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CHAPTER 6

MEASURING THE SUSTAINABILITY OF A PROCESS/PRODUCT/SERVICE

COURSE OVERVIEW

1. Environmental analysis
2. Life Cycle Analysis (LCA)
3. The carbon footprint
4. Case Studies/Applications

Environmental analysis

Generalities and Definition

In an environmental management system, it is essential to identify the environmental aspects related to an activity. It is necessary to know the controllable aspects and determine the significant environmental impacts. According to ISO 14001 Standard, the chosen approach must be developed in a procedure and the results documented. Environmental analysis is commonly referred to. Its implementation allows to guide the environmental policy and propose environmental objectives. Environmental analysis involves several steps:

- ✓ Identifying activities, manufacturing processes, and flows.
- ✓ Identifying requirements (including legal ones) applicable to the inventoried activities.
- ✓ Gathering informative documents on the flows, history, and environment.
- ✓ Identifying inputs and outputs for each identified activity.
- ✓ Inventorying environmental aspects corresponding to activities and defining the corresponding impacts (for all phases of the activity's life).
- ✓ Defining the "significance" of environmental impacts (rating impacts)

The environmental analysis takes into account all the following parameters: Air, Noise, Waste, Water, Energy, Landscape, Soil and subsoil and Natural and technological risks.

How to Conduct an Environmental Analysis

- ✓ Identify environmental aspects: list activities, products, and services (inside and outside the company).
- ✓Choose the necessary environmental factors.
- ✓Define the weighting scale for environmental impacts.
- ✓Define weighting criteria for each environmental factor.
- ✓Weigh the impacts related to each aspect and the risks.
- ✓Define significance criteria for the aspects.

Life Cycle Analysis (LCA)

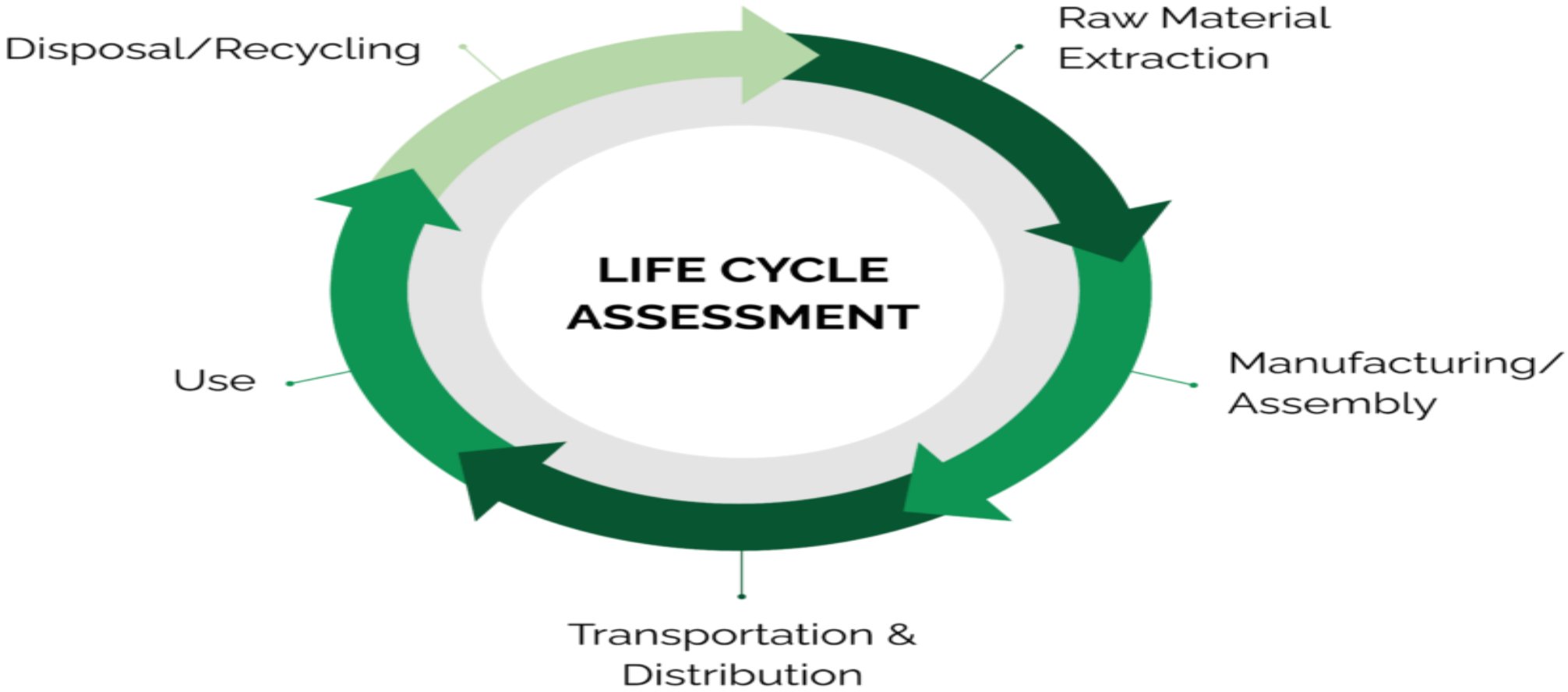
Definition

Life Cycle Assessment (LCA) is a standardized evaluation method (ISO 14040 and 14044) that allows for a multi-criteria and multi-stage environmental assessment of a system (product, service, company, or process) throughout its life cycle.

Its goal is to understand and compare the environmental impacts of a system throughout its life cycle, from the extraction of necessary raw materials for its production to its end-of-life treatment (landfilling, recycling, etc.), including its phases of use, maintenance, and transportation.

Life Cycle Assessment (LCA) identifies and quantifies, throughout the life of products, the physical flows of materials and energy associated with human activities. It assesses their potential impacts and interprets the results obtained according to its initial objectives.

The collection of information related to flows is an important step in LCA. They are quantified at each stage of the cycle and correspond to potential environmental impact indicators.


Disposal/Recycling
Raw Material Extraction
LIFE CYCLE ASSESSMENT
Use
Manufacturing/ Assembly
Transportation & Distribution

The carbon footprint

For businesses, reducing greenhouse gas (GHG) emissions resulting from their activities is both a regulatory requirement and an economic necessity: the best way to limit the impact of rising energy costs on the company's results is to consume less. The Carbon Footprint is an effective tool to comply with regulations while achieving energy savings.

What is the Carbon Footprint?

A "carbon footprint" refers to an approach for quantifying all greenhouse gas (GHG) emissions associated with an organization. It aims to calculate direct emissions (for example, emissions from a car while it is running) as well as indirect emissions, also known as "hidden" emissions (for example, emissions related to the construction of various materials used in a car). This quantification is increasingly used in the context of combating climate change. The GHG footprint then becomes a kind of speedometer necessary for managing one's activity in a world constrained by energy and transitioning towards a "low-carbon" economy.

What are GHGs?

A "greenhouse gas" (GHG) is a gaseous component present in the Earth's atmosphere that absorbs infrared radiation emitted by the Earth's surface. This absorption of thermal radiation by GHGs contributes to warming the atmosphere, which in turn warms the Earth's surface, thus creating the greenhouse effect. There are many greenhouse gases, which can be classified into two categories:

- ✓ Greenhouse gases that exist naturally in the atmosphere and are also produced by human activity include water vapor (H2O), carbon dioxide (CO2), methane (CH4), natural gas, nitrous oxide (N2O), and ozone (O3).
- ✓ Greenhouse gases created exclusively by human activity, including the main fluorinated gases, namely chlorofluorocarbons (CFCs), tetrafluoromethane (CF4), and sulfur hexafluoride (SF6).

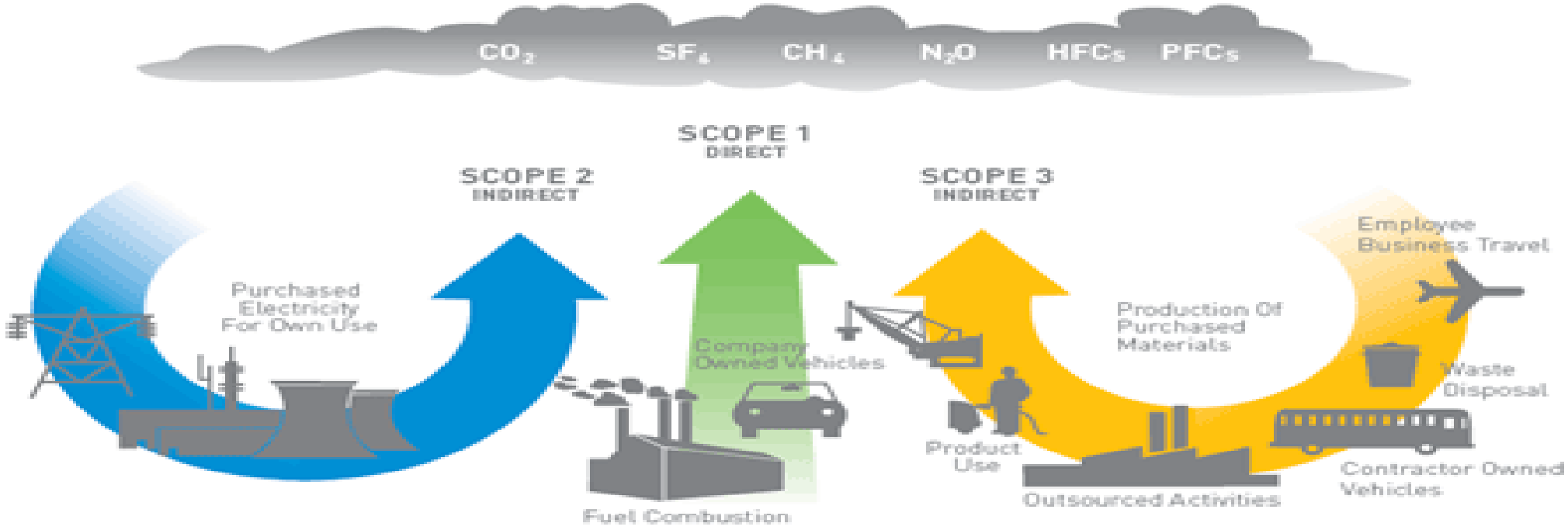
Principle of the Carbon Footprint:

"Emissions Accounting Boundary": Greenhouse gas emissions are most commonly distinguished into 3 categories or "scopes" in English, defined by the international standard ISO 14069:

✓ Direct emissions "Scope 1".

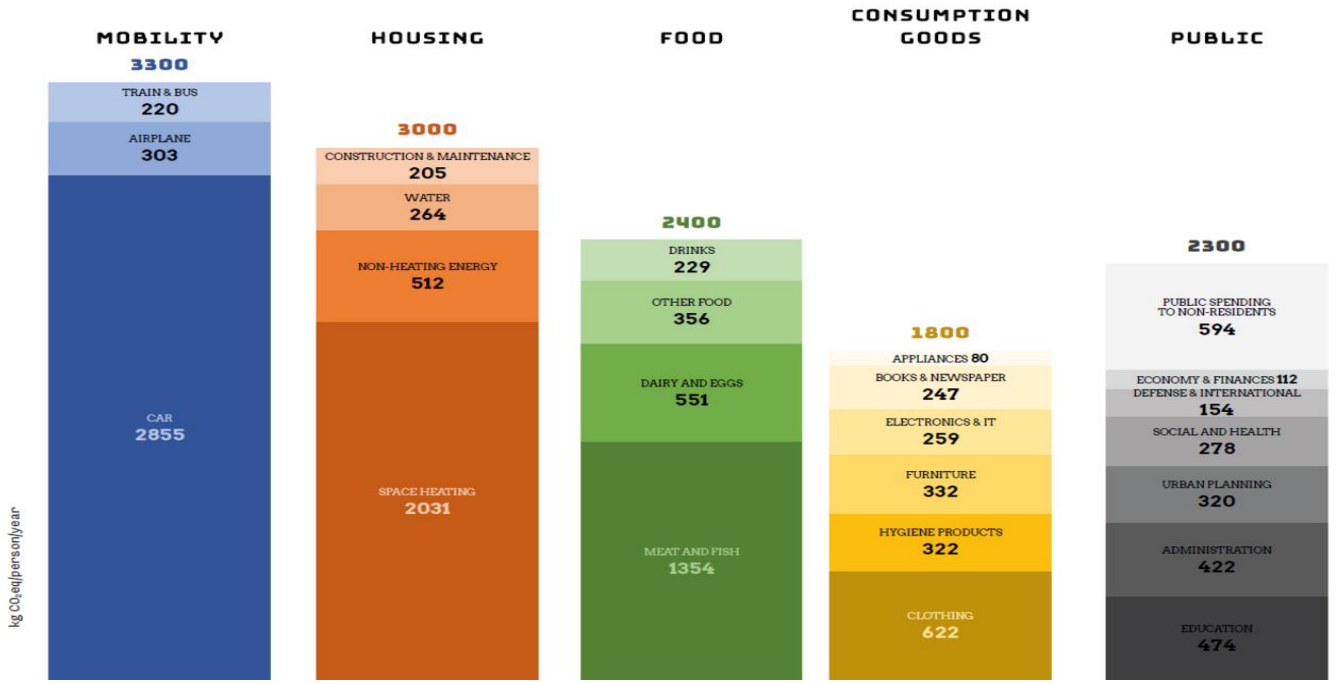
✓Indirect emissions related to energy, particularly related to the production of electricity and heat "Scope 2".

✓ Other indirect emissions "Scope 3".



Case Studies/Applications

Carbon footprint of a community of 170,000 inhabitants (source: Mosaic Environment Agency)



In this city of 170,000 inhabitants (with approximately 3,600 employees and over 1,200 buildings), nearly 42% of greenhouse gas emissions come from energy consumed in municipal buildings (the assessment only concerns emissions related to the services of the community and not those of its residents).

These emissions are mainly due to the use of natural gas in highly energy-consuming buildings (such as pools, gyms, technical buildings, etc.). The second largest emission source, referred to as "Purchases," refers to emissions related to "the manufacturing of all supplies purchased by the community as well as those generated by maintenance, services, etc.“

Following the identification of these emissions, this city has implemented an action plan to reduce fossil energy consumption in its buildings as well as technical improvement actions (utilizing Smart Grids), user awareness campaigns, and thermal performance enhancement works for buildings. Eco-responsibility in procurement is also a major component of the deployed action plan: promoting eco-materials, integrating environmental criteria into procurement contracts, reducing the use of chemicals and non-organic or out-of-season foods, etc. Additionally, the development of alternative mobility options to traditional fuels is prioritized.

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