

**Henning
Larsen** —

Unboxing Carbon: The Course

CO_{2e} - Background - Strategies - Materials - EPD Data

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Reset City, Milan
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**Do you
speak**

Carbon?



Unboxing Carbon

- Course start 9/2021
- Henning Larsen initiative
- Knowledge-based design
- Carbon emissions of materials
- Targeting architects
- 1000+ participants over 4 years
- Touching the materials= ideal learning scenario

GOALS – 1A Carbon Course:

Understand the state of the planet – broad strokes

Understand embodied CO₂

Intro understanding: lifecycles & material impacts

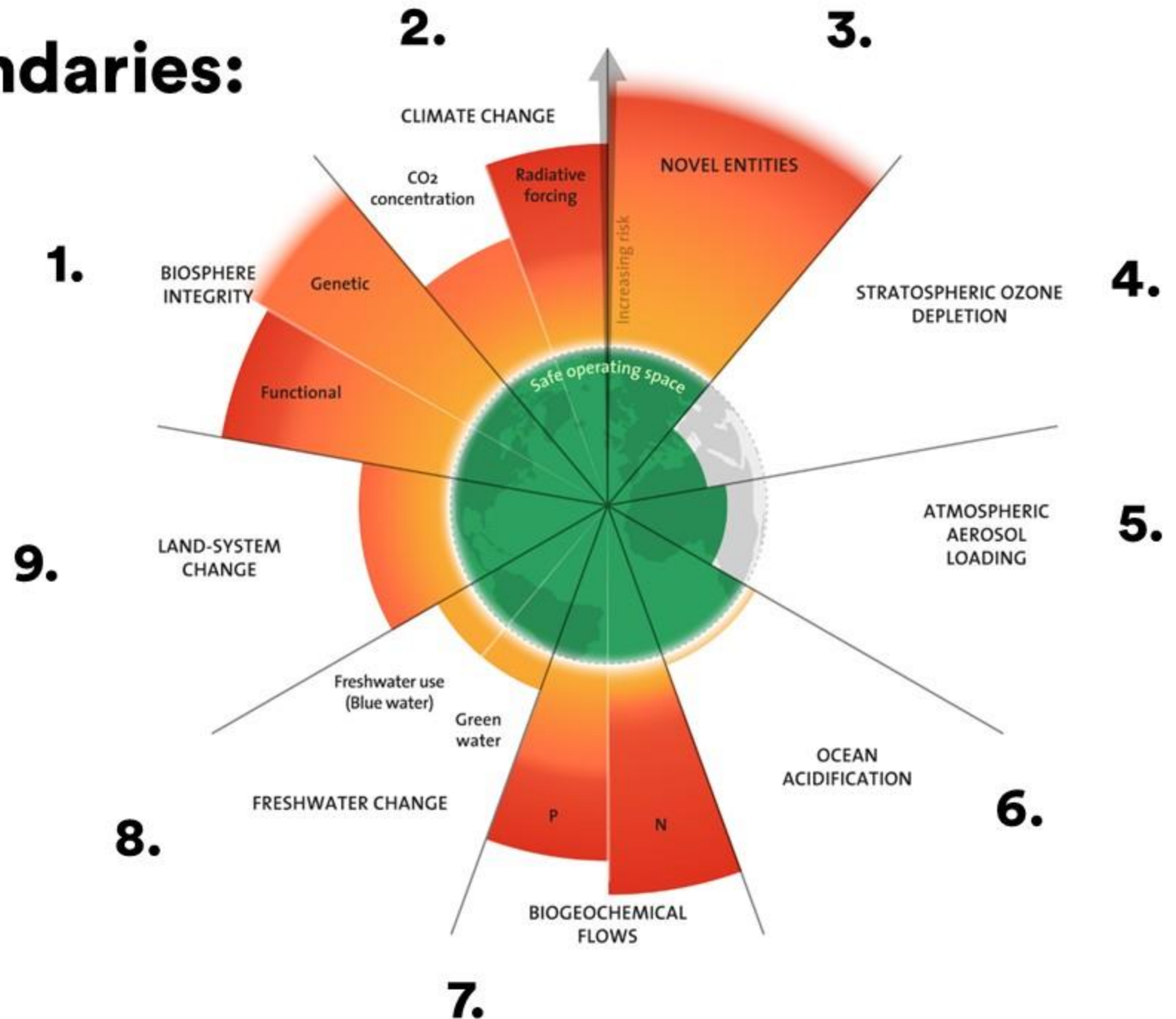
Learn to read EPD data

Learn to make material comparisons

Triple planetary crisis



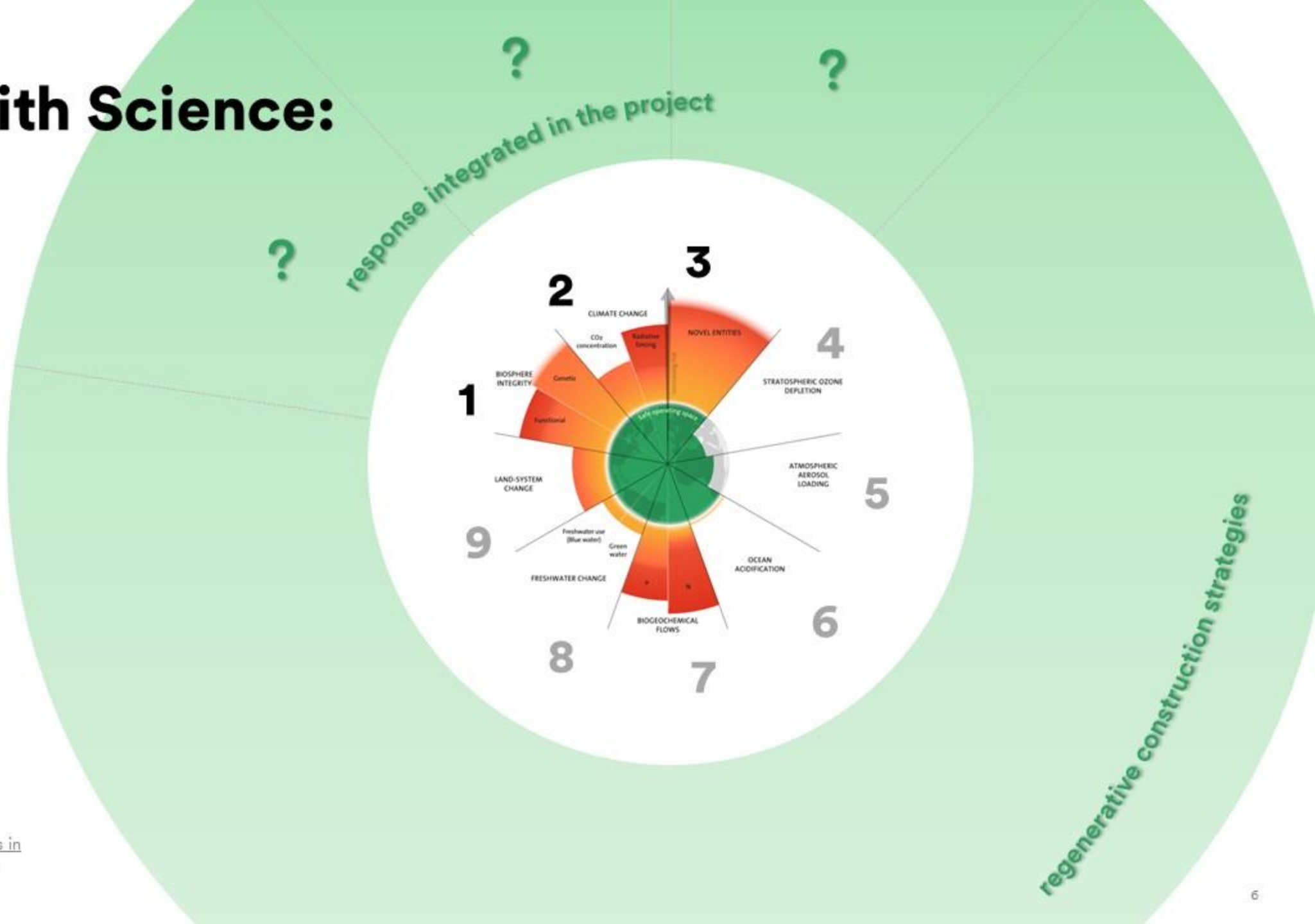
Planetary boundaries:



Source: [Azote for Stockholm Resilience Centre](#), based on analysis in [Sakschewski and Caesar et al. 2025](#)

Design with Science:

Planetary Boundaries



Source: [Azote for Stockholm Resilience Centre](#), based on analysis in [Sakschewski and Caesar et al. 2025](#)

Pollution – a driver of loss of biodiversity

Toxic chemicals, microplastics and processed heavy metals





Construction sector consumes 28% of global chemical production.

Source:
UN Global Chemical Outlook II, 2019
Photo by Dorsa Masghati on Unsplash

The image shows a massive open-pit mine or construction site. In the foreground, a yellow excavator with the number '107' on its arm is positioned on a pile of dark earth. To its left, a yellow dump truck with the identification 'DT-0123' and 'FMC' is visible. In the background, another yellow excavator is working on a higher level of the site. The terrain is characterized by steep, terraced walls of earth and rock, indicating deep excavation. The overall scene is one of large-scale industrial activity.

**Construction materials contribute to
10% of CO₂ emissions.**

Source:
www.buildinggreen.com

Regulatory Response



Danish regulations 2023 & 2025

2023 code: 12 kg CO_{2e} / m² / year

LCA stages: A1 – A3, B-4, B-6, C3 – C4 over 50 years

Danish regulations 2023 & 2025

2023 code: 12 kg CO_{2e} / m² / year

2025 code: 7.5 kg CO_{2e} / m² / year

LCA stages: A1 – A3, B-4, B-6, C3 – C4 over 50 years

European regulations 2028 / 2030

Energy Performance of Buildings Directive

New buildings - whole building LCA in 2028.

Member states set caps by 2027.

Material Strategies



IPCC 2021 report: increased urgency

**50/50 chance to achieve the Paris agreement
limiting warming to 1,5 degree**

Is this an option?

Cost? Capacity? Verification?



Bio-mass sequesters CO₂



Workshop 1





Bergen, NO
April 2022



Copenhagen
Feb. 2022



kg CO₂ / m²
phases A1-A3



kg CO₂ /m²
phases A1-A3 + C3-C4



Gramitherm, grass
insulation, 45mm

-2.24 kg

CO₂ pr. m²

Workshop 2



Natural Stone Cladding

Semi-rijo, Pelsparite Limestone
Solancis, S.A.
4.52 kg CO₂e



Type: Portuguese Branco Real, etc.
Thickness: 30 mm
Density: 70.5 kg/m²
Lifetime: not listed
EPD no: DAP 001:2022

Limestone
Franken-Schotter
4.60 kg CO₂e



Type: jura limestone from Germany
Thickness: 30 mm
Density: 77.1 kg/m²
Lifetime: 50 years
EPD no: EPD-FRS-20170103-IBD1

Granite G358
Naturstein Montering NO
8.02 kg CO₂e



Type: granite from China
Thickness: 30 mm
Density: 78.6 kg/m²
Lifetime: not listed
EPD no: NEPD-1635-653-NO

Granite G654
Naturstein Montering NO
13.20 kg CO₂e



Type: granite from China
Thickness: 30 mm
Density: 84 kg/m²
Lifetime: not listed
EPD no: NEPD-1636-653-NO

Limestone
Portland Stone firms
18.51 kg CO₂e



Type: natural stone from the UK
Thickness: 30 mm
Density: 69 kg/m²
Lifetime: not listed
EPD no: BREG EN_000389

Finnish Natural Stone
Kivi Ry (FI market average)
25.27 kg CO₂e



Type: facade cladding
Thickness: 30 mm
Density: 81 kg/m²
Lifetime: not listed
EPD no: EPD-RTS_56_20

Bricks

1 of 4 pages

Used Bricks
Gamle Mursten
0.52 kg CO2e



Type: Used bricks (whole and half)
Thickness: 108 mm
Density: 1800 kg/m³
Lifetime: Not listed
EPD no: MD-16007-EN

Red Brick, Egernsund
Wienerberger
10.7 kg CO2e



Type: biogas without Mn-oxide
Thickness: 108 mm
Density: 1450 kg/m³
Lifetime: 150 years
EPD no: MD-22001-EN

LESS Red Brick, Egernsund
Wienerberger
11.9 kg CO2e



Type: biogas without Mn-oxide
Thickness: 108 mm
Density: 1438 kg/m³
Lifetime: 150 years
EPD no: MD-21027-EN

Greener Red Brick
Randers Tegl
13.2 kg CO2e



Type: biogas
Thickness: 108 mm
Density: 1620 kg/m³
Lifetime: 150 years
EPD no: MD-21001-EN

LESS Red Brick , Egernsund
Wienerberger
18.3 kg CO2e



Type: biogas
Thickness: 108 mm
Density: 1598 kg/m³
Lifetime: 150 years
EPD no: MD-21028-EN

“Greener” Red Brick
Randers Tegl
18.8 kg CO2e



Type: biogas with iron oxide
Thickness: 108 mm
Density: 1750 kg/m³
Lifetime: 150 years
EPD no: MD-21053-EN

Impacts from production only, A1 - A2
Transport after production and end of life not included
Data from 3. party verified EPDs valid on
November, 2022

Henning Larsen | Unboxing Carbon Material Catalog

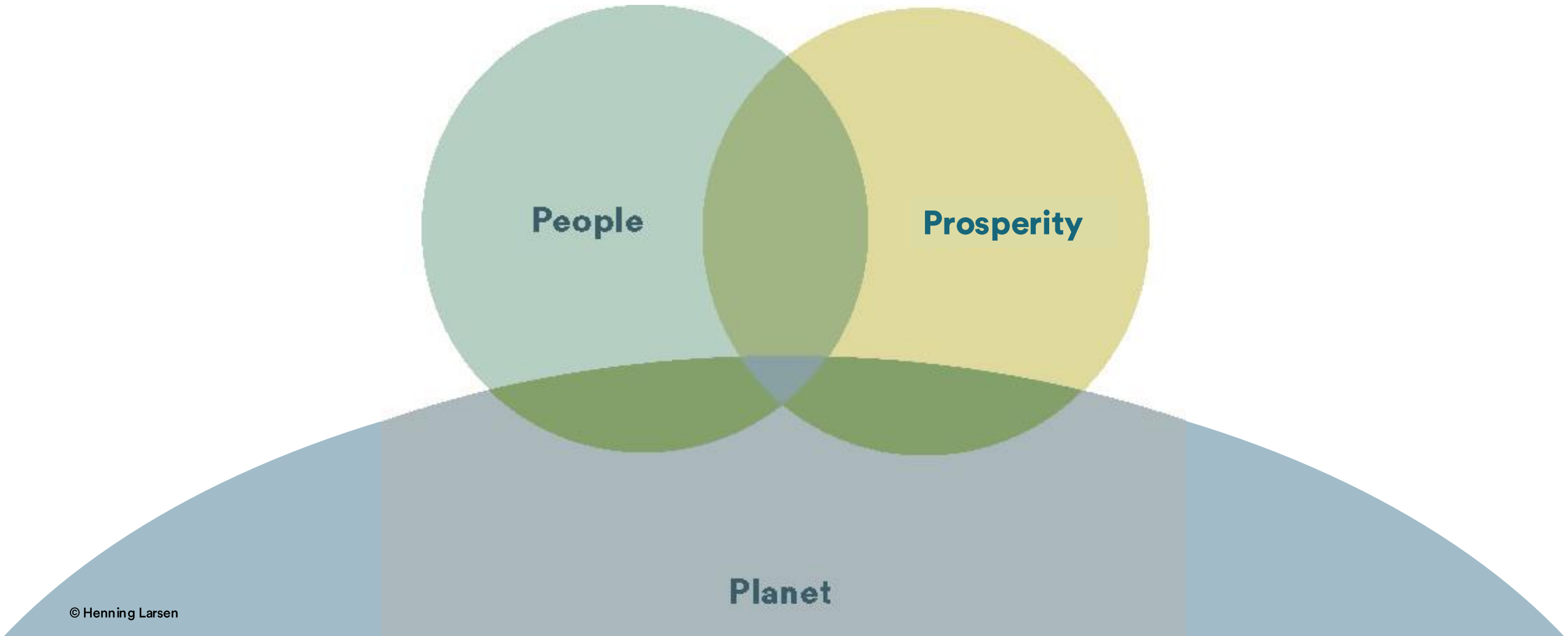
The Catalog

We collect all data developed inhouse and on the course in a catalog, hoping that it will be used across the industry to minimize our collective footprint.

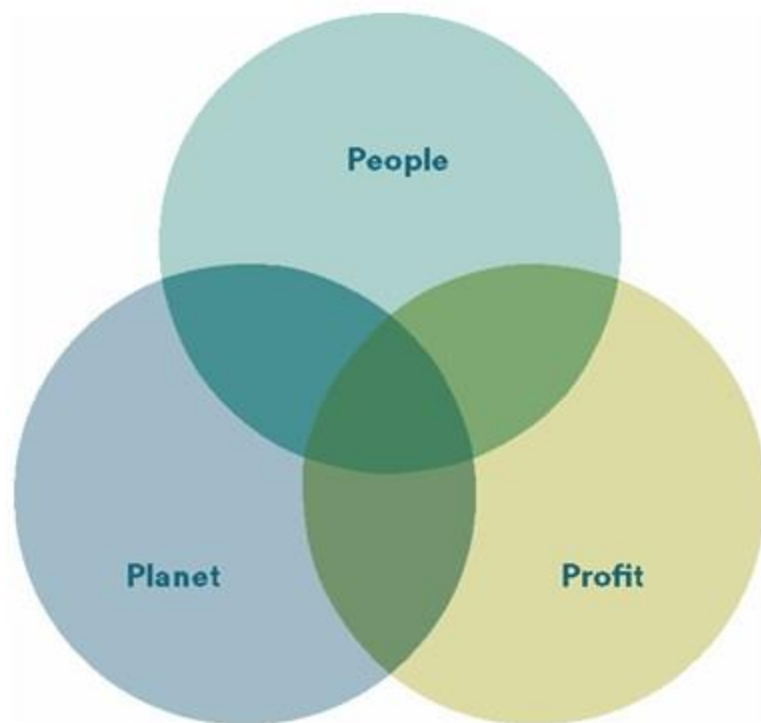
[Read more and download the latest version available.](#)



Reassess the triple bottom line:



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