Operationalizing the Doughnut: A Sufficiency-Based Approach for Equitable Allocation

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1 How much can we consume? SJOS

The Planetary Boundaries (PB) framework defines safe ecological limits, demarking a safe operating space, while the Doughnut framework integrates these ecological limits with minimum social standards, known as Decent Living Standards (DLS), to define a safe and just operating space (SJOS) that huamn can consume.

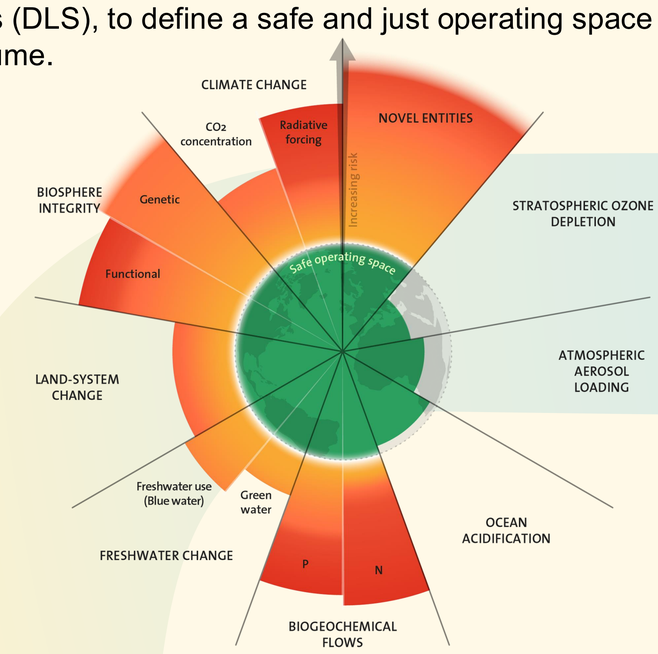


Figure2: *The latest Planetary Boundary framework with 6 boundaries transgressing the limits, adopting preindustrial Holocene conditions as a reference for assessing the magnitude of anthropogenic deviations (Richardson et al., 2023).*

2 Fulfill our minimum needs? Sufficiency

We propose a sufficiency-based allocation approach operationalizing the Doughnut framework globally. First, we define a universal "basket" of materials necessary to achieve DLS. Using LCA, we quantify ecological impacts from provisioning this basket, establishing a global "base economy" meeting human needs.

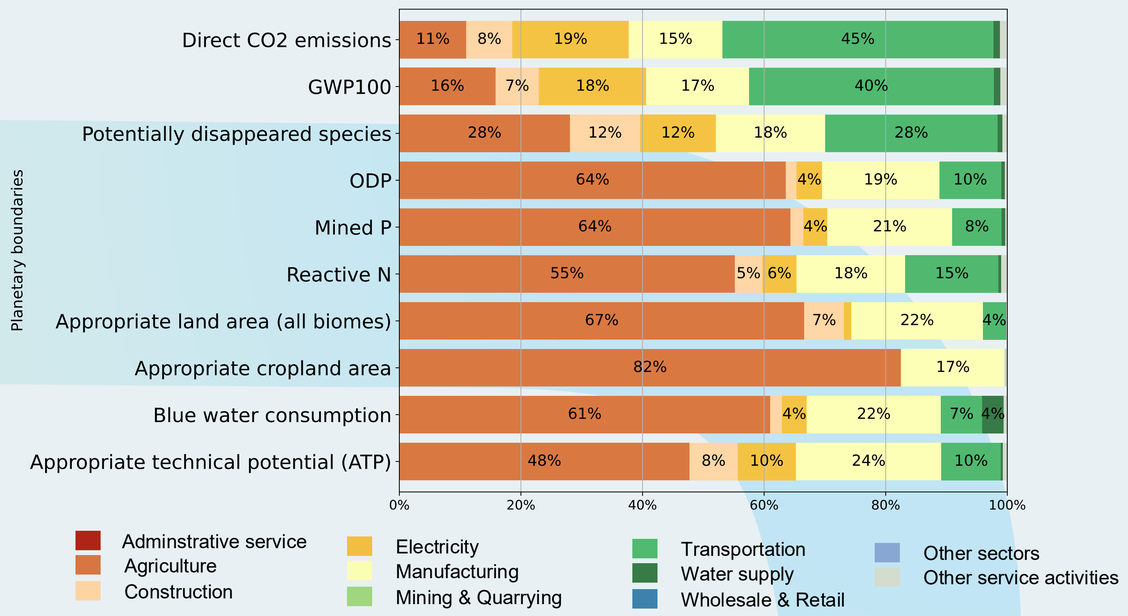
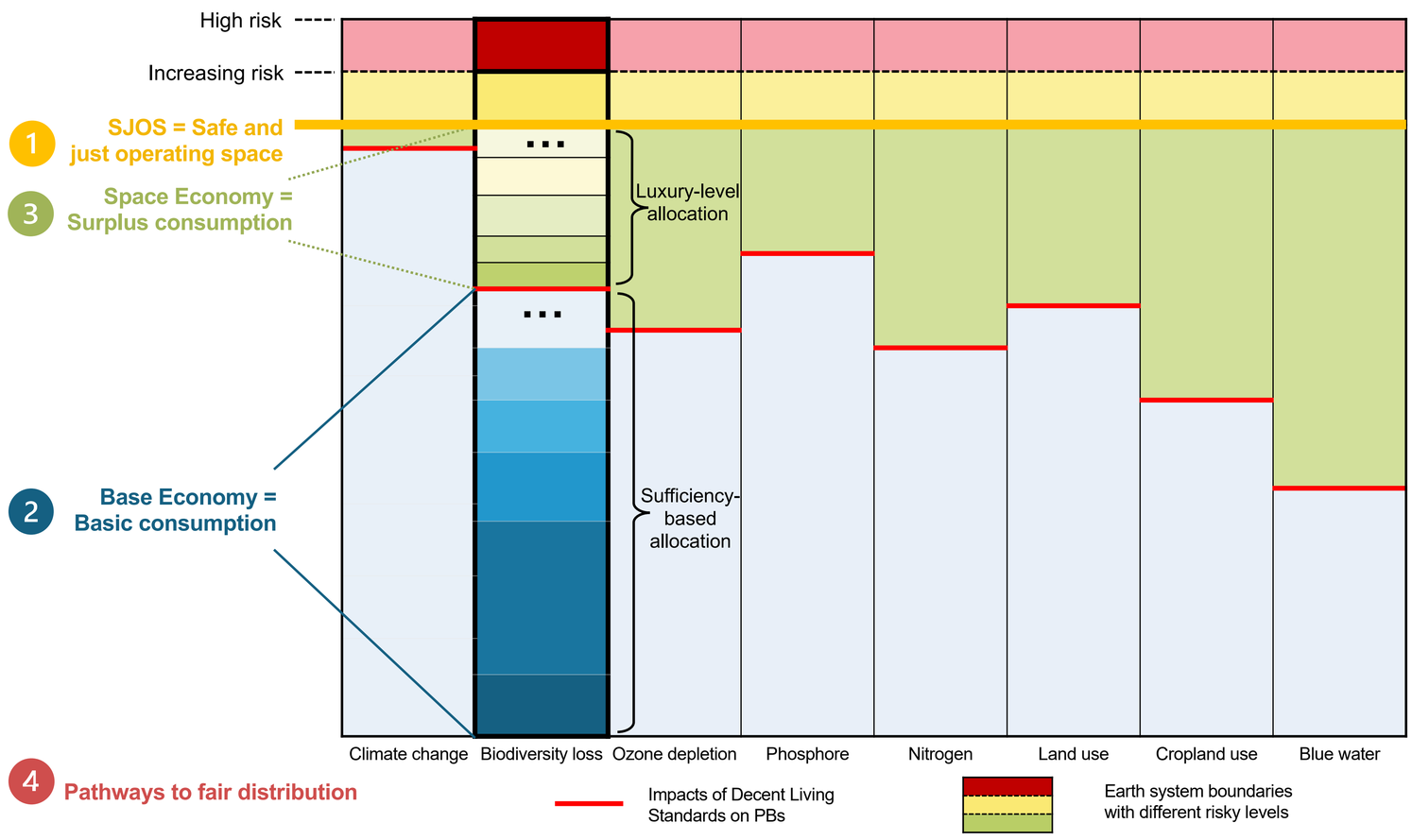


Figure3: *Sectoral global allocation of SJOS under the Basic Weighted scenario to achieve DLS for all. Control variables are selected following the PB framework outlined by Richardson et al. (2023). Basic Weighted = 15% HighDemand + 35% Basic + 50% LowDemand).*

GAP

Practical approaches for equitable sector-level safe and just operating space (SJOS) allocation at different time and space scales remain underdeveloped, particularly regarding fair distribution beyond basic human needs.



GOAL

Our framework advances a globally coherent method for equitably allocating Earth's limited SJOS, linking ecological limits with actionable pathways toward sustainability and social justice.

Figure1: *Schematic framework illustrating the operationalization of the Doughnut framework. The Safe and Just Operating Space (SJOS) is partitioned into two parts: Base Economy, necessary to ensure Decent Living Standards (DLS) for all, and Space Economy for non-essential activities. Potential pathways toward achieving a sustainable future through allocation strategies and regional adaptations are also explored. The colored numbers in the circle before each section lead you to a detailed explanation of that topic.*

4 From now to sustainable future? Pathways

We compare the current situation against PB limits and explore multiple pathways toward different sustainable futures. These pathways vary significantly in speed, ambition, and transformative potential to different scenario, e.g. fossil-free society and circular economy (ongoing work).

If no surplus exists or an ecological deficit emerges, we identify necessary trade-offs and targeted interventions, emphasizing demand-side managements and structural transformations to return within PB.

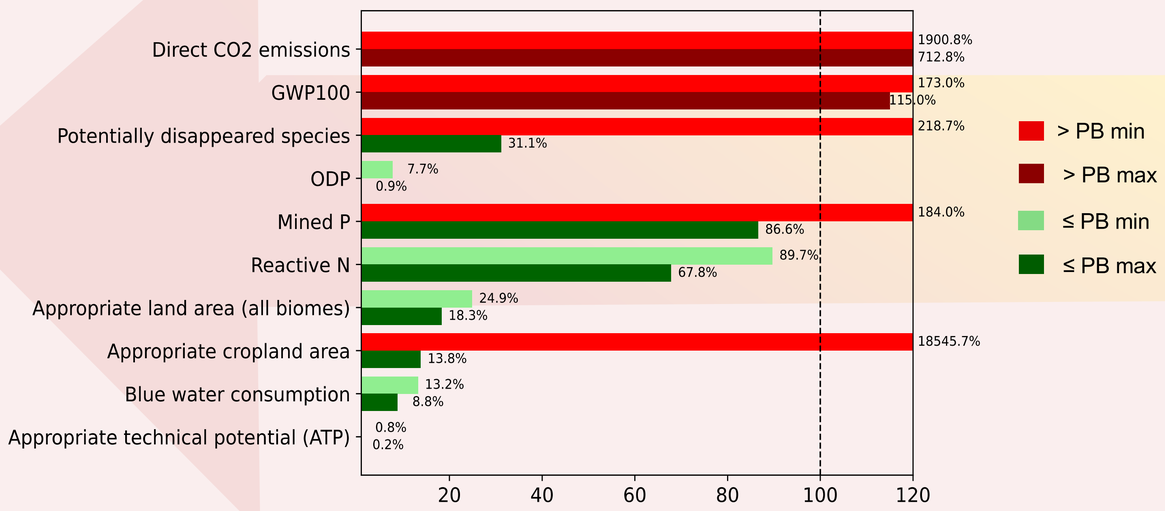


Figure5: *The share of Basic Weighted scenario within planetary boundary limits (min and max).*

3 Beyond basic consumption? Surplus

Next, we evaluate if residual SJOS remains beyond the base economy. If surplus exists, we explore allocation strategies with the sufficiency-based allocation key and household expenditure data (*COICOP expenditure categories are ranked using Normalized Inverse Median Elasticities and matched to ISIC sectors*).

We can regionalize the DLS baseline and available SJOS from global averages to different region levels, reflecting diverse contexts and ecological capacities.

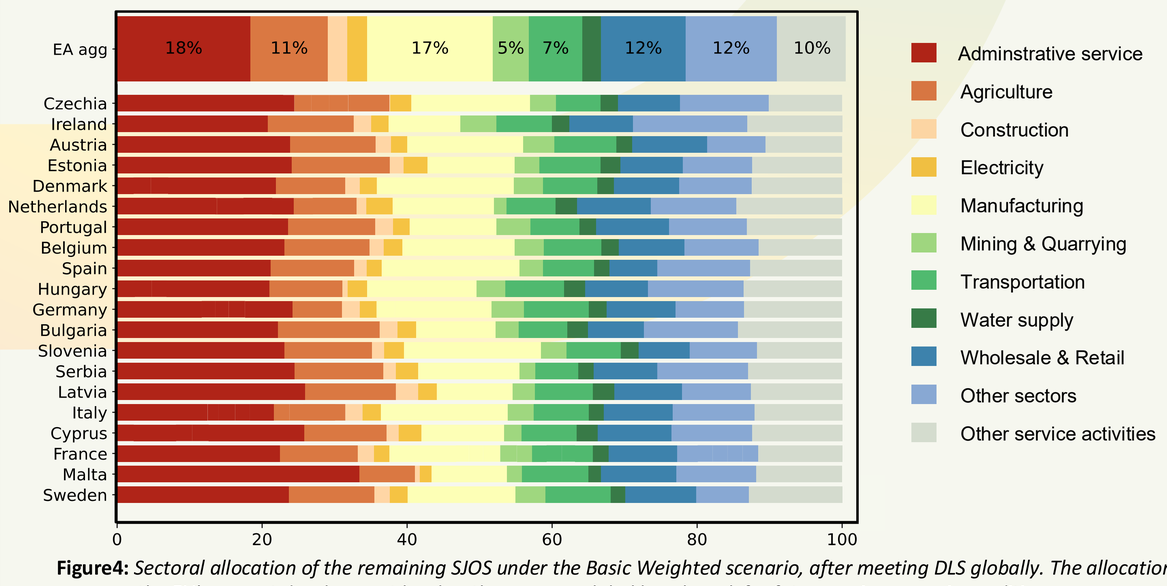


Figure4: *Sectoral allocation of the remaining SJOS under the Basic Weighted scenario, after meeting DLS globally. The allocation assumes the EU's current development level as the average global benchmark for future socioeconomic conditions.*

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