Lesson 8.3 Exercises: Climate Finance and Sustainable Investing

Module 8: The Future Problem

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Digital Finance — BSc Course

Exercise 1: ESG Materiality Mapping

Scenario: You are an analyst at a Swiss asset manager. You need to identify the **most financially material** ESG issue for each of the following companies.

Company	Industry
A	Global oil & gas producer
B	Swiss private bank
C	Social media platform
D	Fast-fashion retailer
E	Lithium mining company

Tasks:

a. For each company, identify the single most material ESG issue and state whether it falls under E, S, or G.

b. For Company A (oil & gas), explain in 2–3 sentences how the identified ESG issue creates financial risk.

c. Company E (lithium mining) produces a material essential for electric vehicles. Does being part of the "green transition" make it immune to ESG risks? Explain.

Difficulty: Introductory — tests understanding of materiality and ESG categories.

Exercise 2: Classifying Climate Risks

Scenario: Classify each of the following events as **physical risk** (acute or chronic), **transition risk**, or **liability risk**.

1. The EU introduces a carbon border adjustment mechanism (CBAM) taxing imports from high-emission countries
2. A prolonged drought reduces hydroelectric power generation in Switzerland by 20%
3. A class-action lawsuit is filed against a major bank for financing deforestation in the Amazon
4. An insurance company raises coastal property premiums by 40% due to increasing hurricane frequency
5. A government announces a ban on sales of new internal combustion engine vehicles by 2035
6. An investment fund is fined by regulators for labeling a fossil-fuel-heavy portfolio as "sustainable"

Tasks:

a) Classify each event. For events 1–3, provide a one-sentence justification.

b) Event 4 could be interpreted as both physical and transition risk. Explain how.

c) Which of the three risk types do you think is hardest for financial models to quantify? Why?

Difficulty: Introductory–Intermediate — tests classification and reasoning.

Exercise 3: Carbon Market — Cap-and-Trade Calculation

Scenario: A European cement factory participates in the EU ETS. It has been allocated **50,000 free allowances** (1 allowance = 1 tonne CO_2). Its actual emissions this year are **72,000 tonnes**.
The current EU ETS price is **EUR 75 per tonne**.

Tasks:

a) How many additional allowances must the factory purchase?

b) What is the total cost of those additional allowances in EUR?

c) The factory can invest EUR 1.5 million in energy efficiency upgrades that would reduce annual emissions by 15,000 tonnes. Should it invest, or continue buying allowances? Show the break-even calculation.

d) If the carbon price rises to EUR 120 per tonne next year, how does the break-even calculation change?

e) In 2–3 sentences, explain why a rising carbon price creates an incentive for companies to decarbonize rather than simply buying allowances.

Difficulty: Intermediate — combines arithmetic with economic reasoning.

Exercise 4: Mapping a Company's Carbon Footprint

Scenario: SwissAuto AG manufactures electric vehicles. It reports the following emissions data:

Source	Tonnes CO_2	Category
Factory natural gas heating	5,000	?
Purchased electricity for factory	8,000	?
Steel purchased from suppliers	45,000	?
Employee commuting	2,000	?
Customer electricity use to charge EVs	120,000	?
Business air travel	1,500	?

Tasks:

a) Classify each source as Scope 1, 2, or 3.

b) Calculate total Scope 1, total Scope 2, and total Scope 3 emissions.

c) What percentage of total emissions is Scope 3?

d) A competitor reports only Scope 1 and 2. Why might this be misleading?

Difficulty: Intermediate — requires classification and basic arithmetic.

Exercise 5: Green Bond vs. Sustainability-Linked Bond

Scenario: You are evaluating two bonds from GreenEnergy Corp:

	Bond A: Green Bond	**Bond B: SLB**
Maturity	10 years	10 years
Coupon	3.20%	3.25% (base)
Use of proceeds	Solar farm construction	General corporate purposes
SPT	N/A	Reduce Scope 1 by 30% by 2030
Penalty for miss	N/A	Coupon +25 bps
External review	Climate Bonds certified	ISS ESG Second Party Opinion

Tasks:

a. Explain in 2–3 sentences why Bond A has a lower coupon than Bond B (the "greenium").

b. If GreenEnergy Corp misses the SPT in 2030, what is the new coupon on Bond B?

c. Which bond gives the investor more transparency about where the money goes? Why?

d. Which bond creates a stronger financial incentive for the company to decarbonize? Justify.

e. A critic says: "The 25 bps step-up is too small to matter for a large corporation." Do you agree? Discuss.

Difficulty: Intermediate — requires comparing two instruments and evaluating incentive structures.

Exercise 6: Bank Financed Emissions (PCAF Method)

Scenario: SwissBank AG has the following lending portfolio:

Borrower	Loan (CHF M)	Enterprise Value (CHF M)	Annual Emissions (t CO_2)
SteelCo	50	1,000	800,000
SolarTech	30	600	5,000
AirlinePlus	80	2,000	1,200,000
FoodRetail	40	800	60,000

Tasks:

a. For each borrower, calculate the financed emissions attributed to SwissBank using:
Attribution $= \frac{\text{Loan}}{\text{Enterprise Value}} \times \text{Emissions}$.

b. What is SwissBank's total financed emissions across the four borrowers?

c. Which single borrower contributes the most to SwissBank's financed emissions?

d. If SwissBank reduces its loan to AirlinePlus by 50%, by how many tonnes do its financed emissions decrease?

e. Is reducing loan exposure the only way for a bank to lower financed emissions? Name one alternative.

Difficulty: Intermediate — applies the PCAF attribution formula.

Exercise 7: Greenwashing — Spot the Red Flags

Scenario: "EcoInvest Global Fund" markets itself with the following claims:

1. "Our fund is 100% sustainable and planet-friendly"
2. The fund holds 8% in oil & gas companies (which the prospectus classifies as "transition companies")
3. The fund reports a MSCI ESG rating of AA but does not disclose Sustainalytics or S&P scores
4. Marketing materials prominently feature a wind turbine photo, but the fund's largest holding (15%) is a tech conglomerate
5. The fund claims "net-zero portfolio" based on purchased carbon offsets from a forestry project with no independent verification

Tasks:

a) For each claim (1–5), identify whether it is a greenwashing red flag and explain why or why not.

b) Under the EU SFDR classification, would this fund likely qualify as Article 8 or Article 9? Why?

c) Draft a 3-sentence investor warning about this fund, explaining the key risks.

Difficulty: Advanced — requires critical evaluation and regulatory knowledge.

Exercise 8: Climate Risk Stress Test for a Swiss Pension Fund

Scenario: You manage a CHF 5 billion Swiss pension fund with the following asset allocation:

Asset Class	Allocation	Climate Exposure
Swiss equities	25%	Moderate (pharma, industrials)
Global equities	30%	High (includes oil, mining)
Swiss real estate	20%	Physical risk (flooding, heat)
Green bonds	10%	Low
Government bonds	15%	Low

Tasks:

a. Under a "delayed transition" NGFS scenario (sharp policy action after 2030, carbon price spikes to USD 300/t by 2050), which asset classes face the greatest **transition risk**? Estimate rough percentage losses for each.

b. Under a "hot-house world" scenario (4°C warming, minimal policy), which asset classes face the greatest **physical risk**?

c. Propose three concrete portfolio adjustments to improve climate resilience.

d. Write a 5-sentence executive summary for the pension fund's board of trustees.

Difficulty: Advanced–Integrative — combines all lesson concepts into a realistic portfolio scenario.

Answer Key

Exercise 1:

(a) A: Carbon emissions (E); B: Governance/risk oversight (G); C: Data privacy (S); D: Supply chain labor (S); E: Water use/biodiversity (E).

(b) The oil & gas producer faces transition risk: carbon taxes increase costs, stranded asset risk devalues reserves, and divestment campaigns reduce access to capital.

(c) No. Lithium mining has significant E risks (water depletion, toxic tailings, biodiversity loss). Being "green" in product does not mean green in process.

Exercise 2:

(a) 1: Transition (policy). 2: Physical (chronic). 3: Liability. 4: Physical (acute) driving premium increases. 5: Transition (policy/technology). 6: Liability (regulatory enforcement).

(b) The premium increase is triggered by physical risk (more hurricanes) but also represents a transition: insurance markets repricing climate exposure, changing the economics of coastal development.

(c) Liability risk is hardest because lawsuits are binary, precedent-dependent, and jurisdiction-specific — no historical distribution to model.

Exercise 3:

(a) $72{,}000 - 50{,}000 =$ **22,000 additional allowances**.

(b) $22{,}000 \times 75 =$ **EUR 1,650,000**.

(c) Investment saves $15{,}000 \times 75 =$ EUR 1,125,000/year. Payback $= 1{,}500{,}000/1{,}125{,}000 =$ **1.33 years**. Investment is clearly worthwhile.

(d) At EUR 120: savings $= 15{,}000 \times 120 =$ EUR 1,800,000/year. Payback drops to 0.83 years — even more attractive.

(e) A rising carbon price increases the ongoing cost of emissions, making decarbonization investments pay back faster. Companies that delay investment face accelerating costs.

Answer Key (continued)

Exercise 4:

(a) Factory gas: Scope 1. Purchased electricity: Scope 2. Steel suppliers: Scope 3 (upstream). Commuting: Scope 3. Customer charging: Scope 3 (downstream). Air travel: Scope 3.

(b) Scope 1: 5,000t. Scope 2: 8,000t. Scope 3: $45{,}000 + 2{,}000 + 120{,}000 + 1{,}500 = 168{,}500$t. Total: 181,500t.

(c) Scope 3 $= 168{,}500/181{,}500 =$ **92.8%**.

(d) Reporting only Scope 1+2 (13,000t) misses 93% of the company's actual footprint, grossly understating environmental impact.

Exercise 5:

(a) The greenium reflects investor demand for certified green bonds. Investors accept a slightly lower yield in exchange for verified environmental impact and portfolio ESG credentials.

(b) $3.25\% + 0.25\% =$ **3.50%**.

(c) Bond A (green bond) — proceeds are tracked and reported to specific projects. Bond B's money goes to general purposes.

(d) Bond B (SLB) — it creates a direct financial penalty for missing targets. Bond A has no financial consequence if the solar farm underperforms.

(e) Partially agree: 25 bps on a large issuance may be immaterial. However, the reputational cost of publicly missing an SPT can be significant. The penalty should be calibrated to be meaningful.

Answer Key (continued)

Exercise 6:

(a) SteelCo: $(50/1{,}000) \times 800{,}000 = 40{,}000$t. SolarTech: $(30/600) \times 5{,}000 = 250$t. AirlinePlus: $(80/2{,}000) \times 1{,}200{,}000 = 48{,}000$t. FoodRetail: $(40/800) \times 60{,}000 = 3{,}000$t.

(b) Total: $40{,}000 + 250 + 48{,}000 + 3{,}000 =$ **91,250 tonnes**.

(c) **AirlinePlus** at 48,000t (52.6% of total financed emissions).

(d) Halving the loan to CHF 40M: $(40/2{,}000) \times 1{,}200{,}000 = 24{,}000$t. Reduction $= 48{,}000 - 24{,}000 =$ **24,000 tonnes**.

(e) Yes — the bank can **engage** with borrowers to reduce their actual emissions (e.g., require decarbonization plans as loan conditions). This reduces financed emissions without reducing lending.

Exercise 7:

(a) 1: Red flag (vague, unsubstantiated). 2: Ambiguous ("transition" may be legitimate if justified). 3: Red flag (cherry-picking the best rating). 4: Red flag (misleading imagery). 5: Red flag (unverified offsets for net-zero claim).

(b) Article 8 at best (promotes ESG characteristics but does not have sustainable investment as its objective). Unlikely Article 9 given oil & gas holdings and offset reliance.

(c) "This fund uses vague sustainability language without clear, measurable criteria. Its largest holding is unrelated to the environmental imagery in marketing materials, and its net-zero claim relies on unverified carbon offsets. Investors should request the full SFDR disclosure before investing."

Exercise 8: See next page for detailed scenario analysis.

Answer Key (continued)

Exercise 8 (continued):

(a) Delayed transition scenario: Global equities face highest transition risk (-15% to -25% for fossil fuel / mining holdings within that allocation). Swiss equities face moderate risk (-5% to -10% for industrials). Bonds and real estate face lower direct transition risk.

(b) Hot-house world: Swiss real estate faces highest physical risk (flood zones, urban heat islands — potential -10% to -20% impairment). Global equities in agriculture and coastal infrastructure also exposed.

(c) Three adjustments: (1) Increase green bond allocation from 10% to 20% (reduce transition exposure). (2) Screen global equities for high-carbon companies and tilt toward low-carbon alternatives. (3) Conduct physical risk assessment of real estate portfolio and divest from flood-exposed properties.

(d) "Our pension fund faces material climate risk under both delayed-transition and hot-house scenarios. Global equities (30% of assets) are most exposed to transition risk from carbon pricing, while Swiss real estate (20%) faces physical risk from flooding and heat stress. We recommend increasing green bond allocation, screening equities for carbon intensity, and stress-testing real estate for physical hazards. These adjustments would reduce our estimated climate-related loss exposure by approximately 30–40% while maintaining target returns. We recommend the board review climate risk quarterly alongside financial risk reporting."