SCALE MATTERS

BUT SOMETIMES IN *UNEXPECTED* WAYS

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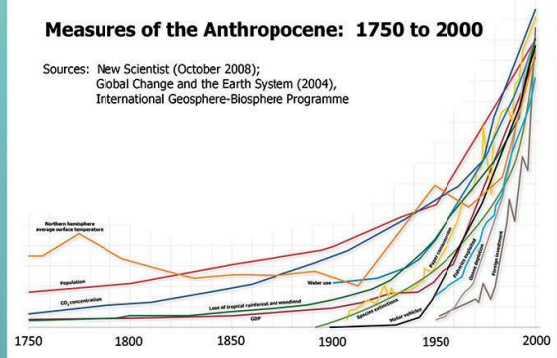
HUMAN EXPANSION TOWARDS THE ANTHROPOCENE

From precarious beginnings, humans have spread out of Africa and occupied the vast majority of terrestrial spaces, except Antarctica, adapting to major climate and ecological shifts. Food availability and adaptability in terms of the range of food items, and innovations in food production and processing were drivers for this successful expansion over the last few tens of thousands of years.

Humans have both been profoundly influenced by geological and climate processes and themselves shaped landscapes and biodiversity by essentially eradicating many species bigger than themselves (Frankopan 2023).



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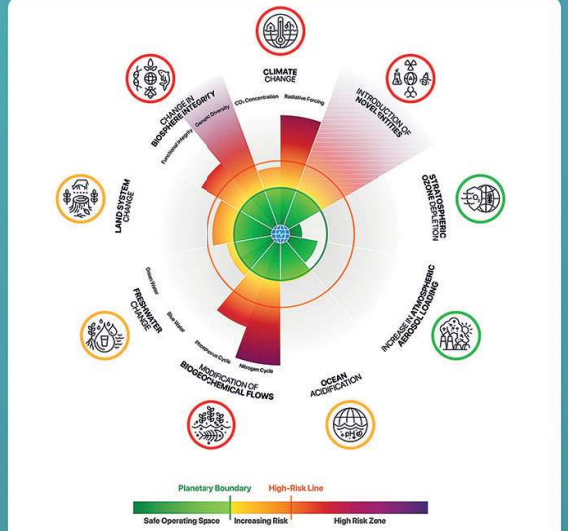
INDUSTRIAL AGRICULTURE AFTER WWII VS PLANETARY BOUNDARIES

The onset of the industrial revolution and the massive deployment of fossil energy resources to replace muscle power of humans and domesticated animals has started to tick up CO2 and methane emissions. The 'great acceleration' after WWII led to the well-known 'hockey stick' effect (Steffen, Broadgate, Deutsch et al. 2015) to the point of exceeding natural processes. The drive towards massive upscaling through industrial processes has transformed food production and distribution.

With initially cheap energy the trend towards standardisation and spatial expansion of industrial agriculture generated increasingly highly processed food items. Energy demand per unit output increased on land with reliance on artificial fertilizers, factory farming of animals and intensive pest and disease control (Conforti and Giampietro 1997). Together with pollution of surface, ground and coastal waters following apace, industrial agriculture has become a major contributor to exceeding planetary boundaries (Richardson, Steffen, Lucht et al. 2023).



Source: Potsdam Institute for Climate Impact Research, 2025

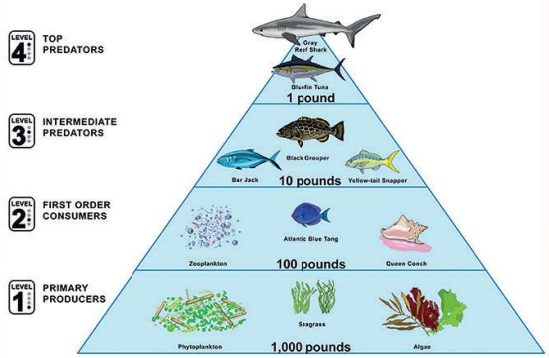
BALANCING MARINE (BIO)DIVERSITY WITH EFFICIENCY FOR POSITIVE STEWARDSHIP IN THE ANTHROPOCENE

A similar pattern has arisen in marine food production. While the ocean is one huge interconnected ecosystem, yet local and regional temperature, salinity and habitat differences have given rise to distinct floral and faunal niches. The scaling up of industrial fishing has, similar to trends on land earlier, significantly changed the faunal species and size distribution. Large top predators that maintain marine food webs have been diminished, in some regions such as the North Atlantic, to less than 10% of their biomass a century ago (Christensen, Guénette, Heymans et al. 2003).

Excessive and unselective extractions not only create waste, but also shrink global landings serving as nutritious food for a balanced diet, while improved utilization and management have great potential to increase nutritional effects (Cardinaals, Simon, Ziegler et al. 2023).

Here it is argued that phasing out unselective and particularly destructive forms of marine food harvesting and giving more room again for locally adapted, low impact, small-scale fisheries would climate proof marine food harvesting and lead to greater justice in resource allocation and benefit sharing (Nauen, Adhuri & Fakoya 2025).

Efficiency vs diversity – scale. Extreme uniformity can not cope with change, extreme diversity has low excess production for harvesting. Response: Sacrificing some efficiency for robustness and adaptability in times of change.



Source: education.nationalgeographic.org