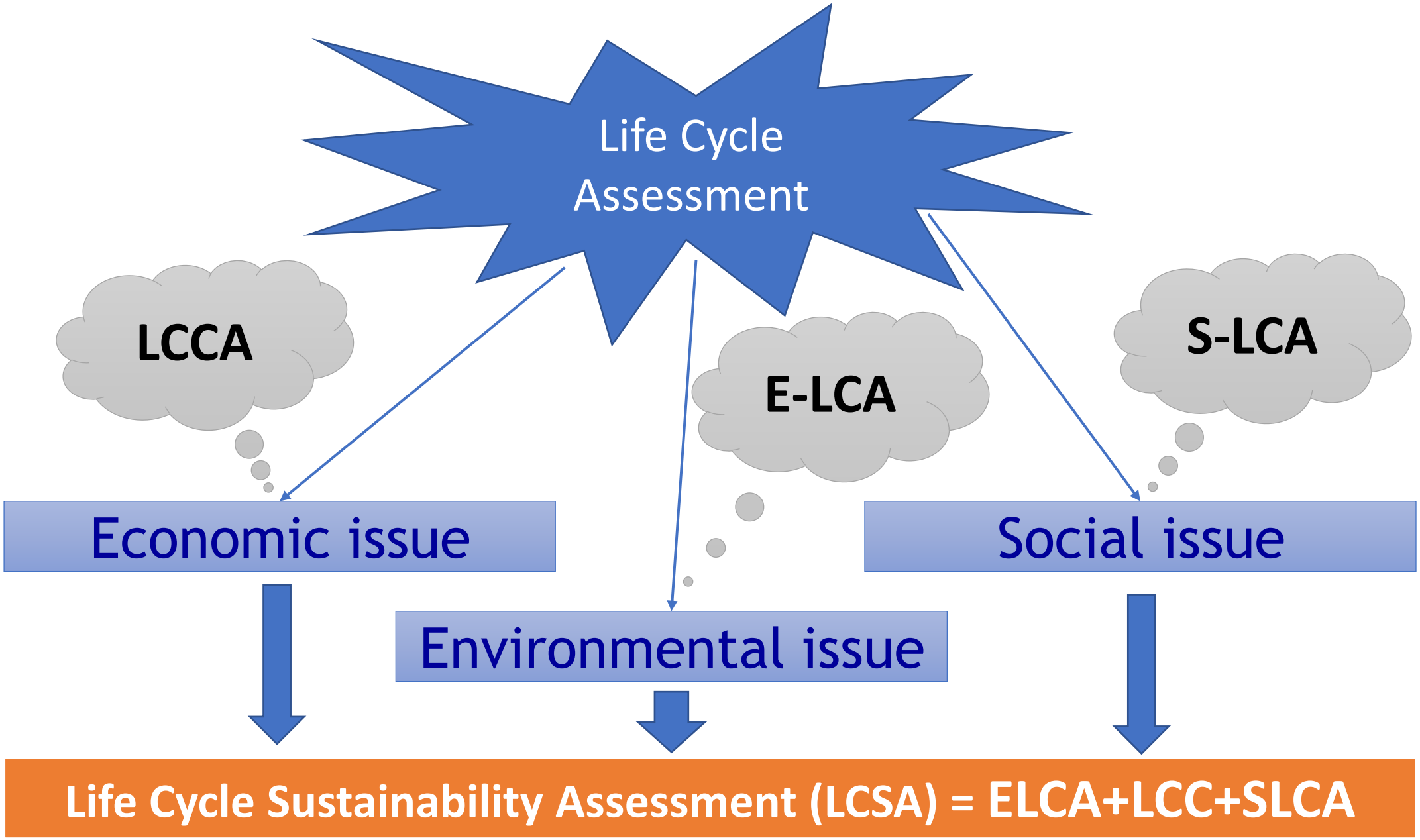


So, there is no doubt that sustainability has become now a hot topic, whose principles and goals companies all over the world are called to meet to improve the total quality of their products and services, be competitive in the market and be part of the global ecological transitions.

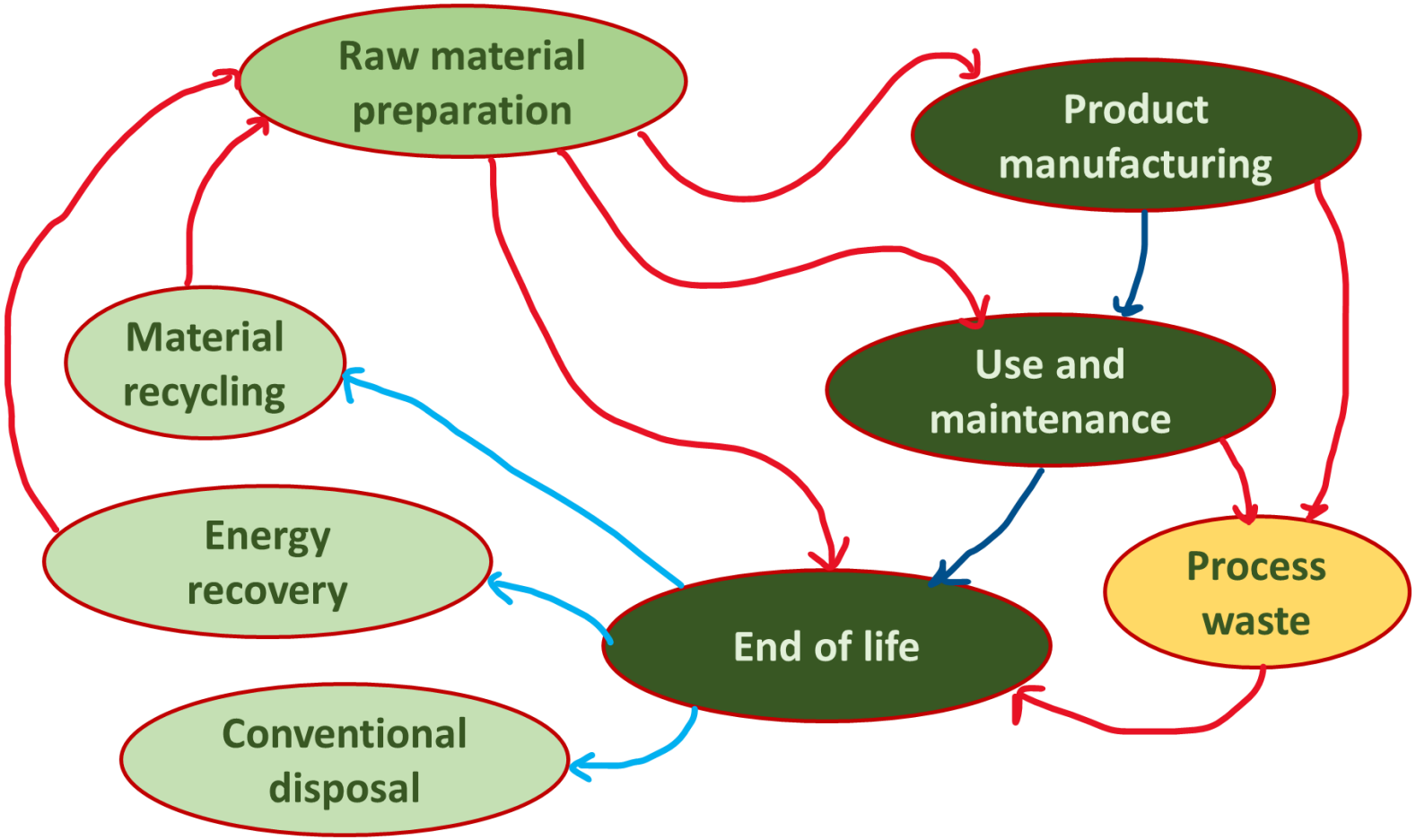
It goes without saying that - for being improved – sustainability needs first to be measured and, to that end, life cycle assessment (LCA) is one valid tool that can be used.

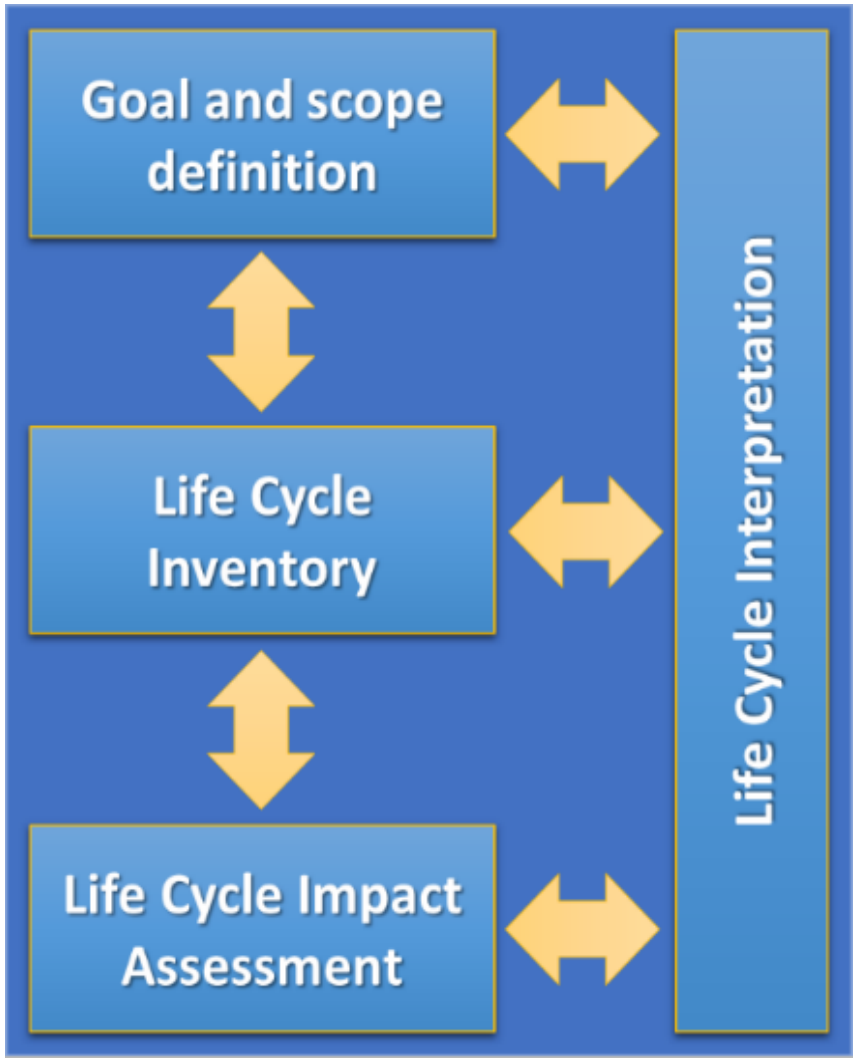
**LCA can help us test those improvement solutions that allow for reducing the entropy, and so the level of pollution, that our processes generate.**

# LCA, a tool for sustainable development



E-LCA is a methodology that is ruled by the ISO 14040-44 (2006), and i about qualifying and quantifying the relevant environment burdens associated with a product in its life cycle, intending the latter as going from resource extraction and acquisition to the end-of-life of the product which those resources are utilised for.



## LCA can be applied to existing supply chains and life cycles, with the multiple aims of:

- Calculating and analysing the input and output flows associated with the investigated system, thus proving to be a valuable management tool for companies;

- Identifying the most environmentally damaging phases within the life cycle under investigation, which thus represent its environmental criticalities;

- Based upon those critical points, find and test room for improvement, so as to contribute to increasing environmental sustainability of supply chain or life cycle of the product at issue.

**LCA can be applied on existing supply chains with the objective of identifying environmental criticalities, and potential for improvement, or for comparative assessments.**

Comparative assessment generally regard :

- **improvement solutions, when these are alternatives** (such an approach is known also as *ex-ante LCA*, in that it is about verifying the environmental sound of the improvement solution before implementing it, and the related assessment is based upon using project data)**;**
- **finished products;**
- **production technologies;**
- **energy generation systems;**
- **waste management systems;**
- **options for waste recovery with a view to the circular economy, using effective and efficient processes with reduced environmental impact.**

# To conclude, Life Cycle Assessment substantiates the Life Cycle Thinking, namely the ecodesign approach, which is on the basis of circular economy.

«DO NOT DESIGN PRODUCTS! INSTEAD, DESIGN PRODUCT CYCLES THAT ARE COMPATIBLE WITH SUSTAINABLE DEVELOPMENT»
(PRé Consultants)

According to the LCT approach, the repercussions that the current production systems have on the quality, safety and sustainability of their products are considered and evaluated, already in the design phase. In addition to this, application of LCT allows to understand how each downstream phase is affected by the technological choices that are made for implementation and development of the upstream one, and how that can be addressed and improved if needed. Such an approach represents the foundation to assess the improvements that can be made all along the life cycle of a product for its enhanced quality and sustainability.