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Promoting ESG Awareness
+ Risk Literacy in SMEs

PEARL Case Study Template

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Case Study Identification

Case Study Title:

Partner Institution: Steinbeis Augsburg Business School

Country: Germany

Sector /Industry: Manufacturing

SME Profile:

Company size (micro / small / medium): medium, 200 employies

Ownership structure (family-owned, partnership, etc.): family-owned

Market scope (local / regional / international): regional and international

2. Relevant PEARL Curriculum Module(s)

*(**Select one primary module and, if relevant, secondary modules:** Module 1 – Introduction to ESG, Module 2 – ESG Onboarding, Vision and Responsibility, Module 3 – ESG Risk Analysis and Materiality Assessment, Module 4 – ESG Strategy and Implementation, Module 5 – Reporting, Communication and Branding, Module 6 – Sustainable Financing and Funding Options for SMEs)*

Primary Module: 4

Secondary / Supporting Modules (if any):

3. Learning Purpose of the Case

This case illustrates the challenge of establishing a structured overview of a company's greenhouse gas emissions. Increasingly, customers and procurement platforms require companies to provide transparent information on their carbon footprint, including emissions from operations as well as emissions embedded in purchased materials and supply chains.

The company must therefore identify and quantify its main emission sources. This includes direct emissions from company operations, indirect emissions from purchased electricity, and emissions embedded in purchased materials such as cement and steel. In addition, logistics activities and other upstream activities may contribute to the overall carbon footprint.

Participants are asked to analyse the operational data provided in the case and estimate the company's greenhouse gas emissions according to the categories **Scope 1, Scope 2 and Scope 3**. The exercise demonstrates how companies can build an initial emissions overview using simplified data and standard emission factors.

The case therefore focuses on the practical steps required to calculate and structure a company's carbon footprint as a basis for ESG reporting and climate management.

Why is this case relevant for SMEs?

Many small and medium-sized enterprises are increasingly asked by customers, financial institutions, or procurement platforms to provide CO_2 footprint information. However, most SMEs do not yet have structured systems for calculating or monitoring greenhouse gas emissions.
At the same time, emissions often originate from several different sources, including energy use, purchased materials, and logistics activities. For companies without dedicated sustainability departments, this makes it difficult to determine where emissions occur and which sources are most significant.
This case reflects a typical situation in which an SME begins to analyse its carbon footprint using available operational data. It demonstrates that even simplified calculations can provide valuable insights into the company's most relevant emission sources and help prioritise climate-related actions.

Which competence gaps (knowledge, skills, attitudes) does it address?

This case addresses several common competence gaps related to climate management in SMEs.
First, participants develop a basic understanding of the structure of greenhouse gas accounting and the distinction between **Scope 1, Scope 2, and Scope 3 emissions**.
Second, the exercise strengthens analytical skills by requiring participants to translate operational data, such as energy consumption or material inputs, into estimated emission values using emission factors.
Third, the case supports the development of a strategic perspective on climate management. By identifying the largest emission sources, participants learn how carbon footprint calculations can inform decision-making on energy efficiency, material choices, and supply chain management.
Overall, the case builds the foundational skills required for companies to begin managing and reducing their greenhouse gas emissions.

4. Case Context and Background

Provide a concise but concrete description of the SME's situation:

The company operates a medium-sized concrete plant specializing in the production of precast concrete components for large-scale construction projects such as infrastructure, commercial buildings, and industrial facilities. Its products are mainly delivered to major international construction companies that increasingly integrate ESG criteria into procurement and supplier evaluation processes. As a result, expectations regarding environmental transparency, particularly related to CO_2 emissions at product level, have risen significantly in recent years.

Concrete production is energy-intensive, and energy costs represent a strategically relevant cost factor for the company. In response, the company has initiated investments in photovoltaic systems and implemented energy-efficiency measures across production processes. These measures are intended to reduce long-term operating costs while contributing to a lower carbon footprint, although full CO_2 transparency at product level remains challenging.

Water consumption plays an important role in the production process, especially for mixing, cooling, and cleaning activities. To address this, the company has introduced a closed-loop water system that allows for the reuse of process water, reducing freshwater withdrawal. While this system improves resource efficiency, it requires ongoing monitoring and maintenance.

The company has also invested in processing concrete waste generated during production and demolition returns. By increasing the share of recycled concrete in selected product lines, it aims to support circularity and reduce material-related emissions. However, recycled content levels vary depending on technical requirements and customer specifications.

Workplace safety is a critical operational issue, particularly in production, storage, and transport activities involving heavy machinery and materials. The workforce includes a notable share of temporary and agency workers, reflecting cyclical demand in the construction sector. These workers often remain with the company for limited periods, which increases the importance of effective onboarding, training, and safety communication.

To date, the company has not implemented a comprehensive or overarching ESG reporting system. However, many relevant operational data points are already collected across departments, including energy use, water consumption, waste volumes, and safety-related indicators. These data are primarily used for internal management purposes and compliance, rather than being integrated into a structured ESG framework or external reporting.

Overall, the company finds itself in a situation where operational efficiency, cost pressure, and rising ESG expectations increasingly intersect, creating the need for a structured and prioritized approach to sustainability-related decision-making.

5. ESG Challenge / Problem Statement

Clearly describe the central ESG-related issue, for example:

*(*The company faces increasing pressure from customers and procurement platforms to provide transparent and reliable information on its carbon footprint. In particular, several key customers in the construction sector have started to request product-level CO_2 data and emissions information as part of procurement processes.

At present, the company has operational data available on energy consumption, materials, logistics activities, and other operational processes. However, these data have not yet been structured into a comprehensive greenhouse gas inventory. As a result, the company currently lacks a clear overview of where its emissions occur and which emission sources are most significant.

The management therefore intends to build a first structured overview of the company's greenhouse gas emissions. This includes identifying direct emissions from company operations, emissions related to purchased electricity, and emissions embedded in purchased materials and upstream activities.

Participants are asked to analyse the operational data provided in the case and estimate the company's emissions according to the **Scope 1, Scope 2, and Scope 3 categories of the Greenhouse Gas Protocol**. Using the provided calculation templates, participants should estimate emissions based on activity data and emission factors.

The objective of the exercise is to create a first simplified carbon footprint overview and to identify the emission sources that contribute most significantly to the company's overall greenhouse gas emissions.

6. Data, Evidence, and Inputs

Energy and Fuel Consumption
Annual electricity consumption of the production site: **4,200,000 kWh**
Photovoltaic system installed on production halls covers approximately **40 percent of annual electricity demand**
Remaining electricity is purchased from the public grid
Total annual diesel consumption of company-owned trucks: **240,000 liters**
Natural gas consumption for concrete curing processes and heating: **1,200,000 kWh**

Workforce and Mobility
Total number of employees: **140**
Average commuting distance between home and workplace (one way): **18 km**
Average number of working days per year: **220**

Purchased Materials for Concrete Production
Annual cement consumption: **10,000 tonnes**
Emission factor for cement production: **0.6 t CO_2e per tonne**
Annual reinforcing steel consumption: **2,000 tonnes**
Emission factor for reinforcing steel: **1.9 t CO_2e per tonne**
Annual sand and aggregates consumption: **25,000 tonnes**
Emission factor for sand and aggregates extraction and processing: **0.005 t CO_2e per tonne**

Waste and Circularity
Annual production waste from concrete residues and material losses: **1,500 tonnes**

Purchased Goods and Services (Spend-Based Estimation)
Annual expenditure for office supplies (paper, small office materials): **25,000 €**
Annual expenditure for IT equipment (computers, servers, printers): **60,000 €**
Annual expenditure for packaging materials used in logistics: **120,000 €**

7. Suggested Tools from the PEARL Toolbox

Indicate which PEARL tools can be applied in this case and how?

CO2 Footprint overview for SME(M4)

Using the provided activity data:
1.Identify which emission sources belong to

1. **Scope 1 (direct emissions)**
2. **Scope 2 (purchased energy)**
3. **Scope 3 (indirect upstream activities)**

2.Calculate the emissions for each relevant category using the formula:
Emission = Activity Data × Emission Factor
3.Estimate the **total emissions for each scope**.
4.Identify the **largest emission drivers** within the company's operations.

8. Suggested Solution

- Scope 1
- **Scope 1 Calculation**
- **1. Diesel consumption of company-owned trucks**
- Activity data:
- **240,000 liters**

Emission factor:
2.65 kg CO_2e per liter
Calculation:
240,000 × 2.65 = **636,000 kg CO_2e**
= **636 t CO_2e**

2. Natural gas consumption for concrete curing and heating
Activity data:
1,200,000 kWh
Emission factor:
0.202 kg CO_2e per kWh
Calculation:
1,200,000 × 0.202 = **242,400 kg CO_2e**
= **242.4 t CO_2e**

Scope 1 category	Activity data	Emission factor	Emissions
Company-owned trucks (diesel)	240,000 liters	2.65 kg CO_2e/l	636.0 t CO_2e
Natural gas for curing and heating	1,200,000 kWh	0.202 kg CO_2e/kWh	242.4 t CO_2e

Total Scope 1 = 878.4 t CO_2e

8. Suggested Solution

- Scope 2
- Annual electricity consumption
- = **4.2 GWh**
- 1 GWh = 1,000,000 kWh
- → 4.2 GWh = **4,200,000 kWh**

Emission factor (location based)
= **0.4 kg CO_2e/kWh**
Calculation
4,200,000 × 0.4 = **1,680,000 kg CO_2e**
= **1,680 t CO_2e**

Photovoltaic share
PV share
= **40 %**
PV electricity
4,200,000 × 0.4 = **1,680,000 kWh**
Remaining grid electricity
2,520,000 kWh
Grid emissions
2,520,000 × 0.4 = **1,008,000 kg CO_2e**
= **1,008 t CO_2e**

Category	Activity	Emission Factor	Emissions
Purchased electricity (grid)	2,520,000 kWh	0.4 kg/kWh	**1,008 t CO_2e**
PV electricity	1,680,000 kWh	~0	~0

8. Suggested Solution

- Scope 3
-
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Scope 3 category	Activity data	Emission factor	Emissions
Fuel- and energy-related activities (based on Scope 1)	878.4 t CO_2e	0.1	87.84 t CO_2e
Fuel- and energy-related activities (based on Scope 2)	1,008 t CO_2e	0.15	151.2 t CO_2e
Office supplies	25,000 €	0.0002 kg CO_2e/€	0.005 t CO_2e
IT equipment	60,000 €	0.001 kg CO_2e/€	0.06 t CO_2e
Packaging materials	120,000 €	0.0005 kg CO_2e/€	0.06 t CO_2e
Employee commuting	1,108,800 km	0.12 kg CO_2e/km	133.056 t CO_2e
Cement	10,000 t	0.6 t CO_2e/t	6,000 t CO_2e
Reinforcing steel	2,000 t	1.9 t CO_2e/t	3,800 t CO_2e
Sand and aggregates	25,000 t	0.005 t CO_2e/t	125 t CO_2e
Waste treatment	1,500 t	0.15 t CO_2e/t	225 t CO_2e

= **10,522.221 t CO_2e**

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9. Expected Learning Outcomes

After working on this case, which KSAs will learners be able to develop?

After working on this case, learners will be able to:

Identify key ESG impacts of a concrete manufacturing SME and structure them logically (inside-out).

Assess key ESG risks affecting business performance and customer access (outside-in).

Create a justified longlist and shortlist of ESG topics and explain exclusions based on case assumptions.

Draft a first materiality assessment output suitable for internal alignment and stakeholder communication.

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