



SCIENCE AND TECHNOLOGY CAREER PATHWAYS II

SEMESTER II

University May 8, 1945 Guelma

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Course Outline

Chapter 6

Measuring the sustainability of a process/product/service

Environmental Analysis

Life Cycle Assessment (LCA)

The Carbon Footprint

Principle of the Carbon Footprint

Case Studies/Applications

Environmental Analysis (EA)

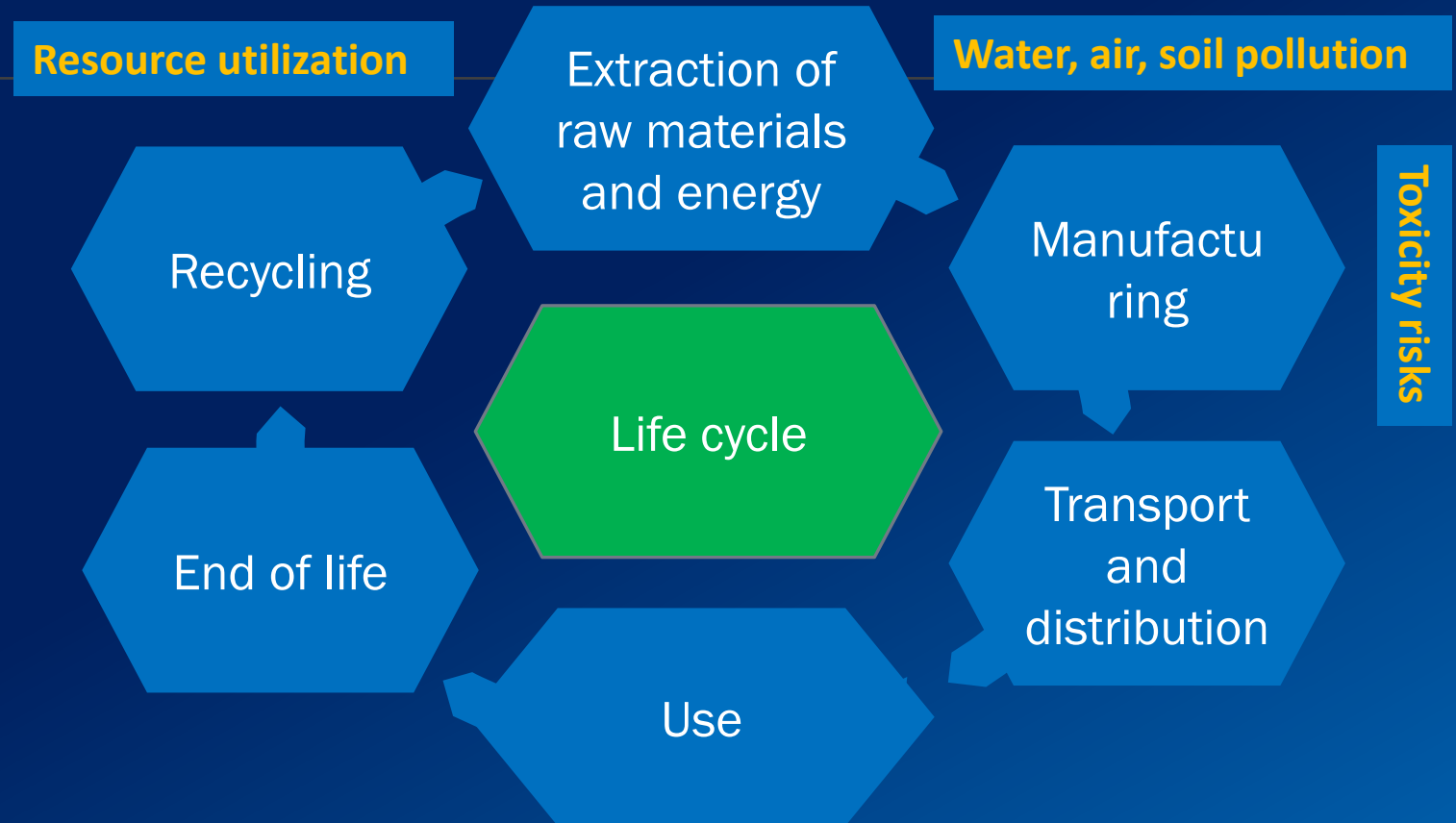
- In an environmental management system, it is essential to identify the environmental aspects associated with an activity. The aim is to prioritize corrective and preventive actions to be implemented.
- According to ISO 14001, the chosen approach should be developed within a procedure, and the results documented. This is known as environmental analysis, guiding policy and setting environmental objectives.
- Mandatory for companies wishing to be certified according to the international standard related to environmental management systems, ISO 14001.
- ISO 14001 offers a framework for organizations to manage environmental responsibilities and enhance performance

How to Conduct an Environmental Analysis

- Environmental analysis considers various parameters such as air, noise, waste, water, energy, landscape, soil and subsoil, as well as natural and technological risks.
- *Here's how to conduct an environmental analysis:*
 - Identify environmental aspects: list the activities, products, and services (both inside and outside the company).
 - Choose relevant environmental factors.
 - Define the weighting scale for environmental impacts.
 - Establish weighting criteria for each environmental factor.
 - Assess the impacts associated with each aspect and the risks.
 - Determine the significance criteria for the different aspects

Life Cycle Assessment (LCA)

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



- ISO 14040 and 14044 are international standards that provide guidelines for conducting (LCA) to evaluate the environmental impacts of products and services across their entire life cycle.

Life Cycle Assessment (LCA)

- The purpose of LCA is to understand and compare the environmental impacts of a system throughout its life cycle, from the extraction of necessary raw materials for its manufacturing to its end-of-life treatment (landfill, recycling, etc.), including its stages of use, maintenance, and transportation.
- Life Cycle Assessment identifies and quantifies, throughout the product's life, the physical flows of materials and energy associated with human activities. It assesses their potential impacts and interprets the results obtained based on its initial objectives.
- Collecting information on these flows is an important step in LCA. They are quantified at each stage of the cycle and correspond to indicators of potential environmental impacts.

The Carbon Footprint

- For businesses, reducing greenhouse gas (GHG) emissions resulting from their operations is both a regulatory requirement and an economic imperative
- The most effective way to mitigate the impact of rising energy costs on company performance is by reducing consumption.
- The Carbon Footprint is an effective tool for compliance with regulations while also achieving energy savings.

What is a Carbon Footprint?

- A "carbon footprint" refers to a process of quantifying all greenhouse gas emissions associated with an organization.
- It aims to calculate direct emissions (for example, emissions from a car while driving) 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 fight against climate change.
- The GHG footprint acts as a crucial metric required for steering activities in an energy-restricted environment and transitioning towards a "low-carbon" economy.

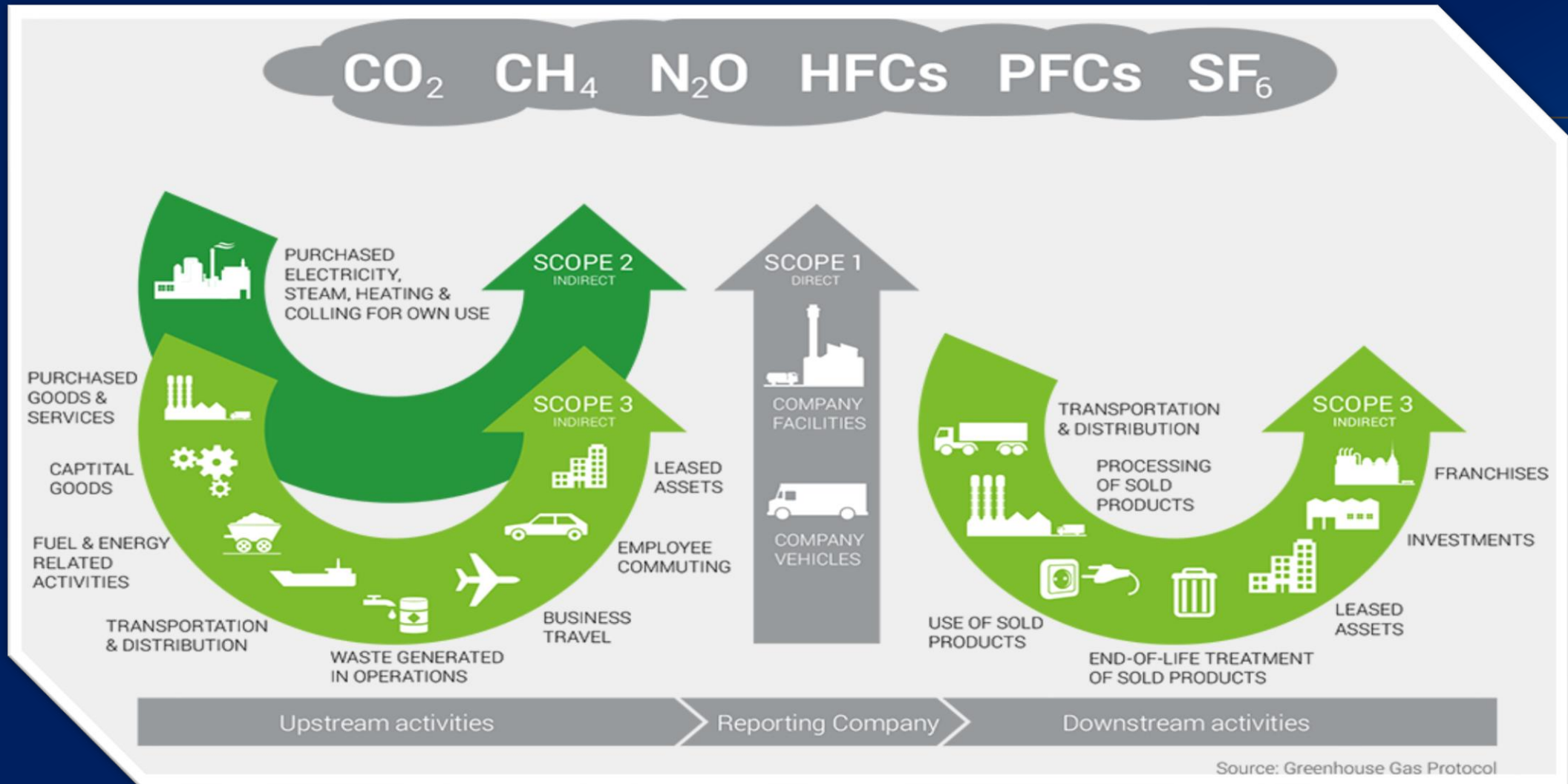
What are greenhouse gases (GHGs)?

- A "greenhouse gas" 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, creating the greenhouse effect.
- *There are numerous greenhouse gases, which can be classified into two categories:*
 - Greenhouse gases that naturally exist 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 exclusively created by human activity, including the main fluorinated gases, such as chlorofluorocarbons (CFCs), tetrafluoromethane (CF₄), and sulfur hexafluoride (SF₆).

Principle of the Carbon Footprint

- The principle of the Carbon Footprint typically categorizes greenhouse gas emissions into three scopes, defined by the international standard ISO 14069.
 - Scope 1: Total direct emissions generated by the resources of the entity using fossil fuels (gas, oil, coal...)
 - Scope 2: Total indirect emissions related to the purchase or production of electricity.
 - Scope 3: extends the assessment to include all other indirect emissions, encompassing activities upstream and downstream of the core operation, such as logistics and transportation of goods and people.

Principle of the Carbon Footprint



Case Studies/Applications

- 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 concerns only emissions related to the services of the municipality and not those of its residents). These emissions are mainly due to the use of natural gas in highly energy-consuming buildings (pools, gyms, technical buildings, etc.). The second emission category, referred to as "Purchases," refers to emissions related to "the manufacturing of all supplies purchased by the municipality as well as those generated by maintenance, services, etc."
- Following the identification of these emissions, this city has implemented a plan of action to reduce fossil energy consumption in its buildings as well as actions for technical improvement (using Smart Grids), user awareness, and thermal performance improvements in buildings. Eco-responsible purchasing is also a major component of the deployed action plan: promotion of eco-materials, integration of environmental criteria into contracts, reduction of chemicals and non-organic or out-of-season foods, etc. Additionally, the development of alternative mobility to traditional fuels is also favored.

