

EN



MAELICE

IN WONDERLAND

SUSTAINABILITY 

« A greener world, but still upside down. »



WELCOME TO THE RABBIT HOLE

CONTENTS

Session 1: Sustainability, planetary boundaries, doughnut, circular economy	3
Sessions 2 to 4: Climate, disinformation and the IPCC	11
Session 5: The 2 Tonnes workshop	17
Session 6: Green growth, degrowth, post-growth	18
Mock MCQ: 12 midterm-style questions	22
The rabbit hole on 1 page: authors, figures, traps	23

HOW TO USE THE RABBIT HOLE



THE CATERPILLAR

Key definitions



DRINK ME

The concept or diagram to know by heart



EAT ME

A concrete case to understand



THE WHITE RABBIT'S TIPS

Method and time management in the exam



THE CHESHIRE GRIN

A memory trick that stays when everything else has vanished



OFF WITH THEIR HEADS!

The classic trap, the mistake that costs points



THE GOLDEN KEY

The 5 things to remember from the part



TEA TIME

Test yourself! Answers upside down at the bottom



THE WHITE RABBIT'S TIPS

Midterm on 30 October: 20-question MCQ in 35 min, about 1 min 45 per question. Read a session, do **Tea time** without peeking, then the **mock MCQ**. The night before, keep only **the rabbit hole on 1 page**.



SESSION 1 · CONCEPT 1

WHAT IS SUSTAINABILITY?



SESSION 1

INTRODUCTION TO SUSTAINABILITY, PLANETARY BOUNDARIES, DOUGHNUT ECONOMICS AND THE CIRCULAR ECONOMY

By the end of this session, you can:

- ✓ define sustainability and its 3 dimensions
- ✓ list the 9 planetary boundaries and their status
- ✓ explain the sustainability paradox
- ✓ explain the doughnut and the circular economy

"Curiouser and curiouser!" (Alice)

THE CATERPILLAR *"Who are you?"*

Sustainable development (Brundtland Commission, **1987**): "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

ENVIRONMENT

Protect ecosystems, stay within planetary boundaries.

SOCIAL

Ensure human well-being, equity and justice.

ECONOMY

Create value without depleting natural or social capital.

 *the real challenge: these 3 dimensions often conflict*



EAT ME: ALICE IN THE RABBIT'S HOUSE

Alice drinks from the little bottle in the Rabbit's house and grows, and grows... until her arm sticks out of the window. The house does not grow.

That is the question guiding the whole course: **can a company grow forever on a finite planet?**



THE WHITE RABBIT'S TIPS

The course is a **flipped classroom**: prepare before (videos, readings, e-learning), debate in class. E-learning modules are worth **20%**, don't miss them.



SESSION 1 · THE BIG PARADOX

THE PARADOX AND THE ECOLOGICAL FALLACY



THE SUSTAINABILITY PARADOX *Drink me*

CORPORATE EFFORTS: RISING

- ESG reports, eco-efficiency, net-zero pledges, green budgets
- growing for 30 years



STATE OF THE PLANET: DECLINING

- most planetary boundaries crossed
- wild animal populations: about **-70%** (1970-2018)

Whiteman, Walker & Perego (2012), *Journal of Management Studies*. Their diagnosis: corporate sustainability measures **internal eco-efficiency**, not the impact on the Earth system. Their remedy: **re-anchor sustainability in natural science** and planetary boundaries.



THE CHESHIRE GRIN

Like the **Red Queen's race**: companies run faster and faster... and the planet stays in the same place, or goes backwards.



OFF WITH THEIR HEADS!

The paradox is not “a company depends on the nature it degrades”. It is: **more effort, yet a planet doing worse.**

WHY DOES STRATEGY IGNORE THE PLANET?

BEFORE · BUSINESS POLICY (1950S-60S)

- the firm is one instrument among others for social welfare
- rooted in society, history and nature



THEN · STRATEGY PARADIGM (1970S-80S →)

- the firm becomes the central unit: profit and competitive advantage
- the environment is just an **externality** to avoid or exploit



THE CATERPILLAR “Who are you?”

Ecological fallacy, Bansal et al. (2024), *JMS*: a **level-of-analysis error**. Strategy borrowed **macro** assumptions (markets clear, growth = welfare, governments fix externalities) and applied them to the **firm**, assuming the sum of profits produces social and ecological well-being. **It does not.**

1 · MACRO CONSTRAINTS

Set firm targets within planetary and biophysical limits.

2 · INTERACTIONS

Map links between firm, industry, supply chain, ecosystem.

3 · TEMPORAL DYNAMICS

Respect regeneration rates, tipping points, non-linear time.



Bansal et al.'s 3 imperatives for a renewed strategy



SESSION 1 • CONCEPT 2

THE 9 PLANETARY BOUNDARIES

THE CATERPILLAR “Who are you?”

Planetary boundaries (Rockström et al., 2009, *Nature*): **9 Earth-system processes** defining humanity's **safe operating space**. Crossing them risks **irreversible** change.

1 **CROSSED** ★
Climate change
CO₂ ≈ 425 ppm vs a 350 ppm limit

2 **CROSSED** ★
Biosphere integrity
extinctions 10 to 100× above the safe rate

3 **CROSSED**
Novel entities
synthetic chemicals, plastics;
crossed in 2023

4 **CROSSED**
Land-system change
deforestation, cropland expansion

5 **CROSSED**
Freshwater change
blue and green water beyond the limit

6 **CROSSED**
Biogeochemical flows
nitrogen and phosphorus cycles overloaded

7 **CROSSED**
Ocean acidification
pH down about 0.1; crossed in 2025 (the 7th)

8 **SAFE**
Stratospheric ozone
recovering thanks to the Montreal Protocol

9 **SAFE**
Atmospheric aerosols
within the safe zone, pollution falling

★ = the 2 core boundaries (Steffen et al., 2015)

OFF WITH THEIR HEADS!

6 or 7 out of 9? The course says both. **6** crossed in **2023** (Richardson et al.), **7** in **2025** (Planetary Health Check) with ocean acidification. Answer **7** if the question is about 2025.

THE CHESHIRE GRIN

Only **O**zone and **A**erosols are still safe: “Oh! Ah!”, the two sighs of relief.

NOT 9 SILOS: ONE SYSTEM



A COUPLED SYSTEM *Drink me*

The 9 boundaries are not 9 silos: the real danger is their interactions.

- **Coupled** (Lade et al., 2020): cascades and feedbacks. Climate speeds up biodiversity loss; land use disrupts water, carbon and nutrient cycles.
- **Non-linear**: crossing a threshold can trigger abrupt, self-sustaining, irreversible change (**tipping points**).
- **Two core boundaries**: climate change and biosphere integrity (Steffen et al., 2015).

OFF WITH THEIR HEADS!

Managing **one** boundary while ignoring the others can just **shift the problem**. Yet management research is almost always **single-boundary, climate-focused** (Williams, Perego & Whiteman, 2024, *JMS*).

WHAT DOES IT MEAN FOR BUSINESS?

THEY DEPEND ON THEM

Resources, supply chains, markets: everything relies on stable ecosystems.

THEY MEASURE POORLY

Most measure internal eco-efficiency, not planetary impact. Boundaries finally provide a **scientific benchmark**.

2012

Whiteman, Walker & Perego

bring boundaries into management, reveal the paradox

2024

Bansal et al.

the cause: strategy's ecological fallacy

2024

Williams, Perego & Whiteman

boundaries are the framing conditions of all management

THE LINE TO USE IN THE EXAM *The golden key*

The manager's question changes. Before: **"Is it profitable?"** Now: **"Is it profitable while staying within the safe space?"**



SESSION 1 · CONCEPT 3

DOUGHNUT ECONOMICS (RAWORTH, 2017)



THE DOUGHNUT *Drink me*

A thriving society lives **between two limits**:

- **Ecological ceiling**: the 9 planetary boundaries, not to be overshoot.
- **Social foundation**: **12 basic needs** drawn from the UN SDGs, not to fall short of.

In between: the **safe AND just space**. Goal: an economy that is “**regenerative and distributive by design**”.

food

water

health

education

income and work

energy

networks

housing

gender equality

social equity

political voice

peace and justice

the 12 dimensions of the social foundation



EAT ME: ALICE'S RIGHT SIZE

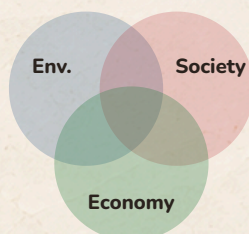
Too **small**, Alice can't reach the key on the table: that's the **shortfall**. Too **big**, she can't get through the door and floods the hall with tears: that's the **overshoot**. The right size is the doughnut.



OFF WITH THEIR HEADS!

Social foundation = **12** needs, ceiling = **9** boundaries. Don't swap them.

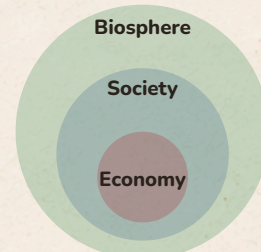
TRADE-OFF MODEL



3 “equal” pillars: the biosphere could be traded for growth

≠

EMBEDDED MODEL (RAWORTH)



the economy sits inside society, itself inside the biosphere



SESSION 1 · CONCEPT 4

THE CIRCULAR ECONOMY

LINEAR ECONOMY

- **Extract** → **Make** → **Use** → **Dispose** (take, make, waste)
- resources used once then thrown away
- **60%** of ecosystems already degraded

VS

CIRCULAR ECONOMY

- **Reduce**: use fewer resources
- **Reuse**: extend product life
- **Repair** instead of replacing
- **Recycle**: turn into new material



EAT ME: THE HATTER'S CUPS

At the Hatter's tea party, nobody ever washes the cups: they just **move round** to a clean one. It works... as long as clean cups remain. That's the **linear economy**: at the end of the table, there's nothing left.



THE VALUE-RETENTION LADDER *Drink me*

SHORTEST LOOPS

Refuse Rethink Reduce

most value kept

INTERMEDIATE LOOPS

Reuse Repair Refurbish
Remanufacture Repurpose

extend the life of products and parts

OUTER LOOPS

Recycle Recover

least value kept

↑ short loop = more value

last resort ↓

👑 OFF WITH THEIR HEADS!

*Recycling is the last resort, not the goal. It destroys most of the value and uses a lot of energy: often **downcycling** (recycling with loss of value).*



THE WHITE RABBIT'S TIPS

The French slide writes "Reuse · Rethink · Reduce" at the top of the ladder: the 1st word is the **Refuse** of the 10R model.

the circular economy is a design strategy, not a waste-management programme



CIRCULARITY: BARRIERS AND JUSTICE



THE 4 BARRIERS (GRAFSTRÖM & AASMA, 2021) *Drink me*

TECHNOLOGICAL

MARKET

INSTITUTIONAL

CULTURAL

A circular economy is still subject to **market rules**: prices, property rights, the rule of law. It **won't happen by itself**, and even small obstacles can slow it down.



THE CHESHIRE GRIN

Technological, Institutional, Market, Cultural: *"Tea Is My Cure"*, says the Duchess.



THE CATERPILLAR *"Who are you?"*

Environmental justice (Park, Härrä & Levänen, 2025): "slow fashion" and "zero-buy" strategies promoted in rich countries can **destroy livelihoods** in producing countries. A review of **167 studies** shows that communities, especially in **low-income** regions, are **excluded from decisions** about the transition.

Circularity is **not automatically** green or fair: it creates winners and losers. Back to the doughnut's **social foundation**.

HOW THE 3 FRAMEWORKS FIT TOGETHER

PLANETARY BOUNDARIES

What the planet can **absorb**: the hard limits.

DOUGHNUT

How society can thrive: adds social equity.

CIRCULAR ECONOMY

How businesses can operate while respecting both.

"The question is no longer: can we grow? but: how can we grow while respecting certain limits?"

• Session 1 conclusion •



SESSION 1 • RECAP

END OF SESSION 1

THE GOLDEN KEY *key takeaways*

- 1 **Brundtland 1987**: present needs without compromising future generations. 3 dimensions **often in conflict**.
- 2 **Paradox** (Whiteman et al., 2012): more corporate effort, planet in decline. **Ecological fallacy** (Bansal et al., 2024): level-of-analysis error.
- 3 **9 boundaries** (Rockström 2009): **7 crossed in 2025**, only ozone and aerosols are safe. They **interact**.
- 4 **Doughnut** (Raworth 2017): between **social foundation (12)** and **ecological ceiling (9)**. Economy **embedded** in society and the biosphere.
- 5 **Circularity**: short loops first, recycling last; **4 barriers** (TIMC) and a question of justice.

TEA TIME *mini quiz*

- 1 Who proposed the planetary boundaries framework, and when?
- 2 Which 2 boundaries are still safe in 2025?
- 3 What does “shortfall” mean in the doughnut?
- 4 Which keeps the most value: recycle, repair or reduce?
- 5 Name 2 of the 4 barriers to circularity per Grafström & Aasma.

Answers : 1. Rockström et al., 2009 (Nature) · 2. Stratospheric ozone and atmospheric aerosols · 3. Falling below the social foundation: basic needs not met · 4. Reduce (shortest loop) · 5. Technological, institutional, market, cultural

“Then it doesn’t matter which way you go.”

· the Cat, to Alice who doesn’t know where to go ·



SESSION 2 · CLIMATE MODULE

THE CLIMATE SYSTEM



SESSIONS 2 · 3 · 4

THE CLIMATE SYSTEM, DISINFORMATION, SCIENTIFIC CONSENSUS AND THE IPCC

By the end of this session, you can:

- ✓ tell weather from climate, describe the climate system
- ✓ tell misinformation, disinformation and uncertainty apart
- ✓ explain the greenhouse effect, Keeling curve, albedo and tipping points
- ✓ explain the IPCC and how consensus is built

"When I use a word, it means just what I choose it to mean." (Humpty Dumpty, master of disinformation)

WEATHER

- short term, changes fast
- e.g. rain, wind, heat, hail today

≠

CLIMATE

- long term (usually **30 years**), changes slowly
- e.g. rising average temperatures



THE CHESHIRE GRIN

*Weather is the Hatter's mood today. **Climate** is his personality.*

THE CATERPILLAR "Who are you?"

Climate system: a large, dynamic, complex system whose "parts" are all connected. **Powered by the Sun**, which heats the Earth unevenly → temperature and pressure differences → air and water movements. **Oceans** redistribute heat.

ATMOSPHERE

air and gases

HYDROSPHERE

oceans, seas, rivers, lakes

CRYOSPHERE

glaciers, sea ice, snow

BIOSPHERE

living things, vegetation

LITHOSPHERE

soils and rocks

HUMAN SOCIETIES

activities influencing the system



EAT ME: ICE CORES

An **ice core** is a long cylinder of ice drilled from a glacier, full of **ancient air bubbles**. Cores rebuild the climate over **800,000 years**: alternating **glacial** and **interglacial** periods, about **5 °C** apart in average temperature, over cycles of roughly 100,000 years.

Did you know? During glacial periods, the Channel didn't exist: you could walk to England. In warm periods, hippos lived in Europe.

WRITTEN BY A PGE 1A STUDENT



GREENHOUSE EFFECT, KEELING, FEEDBACKS

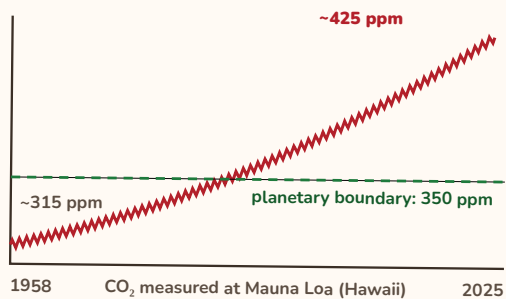
THE CATERPILLAR "Who are you?"

Greenhouse effect: some gases trap part of the heat sent back by the Earth. It is **natural** (without it, Earth would be about -18°C instead of $+15^{\circ}\text{C}$), but **we have intensified it**.

Main GHGs: CO_2 (carbon dioxide), CH_4 (methane), N_2O (nitrous oxide), fluorinated gases.



THE KEELING CURVE *Drink me*



Continuous measurements since **1958**. It rises because of **fossil fuels**; the sawtooth comes from the vegetation's **seasons**.



THE CATERPILLAR

"Who are you?"

Albedo: the share of sunlight **reflected** by a surface. Ice reflects a lot, the dark ocean absorbs.

Feedback loop: ice melts → less reflection → more heat absorbed → more ice melts. It **amplifies** warming.

OFF WITH THEIR HEADS!

Tipping points (ice sheets, the Amazon, permafrost...) are **interconnected**: crossing one can trigger others **in a cascade**. It is not linear.

MITIGATION

- **cut GHG emissions** at the source
- e.g. renewables, sufficiency, efficiency

≠

ADAPTATION

- **adapt to effects** already here or unavoidable
- e.g. sea walls, drought-resistant crops

THE CATERPILLAR "Who are you?"

Carbon sink: what absorbs carbon (oceans, forests, soils, wetlands). **Carbon neutrality:** balance between emissions and removals.



EAT ME: THE PACE

Today, about **$+1.2^{\circ}\text{C}$** above pre-industrial levels, in barely 150 years. Natural cycles move $\sim 5^{\circ}\text{C}$ over thousands of years.



SESSIONS 2 TO 4 · DISINFORMATION MODULES

DISINFORMATION AND BIASES

no intent

MISINFORMATION

False info **shared in good faith**: the person believes it.

intent to deceive

DISINFORMATION

False info spread **deliberately** to deceive.

normal in science

SCIENTIFIC UNCERTAINTY

A real limit of knowledge, **measured and stated** (confidence levels).

👑 OFF WITH THEIR HEADS!

Uncertainty $\neq$ ignorance. Saying "scientists aren't 100% sure" to dismiss everything is a **disinformation tactic**.

🐛 COGNITIVE BIASES *The Caterpillar*

- **Confirmation bias**: we keep what confirms what we already think.
- **Authority bias**: we believe someone for their status, even outside their field.
- **Availability bias**: we judge from examples that come to mind ("it snowed, so no warming").
- **Filter bubbles**: algorithms show us more of the same, fuelling **polarisation**.

🏰 EAT ME: THE KNAVE'S TRIAL

"**Sentence first, verdict afterwards!**" shouts the Queen at the trial. That's **confirmation bias**: the conclusion before the evidence.

😁 THE CHESHIRE GRIN

The 3 biases: **Confirmation**, **Authority**, **Availability**, a **CAA** that warps the picture.



MANIPULATION TACTICS *Drink me*

Disinformation **rarely lies outright**: it **manufactures doubt**, **oversimplifies**, **quotes out of context** and **attacks people, not data**.

Against it: science **self-corrects** through peer review, and about **99%** of studies conclude that warming is human-caused.



CHECK A SOURCE IN 4 QUESTIONS

- 1 Who is speaking, and are they an expert **in this field**?
- 2 What evidence? Peer-reviewed?
- 3 What interest (financial, political)?
- 4 Consistent with the consensus?





SESSIONS 3 AND 4 · IPCC

THE IPCC AND SCIENTIFIC CONSENSUS

1988

IPCC created

by the WMO and UNEP, a
“compass” for decisions

1992

Rio Earth Summit

1st international climate
convention (UNFCCC)

2015

Paris Agreement (COP21)

well below 2 °C, aim for 1.5 °C

WORKING GROUP I

Physical science:
temperatures, GHGs,
oceans, atmosphere.

WORKING GROUP II

Impacts,
vulnerability and
adaptation of
societies.

WORKING GROUP III

Solutions to cut
emissions
(mitigation).

TASK FORCE

Oversees **national**
GHG inventories.



THE CHESHIRE GRIN

I “Is it warming?” · II “Who gets hurt?” · III “What do we do?”



THE CATERPILLAR “Who are you?”

The IPCC **does no research of its own**: thousands of volunteer experts synthesise the world's literature, the text is **peer-reviewed**, corrected, commented. A **Summary for Policymakers** is approved by the **195 member states**. A report takes about **6 to 7 years**.

RCP: EMISSION PATHWAYS

- the possible **physical pathways** of the climate (GHG concentrations)



SSP: SOCIETAL FUTURES

- the **socio-economic storylines** leading to those emissions; they complement the RCPs



CONFIDENCE LEVELS *Drink me*

very low

low

medium

high

very high

limited or conflicting evidence

robust, converging evidence

Confidence depends on the **robustness of evidence** and the **degree of agreement**.





SESSION 4 • DEBATE

CONSENSUS UNDER ATTACK... AND SOLID

Reports take long to produce, hence the charge of “**bureaucratic heaviness**”. And since states approve the Summary for Policymakers, some call it a “**political machine**”.

CRITICISM	WHAT IT SAYS	WHY THE CONSENSUS HOLDS
Not infallible	The IPCC synthesises existing data: it can be slow to integrate new findings.	Collective strength: consensus doesn't erase debate, it's the convergence of thousands of studies .
Too technical	Precise but hard-to-read reports: room for oversimplification and disinformation.	Full transparency: sources and review comments are published, manipulation is nearly impossible.
Geographic imbalance	Most experts come from the North: Global South issues are less visible.	Growing diversity: more Southern scientists, more disciplines, better gender balance.

KEY POINT *The golden key*

The IPCC's caution is its credibility, not its weakness. Protecting reliable information is a shared responsibility: companies, platforms, the state and each of us.

OFF WITH THEIR HEADS!

Consensus $\neq$ unanimity, and $\neq$ absence of debate. It's the convergence of evidence.

THE WHITE RABBIT'S TIPS

Session 4's managerial question: not “is it profitable?” but “is it **profitable, honest and compatible** with the safe space?”

“The greatest enemy of truth is not lies, it is simplification.”

• closing line of Session 4 •



SESSIONS 2 TO 4 · RECAP

END OF THE CLIMATE AND IPCC BLOCK

THE GOLDEN KEY *key takeaways*



- 1 **Weather ≠ climate** (short term vs ~30 years). Climate system powered by the **Sun**, heat redistributed by **oceans**.
- 2 Greenhouse effect **natural but intensified**; **Keeling**: CO₂ ~315 → ~425 ppm since 1958; **albedo** and feedbacks amplify.
- 3 **Misinformation** = good faith, **disinformation** = intent to deceive, **uncertainty** = normal in science.
- 4 **IPCC 1988**, 3 working groups + Task Force, 195 states, ~6-7 years per report; RCP + SSP; confidence levels.
- 5 Consensus ≈ **99%**: convergence of evidence, transparency, growing diversity.

TEA TIME *mini quiz*

- 1 What does the Keeling curve measure?
- 2 Why does ice melt speed up warming?
- 3 Sharing false info you believe is... ?
- 4 Which IPCC working group covers mitigation?
- 5 Mitigation or adaptation: building a sea wall?

Answers : 1. Atmospheric CO₂ concentration (Mauna Loa, since 1958) · 2. It lowers albedo: more heat absorbed · 3. Misinformation · 4. Working Group III · 5. Adaptation

“Why is a raven like a writing-desk?”

· the Hatter, who never cites his sources ·

WRITTEN BY A PGE 1A STUDENT





SESSION 5 · WORKSHOP

THE 2 TONNES WORKSHOP



SESSION 5 THE 2 TONNES WORKSHOP

By the end of this session, you can:

- ✓ explain the principle and target of the 2 Tonnes workshop
- ✓ link individual choices and collective decisions
- ✓ recall the Paris Agreement goals

"I shall be too late!" (the White Rabbit, in 2050)

THE CATERPILLAR "Who are you?"

2 Tonnes: an **immersive, collaborative 3-hour game** on the ecological transition, **individual and collective**. In small groups, you simulate **decade by decade up to 2050** how lifestyle choices and **public policies** change emissions.



THE TARGET *Drink me*

Today, a French person ≈ 9 to 10 t CO₂ / year

2050 target

2 t

2 t of CO₂ per person per year: the level compatible with France's **carbon neutrality by 2050** target. We are very far from it: we must divide by about 5.



EAT ME: WHAT YOU DO IN THE GAME

In the game you act on **travel, food, housing, consumption...** and on state decisions. The link with Session 1's icebreaker: your **food** and **transport** corner.

OFF WITH THEIR HEADS!

Reaching 2 tonnes is **harder than it looks**, and that's the point: **individual actions alone are not enough**, collective choices are needed too.

THE CATERPILLAR "Who are you?"

Paris Agreement (2015, COP21): keep warming **well below 2 °C**, aiming for **1.5 °C**; reach **carbon neutrality** in the second half of the century (**2050** for the EU and France). Levers: phasing out fossil fuels, renewables, efficient buildings, decarbonised industry.



GREEN GROWTH AND INCLUSIVE INNOVATION



SESSION 6

GREEN GROWTH, DEGROWTH AND POST-GROWTH

By the end of this session, you can:

- ✓ define green growth, degrowth and post-growth
- ✓ tell relative from absolute decoupling, explain the rebound effect
- ✓ summarise the 3 debate articles
- ✓ defend a position with arguments

"Everything's got a moral, if only you can find it." (the Duchess)



THE CATERPILLAR "Who are you?"

- **Green growth:** economic growth **while reducing** environmental impacts, emissions and resource use.
- **Inclusive innovation:** innovation that is **accessible, affordable and useful to all**, especially disadvantaged groups.
- **Carbon intensity of GDP (CI):** CO₂ emitted **per unit of GDP**. Measures green growth.
- **Global Innovation Index (GII):** measures innovation (institutions, human capital and research, infrastructure...).



TRANSITION + SOCIAL JUSTICE

Drink me

Goals: cut emissions, limit degradation, preserve resources, develop low-carbon technologies.

Technological innovation develops renewables, energy efficiency, clean tech; **inclusive innovation** makes sure they also benefit small firms and disadvantaged communities.



OFF WITH THEIR HEADS!

Green growth **does not mean stopping growth**: it wants to make it compatible with the environment.



THE WHITE RABBIT'S TIPS

Even in advanced economies, **access to green technology remains unequal**.



THE CATERPILLAR "Who are you?"

Endogenous growth theory: growth comes from **factors inside** the economy: **investment, human capital, technology**. Hence the idea that innovation can make growth "green".



IS DECOUPLING POSSIBLE?



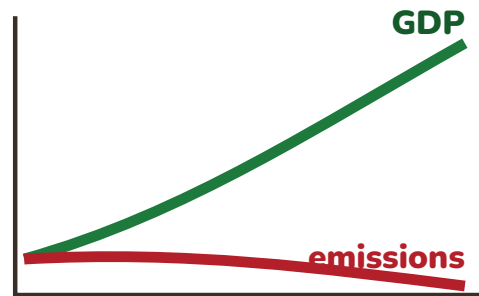
Drink me

ARTICLE 2: IS GREEN GROWTH POSSIBLE? (HICKEL & KALLIS, 2020)

RELATIVE DECOUPLING



ABSOLUTE DECOUPLING



- **Relative:** GDP grows **faster** than resources or emissions, but the impact **keeps rising**.
- **Absolute:** GDP grows while resources or emissions **actually fall**. For green growth to work, decoupling must be **absolute, lasting and fast enough**.



THE CHESHIRE GRIN

Relative: emissions **Rise** slower.
Absolute: emissions **Actually** fall.



OFF WITH THEIR HEADS!

Rebound effect: efficiency gains lower costs, so they **boost demand**, cancelling part of the benefit.

Their conclusion: it is more realistic to cut resources and emissions **without trying to maintain growth at all costs**. They propose **degrowth**: reduce consumption while **decoupling well-being from GDP growth**.



ARTICLE 3: ON TECHNOLOGY AND DEGROWTH (HICKEL, 2023) *The Caterpillar*

Degrowth **accepts and encourages** technology, efficiency and innovation. But **technology alone is not enough**: production, consumption and the economic system must change.

Cut **destructive, less necessary** activities (private jets, fast fashion, industrial beef, SUVs...) and **maintain or expand** what meets human needs.

↖ for Hickel: growth ≠ social progress





SESSION 6 • THE DEBATE

3 POSITIONS FACE TO FACE



THE CATERPILLAR “Who are you?”

Post-growth: stop making GDP growth a **goal**. Aim for **well-being within planetary boundaries** (the doughnut), whether GDP rises or falls. Raworth calls it being “**agnostic**” about growth.

	GREEN GROWTH	DEGROWTH	POST-GROWTH
Key idea	grow while cutting impact through innovation	plan a reduction of destructive production, mainly in rich countries	end dependence on growth, aim for well-being
GDP	must keep growing	its fall is accepted (a consequence, not a goal)	is no longer a goal
Technology	the main solution	useful but not enough alone	one tool among others
Main criticism	absolute decoupling too slow, rebound effect	social acceptability, jobs, the Global South	how to fund the welfare state without growth?



DEFENDING A POSITION IN A DEBATE

- ① Your **position** in one sentence
- ② **2 pieces of evidence** (author, figure, example)
- ③ The **best objection**, and your answer



EAT ME: ENDLESS TEA

At the Hatter's tea party, you either want **more tea** (green growth: more “efficient” tea), **less tea** (degrowth), or to **know why you drink tea at all** (post-growth).



SESSIONS 5 AND 6 · RECAP

END OF SESSIONS 5 AND 6

THE GOLDEN KEY *key takeaways*



- 1 2 Tonnes:** simulation up to 2050; target **2 t CO₂/person/year** ($\approx$ 9-10 t today); individual **and** collective.
- 2 Paris 2015:** well below 2 °C, aim for 1.5 °C; carbon neutrality by 2050 (EU, France).
- 3 Green growth:** grow while reducing impact; measured by **carbon intensity of GDP**; driven by innovation (endogenous growth).
- 4 Relative $\neq$ absolute decoupling; rebound effect;** Hickel & Kallis (2020): green growth is unlikely.
- 5 Hickel (2023):** technology isn't enough, cut destructive excess; **post-growth:** GDP is no longer a goal.

TEA TIME *mini quiz*

- 1** What is the 2 Tonnes target?
- 2** GDP rises, emissions rise more slowly: which decoupling?
- 3** Which indicator measures green growth in Article 1?
- 4** For Hickel, does degrowth reject technology?
- 5** What is the rebound effect?

Answers : **1.** 2 t of CO₂ per person per year by 2050 · **2.** Relative · **3.** Carbon intensity of GDP · **4.** No, but it isn't enough on its own · **5.** Efficiency lowers costs, demand rises and cancels part of the gains



PRACTICE

MIDTERM-STYLE MOCK MCQ

12 questions, **20 minutes** max (the real midterm's pace). Write down your answers, then flip the page.



THE GIANT TEA TIME

- 1 How many boundaries are crossed per the 2025 Planetary Health Check?
A 6
B 7
C 9
D 2
- 2 Which boundaries remain in the safe zone?
A Climate and freshwater
B Biosphere and land
C Nitrogen and phosphorus
D Ozone and aerosols
- 3 Who describes the “sustainability paradox”?
A Whiteman, Walker & Perego
B Raworth
C Bansal et al.
D Hickel & Kallis
- 4 In the doughnut, the social foundation is:
A the 9 planetary boundaries
B a minimum GDP
C 12 basic needs
D an emissions cap drawn from the SDGs
- 5 Which strategy keeps the least value?
A Repair
B Reduce
C Refurbish
D Recycle
- 6 Sharing false information you believe is true:
A disinformation
B misinformation
C scientific uncertainty
D authority bias
- 7 The IPCC was created in:
A 1988
B 1972
C 1992
D 2015
- 8 Which IPCC group studies mitigation?
A Group I
B Group II
C Group III
D Task Force
- 9 The Keeling curve measures:
A average temperature
B CO₂ concentration
C sea level
D albedo
- 10 Melting sea ice speeds up warming because:
A it releases ozone
B it cools the oceans
C it increases aerosols
D it lowers albedo
- 11 Absolute decoupling means:
A GDP rises, emissions fall
B GDP rises faster than emissions
C GDP and emissions both fall
D emissions rise faster
- 12 The “ecological fallacy” (Bansal et al., 2024) is:
A a carbon accounting error
B greenwashing
C a level-of-analysis error
D an availability bias error

Answers : 1B · 2D · 3A · 4C · 5D · 6B · 7A · 8C · 9B · 10D · 11A · 12C



THE WHITE RABBIT'S TIPS

If you hesitate between two answers, look for the **trap word**: “always”, “only”, a slightly-off **figure** or **date**.



EVERYTHING ON 1 PAGE

THE RABBIT HOLE ON 1 PAGE

AUTHORS AND DATES

Brundtland, 1987

definition of sustainable development

Our Common Future

Rockström et al., 2009

the 9 planetary boundaries

Nature

Whiteman, Walker & Perego, 2012

sustainability paradox

JMS

Steffen et al., 2015

2 core boundaries: climate, biosphere

Science

Raworth, 2017

Doughnut Economics

foundation 12, ceiling 9

Lade et al., 2020

interactions between boundaries

Nature Sustainability

Grafström & Aasma, 2021

4 barriers to circularity

TIMC

Bansal et al., 2024

strategy's ecological fallacy

JMS

Williams, Perego & Whiteman, 2024

single-boundary research, boundaries = framing conditions

JMS

Park, Härri & Levänen, 2025

justice and circularity, 167 studies

The Conversation

Hickel & Kallis, 2020

Is Green Growth Possible?

decoupling

Hickel, 2023

On Technology and Degrowth

growth ≠ progress

KEY FIGURES

Boundaries crossed

7 / 9 in 2025

6 / 9 in 2023

Atmospheric CO₂

≈ 425 ppm

limit 350; ~315 in 1958

Wildlife

≈ -70%

1970-2018

Degraded ecosystems

60 %

linear economy

Ice cores

800,000 years

~5 °C glacial / interglacial

Current warming

≈ +1.2 °C

vs pre-industrial

Consensus

≈ 99% of studies

human-caused

GIEC

1988 · 195 states

~6-7 years per report

2 Tonnes target

2 t CO₂/person/yr

≈ 9-10 t today

Paris Agreement

2015 · < 2 °C, aim 1.5 °C

COP21

DON'T MIX UP

Weather / climate

short term / ~30 years

Mis- / disinformation

good faith / intent

Mitigation / adaptation

reduce / adapt

Relative / absolute

slower / falls

decoupling

Shortfall / overshoot

below foundation / above ceiling

doughnut

RCP / SSP

physical pathways / societal storylines

IPCC

WRITTEN BY A PGE 1A STUDENT



END OF THE JOURNEY... ALMOST
NOW TEST YOURSELF!



MAELICEINWONDERLAND.FR



Scan the QR code to find **quizzes, flashcards** and the other Maelice in Wonderland sheets on the website.

“Everybody has won, and all must have prizes.”

• the Dodo •



THE NIGHT-BEFORE-THE-MIDTERM CHECKLIST

- | | |
|--|--|
| ☐ Reread <i>the rabbit hole</i> on 1 page | ☐ Redo the <i>Tea times</i> and the <i>mock MCQ</i> |
| ☐ Know the <i>9 boundaries</i> and the <i>2 safe ones</i> | ☐ Be able to draw the <i>doughnut</i> from memory |
| ☐ Review the <i>3 articles</i> of Session 6 | ☐ Have passed the <i>e-learning modules</i> (20%) |

Sheet written by a PGE 1A student, based on NEOMA Business School's "Sustainability" course. It complements the course, it does not replace it.

Universe inspired by Lewis Carroll's *Alice's Adventures in Wonderland* and *Through the Looking-Glass* (1865 and 1871, public domain).

WRITTEN BY A PGE 1A STUDENT

