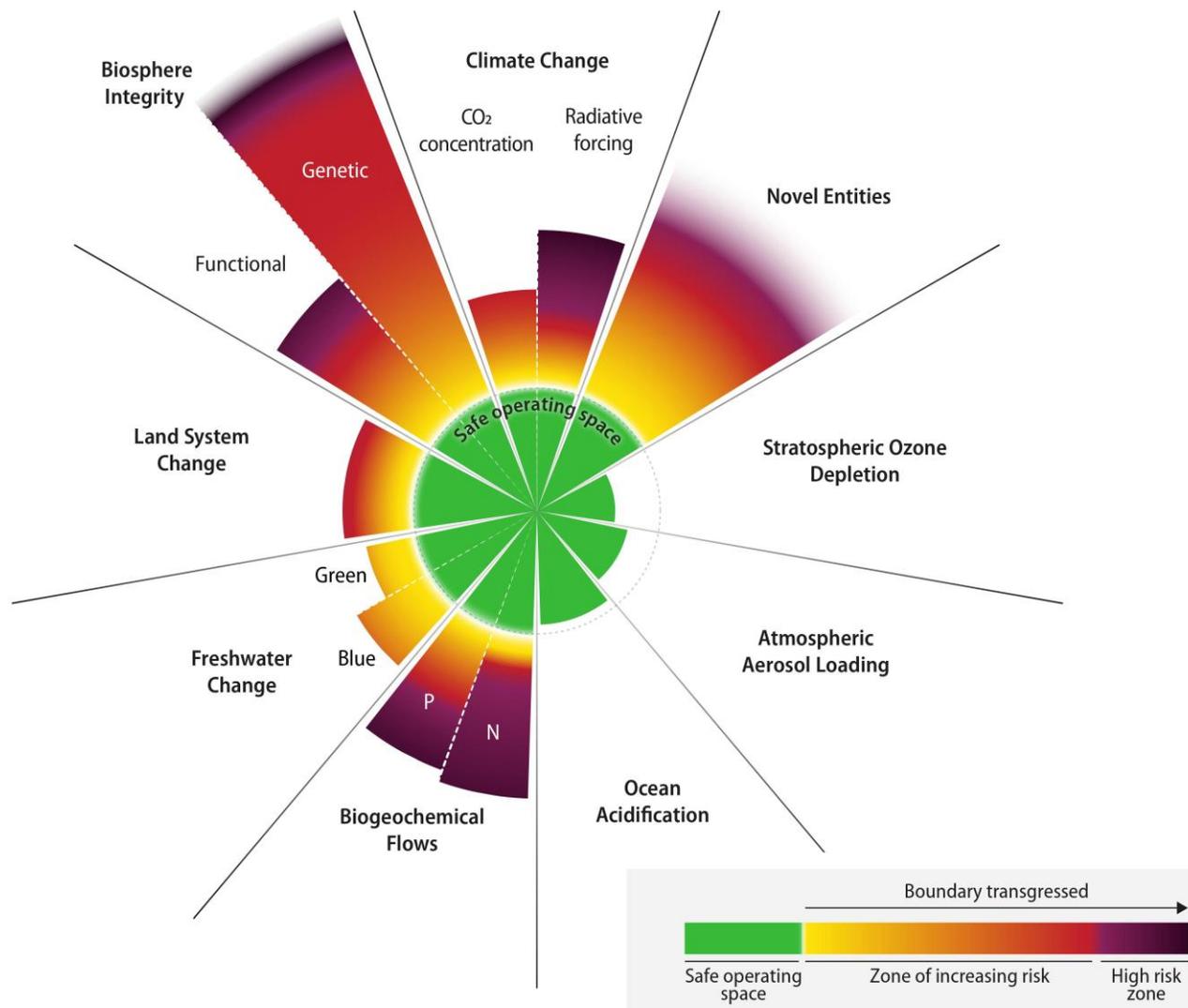




Planetary Boundaries & Absolute Sustainability

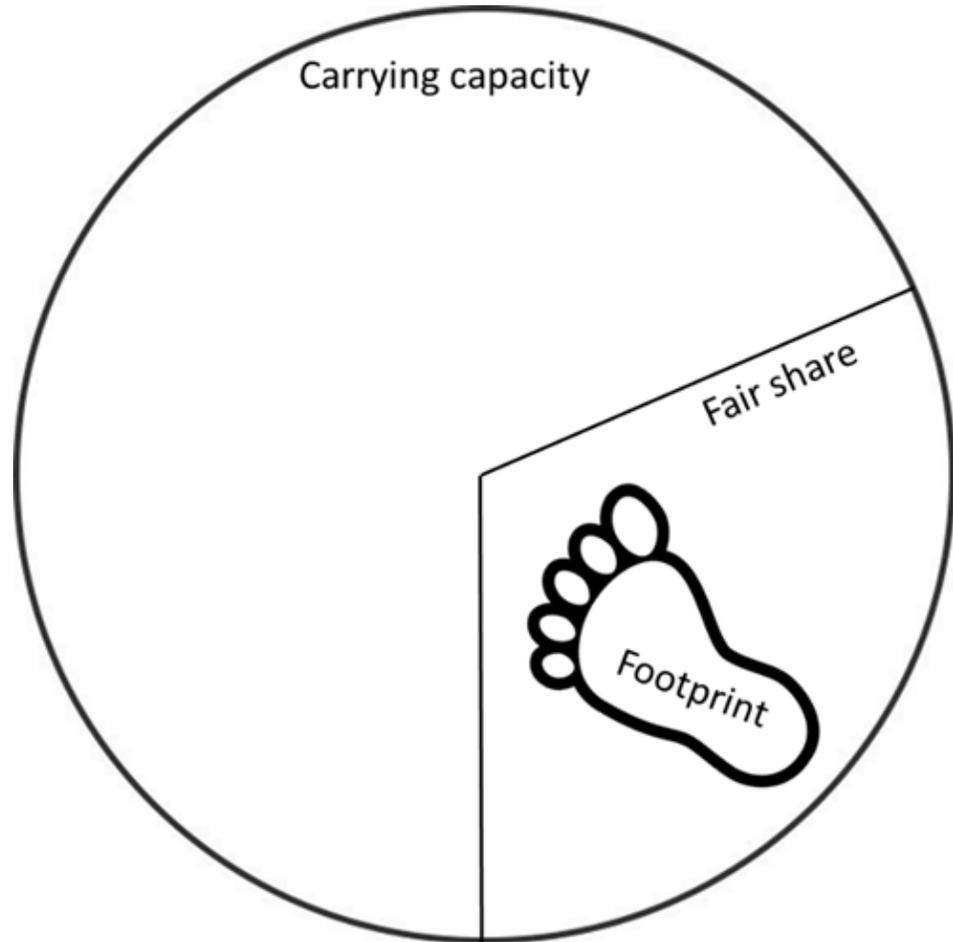
9 Planetary Boundaries



1. **Climate Change**
2. **Novel entities**
3. Stratospheric ozone depletion
4. Atmospheric aerosol loading
5. Ocean acidification
6. Modification of biogeochemical flows
7. Freshwater change
8. **Land system change**
9. **Biosphere integrity**

Source: Richardson et al., Science Advances, 2023

How to divide the space?



Impact category X



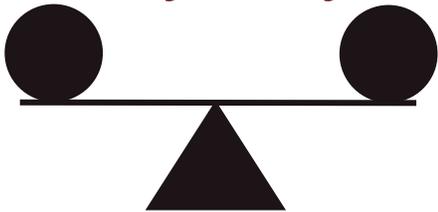
Answering this is what we call *Absolute Sustainability*

Allocation

Equal per capita (EPC)

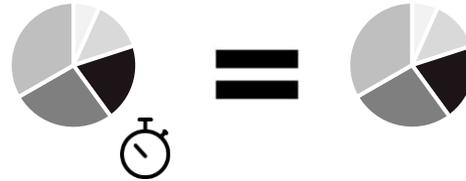


Sufficiency lifestyles (SL)

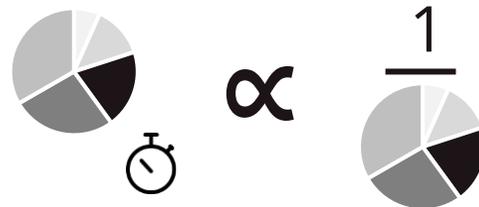


Historic

Grandfathering (GF)

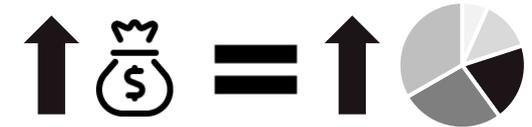


Historic Responsibility (HR)

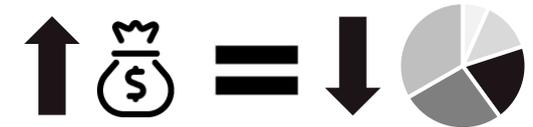


Economic

Economic Value (EV)



Capability to reduce (CTR)

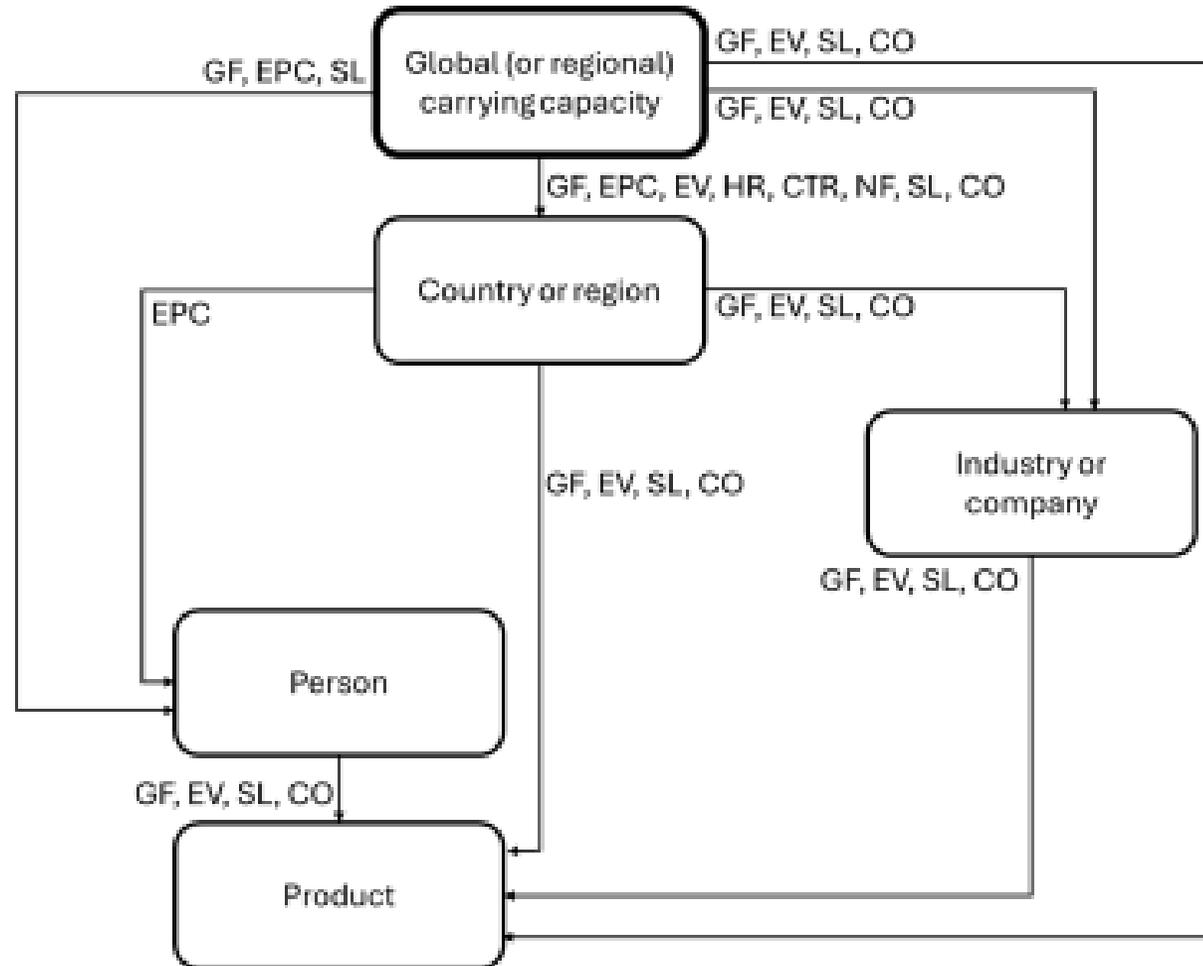


Cost optimization (CO)

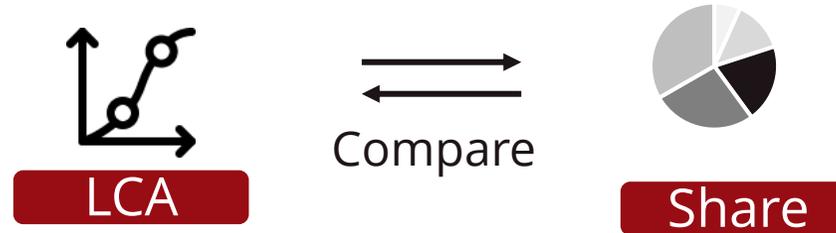


Allocation

Remember: Not all principles can be applied to any problem!



Are we within our share?



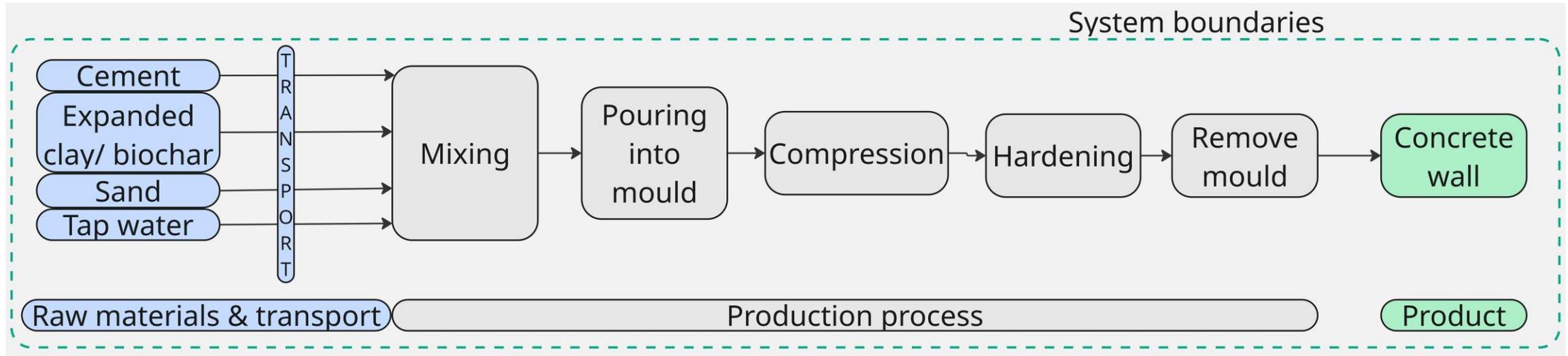
$$\frac{\textit{Result}}{\textit{Allocated carrying capacity}} < 1$$



$$\frac{\textit{Result}}{\textit{Allocated carrying capacity}} > 1$$



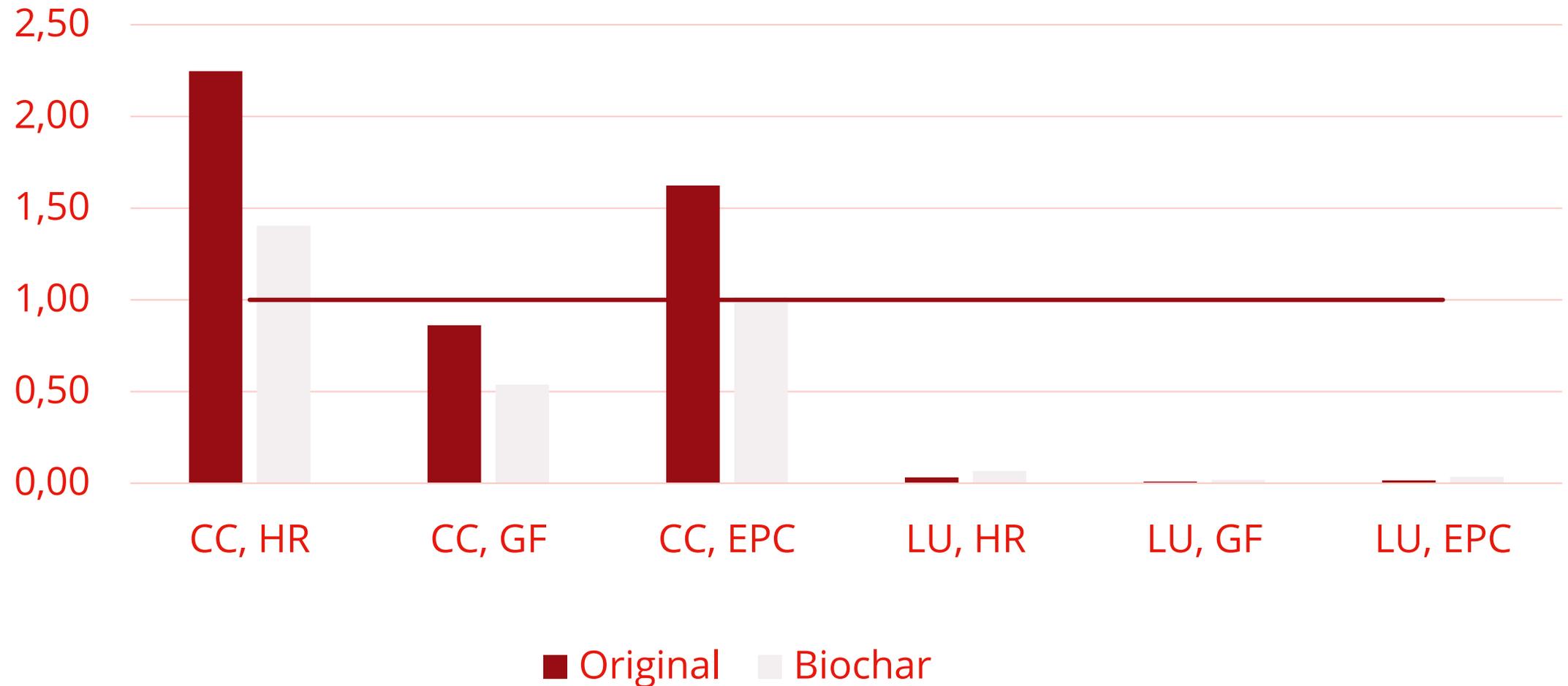
Case study on improved concrete wall



- Impact Categories
 - Climate Change
 - Land Use

- Allocation principles
 - Equal per capita
 - Grandfathering
 - Historic Responsibility

Case study on improved concrete wall



References

BJØRN, A., PAULILLO, A., SANYE MENGUAL, E., DE LAURENTIIS, V., VEA, E., HAUSCHILD, M.Z. and SALA, S., Guidance for applying absolute environmental sustainability assessment on activities at different scales (BETA version), Publications Office of the European Union, Luxembourg, 2025, <https://data.europa.eu/doi/10.2760/7677803>, JRC142099.

Bjørn, A. & Technical University of Denmark. (2025, August). *Introduction to AESA* [Slide show]. Summer Course “12953 Absolute Environmental Sustainability Assessment of Production and Consumption in a Systems Perspective,” Lyngby, Denmark.

Richardson, K. et al. (2023) 'Earth beyond six of nine planetary boundaries,' *Science Advances*, 9(37), p. eadh2458. <https://doi.org/10.1126/sciadv.adh2458>.