

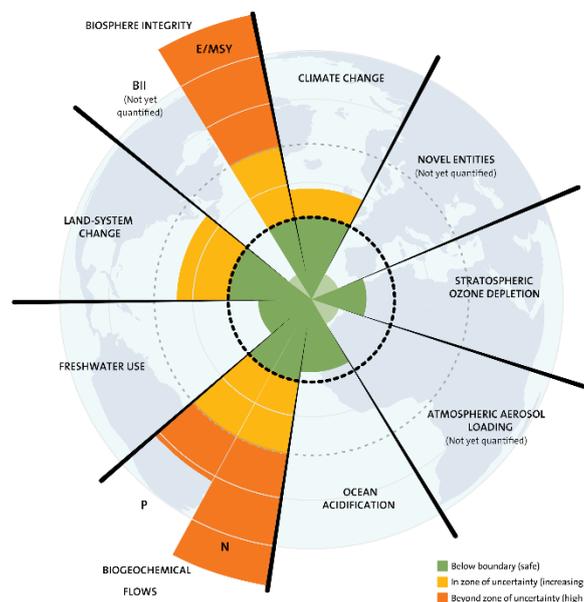
PLANET | BOUNDARIES

“The natural resources we take from the Earth and upon which we, ultimately, are dependent are finite. Once they are depleted, they will not be replaced”.

*Katherine Richardson Professor of Biological Oceanography,
University of Copenhagen and Leader of the Sustainability Science Centre. (1)*

Planetary Boundaries Framework

The planetary boundaries concept presents a set of nine planetary boundaries within which humanity can continue to develop and thrive for generations to come.



See <https://www.stockholmresilience.org/research/planetary-boundaries.html>

Click here to learn more (14 mins) <https://www.youtube.com/watch?v=RgqtrlixYR4>

Introduction to the problem and scale

- Greenhouse gas emissions and the idea of a carbon footprint have dominated the environmental discussion for years and have been the primary corporate measures of sustainability. There is a need to look beyond greenhouse gas emissions alone and consider environmental degradations and opportunities from a planetary boundaries perspective.
- The Planetary Boundaries framework was developed by a group of scientists led by Johan Rockström from the Stockholm Resilience Centre and Will Steffen from the Australian National University and was first released by the Stockholm Resilience Centre in 2010.
- The framework provides a more nuanced understanding of planetary changes and system boundaries that can be employed to safeguard the stability and resilience of the Earth system. Based on scientific evidence, the framework explores the impact humanity has made

on the planet since the Industrial Revolution and has become the 'main driver of global environmental change'. (2)

- As of 2015, four of nine planetary boundaries
 - Climate change
 - Loss of biosphere integrity (biodiversity loss)
 - Land-system change
 - Altered biogeochemical cycles (phosphorus and nitrogen)

had already been crossed as a result of human activity, which could drive the Earth System into a less hospitable state, threatening poverty reduction efforts and driving a deterioration of human wellbeing. (3)

- Some boundaries that have not yet been crossed at a planetary scale have been crossed in certain regions (e.g., freshwater use in the Western United States, Southern Europe, Asia, and the Middle East) (3)

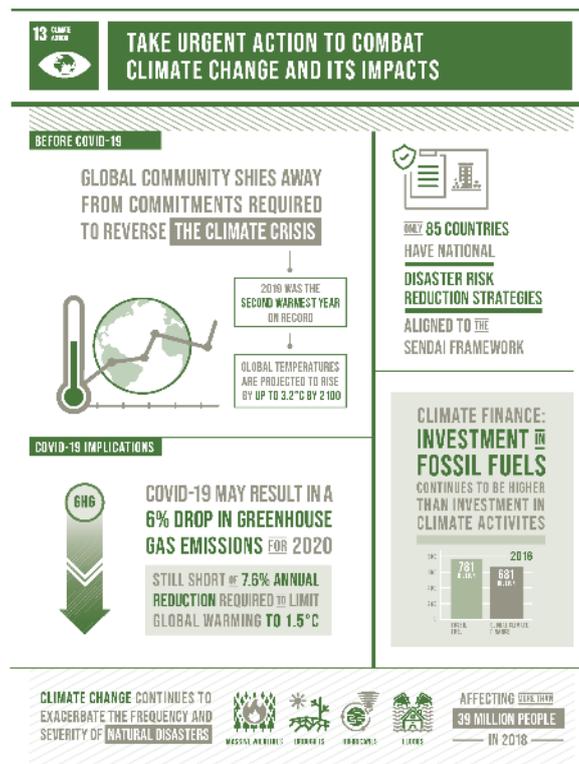
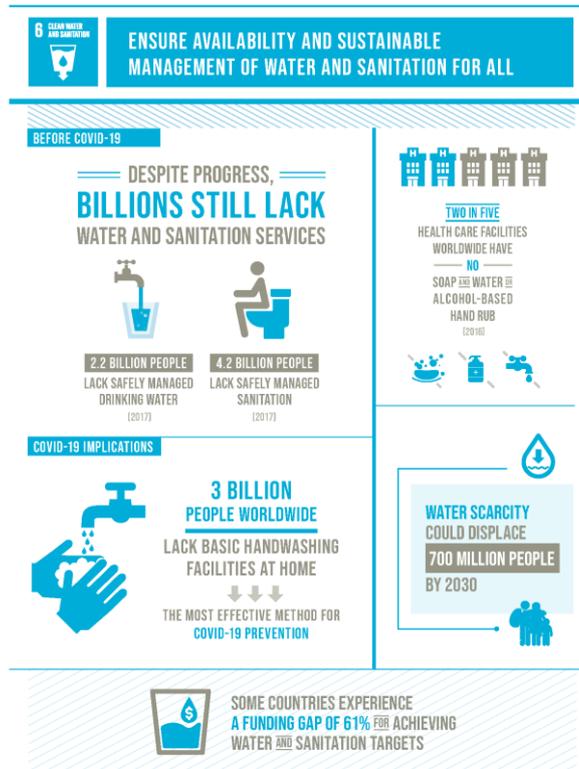
[Link to intensive animal farming](#)

- Intensive animal farming threatens several planetary boundaries, including climate change (release of CO₂ and other greenhouse gasses), biogeochemical flows (nitrogen and phosphorus), land-system change, freshwater use, and biosphere integrity (the loss of biodiversity)
- **Climate change:** intensive livestock production contributes 14.5% of global anthropogenic greenhouse emissions; under a business as usual scenario, in which meat and dairy consumption rises as expected with a growing global population and rising GDPs, the agriculture sector alone would emit enough greenhouse gasses to take up the entire 2 degrees Celsius emissions budget by 2050. (4)
- **Biogeochemical flows:** intensive animal agriculture is inextricably linked with nitrogen and phosphorus runoff and pollution. Crops grown for animal feed require nitrogen- and phosphorus-based fertilizers which run off into waterways, and animal waste (e.g., manure) contains high levels of reactive forms of nitrogen and phosphorus that leach into ground and surface waters. Crop-livestock production systems are the largest cause of human alteration of global nitrogen and phosphorus cycles. (5)
- **Land-system change:** intensive animal agriculture has been a driving force in the conversion of grasslands, wetlands, and forests to crop and grazing fields, resulting in vast deforestation globally. Every year, 10 million hectares of forest is destroyed. (6) Beef and soy production (for animal feed) are the largest drivers of deforestation.
- **Freshwater use:** intensive animal agriculture requires vast quantities of freshwater to produce feed crops and for drinking water for animals. The production of grain to feed animals is implicated in the depletion of vital aquifers, such as the Ogallala aquifer in the High Plains region of the U.S. (7)
- **Biosphere integrity:** as a driving force of land-system change, animal agriculture also contributes to the loss of biodiversity. Overexploitation and agriculture are the two biggest causes of biodiversity loss (8) with 1 million different species threatened with extinction. (9)

[Link to the relevant SDG\(S\)](#)

- **SDG 6:** Clean water and sanitation: Ensure availability and sustainable management of water and sanitation for all (10)
- **SDG 13:** Climate Action: Take urgent action to combat climate change and its impacts (11)
- **SDG 14:** Life below water: Conserve and sustainably use the oceans, sea and marine resources for sustainable development (12)

- **SDG 15: Life on Land:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (13)

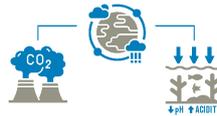




CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

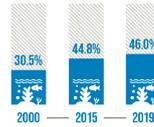
BEFORE COVID-19

OCEAN ACIDIFICATION CONTINUES TO THREATEN MARINE ENVIRONMENTS AND ECOSYSTEM SERVICES



A 100-150% RISE IN OCEAN ACIDITY IS PROJECTED BY 2100, AFFECTING HALF OF ALL MARINE LIFE

GLOBAL MARINE KEY BIODIVERSITY AREAS COVERED BY PROTECTED AREAS INCREASED



COVID-19 IMPLICATIONS

THE DRASTIC REDUCTION IN HUMAN ACTIVITY BROUGHT ABOUT BY COVID-19 MAY BE A CHANCE FOR OCEANS TO RECUPERATE



SUSTAINABLE FISHERIES CONTRIBUTE TO GDP



97 COUNTRIES SIGNED THE AGREEMENT ON PORT STATE MEASURES, THE FIRST BINDING INTERNATIONAL AGREEMENT ON ILLEGAL, UNREPORTED AND UNREGULATED FISHING



PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND HALT AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS

BEFORE COVID-19

THE WORLD IS FALLING SHORT ON 2020 TARGETS TO HALT BIODIVERSITY LOSS



OVER 31,000 SPECIES ARE THREATENED WITH EXTINCTION WHICH IS 27% OF OVER 116,000 ASSESSED SPECIES IN THE IUCN RED LIST



FOREST AREAS CONTINUE TO DECLINE AT AN ALARMING RATE, DRIVEN MAINLY BY AGRICULTURAL EXPANSION

EACH YEAR, 10 MILLION HECTARES OF FOREST ARE DESTROYED (2015-2020)

COVID-19 IMPLICATIONS

WILDLIFE TRAFFICKING DISRUPTS ECOSYSTEMS AND CONTRIBUTES TO THE SPREAD OF INFECTIOUS DISEASES



PANGOLINS ARE POSSIBLY THE INTERMEDIARY ANIMAL THAT TRANSFERRED THE CORONAVIRUS

THE EQUIVALENT OF 370,000 PANGOLINS WERE SEIZED GLOBALLY (2018-2019)



TWO BILLION HECTARES OF LAND ON EARTH ARE DEGRADED, AFFECTING SOME 3.2 BILLION PEOPLE, DRIVING SPECIES TO EXTINCTION AND INTENSIFYING CLIMATE CHANGE



ONLY A THIRD OF 113 COUNTRIES WERE ON TRACK TO ACHIEVE THEIR NATIONAL TARGET TO INTEGRATE BIODIVERSITY INTO NATIONAL PLANNING

Source: <https://unstats.un.org/sdgs/report/2020/>

References

- (1) Katherine Richardson. Livestock and the boundaries of our planet. Farming, Food and Nature. Earthscan from Routledge 2018 Ch 2.
- (2) https://en.wikipedia.org/wiki/Planetary_boundaries#:~:text=In%201972%2C%20The%20Limits%20to,resources%20availability%20is%20only%20linear.
- (3) Potsdam Institute for Climate Impact Research. Four of nine planetary boundaries now crossed. 16/01/2015 Webpage. Accessed on 3 November 2020 <https://www.pik-potsdam.de/en/news/latest-news/four-of-nine-planetary-boundaries-now-crossed>
- (4) Bajželj, B., Richards, K. S., Allwood, J. M., Smith, P., Dennis, J. S., Curmi, E., & Gilligan, C. A. (2014). Importance of food-demand management for climate mitigation. *Nature Climate Change*, 4(10), 924-929
- (5) Exploring global changes in nitrogen and phosphorus cycles in agriculture induced by livestock production over the 1900–2050 period. Lex Bouwman, Kees Klein Goldewijk, Klaas W. Van Der Hoek, Arthur H. W. Beusen, Detlef P. Van Vuuren, Jaap Willems, Mariana C. Rufino, Elke Stehfest. *Proceedings of the National Academy of Sciences* Dec 2013, 110 (52) 20882-20887; DOI: 10.1073/pnas.1012878108
- (6) WWF Forests Impact us in more ways than we can imagine. Their value cannot be underestimated. Webpage: Accessed on 3 November 2020 <HTTPS://EXPLORE.PANDA.ORG/FORESTS#:~:TEXT=1%2F2%3A%20FORESTS%20ARE%20HOME,HECTARES%20OF%20FOREST%20IS%20DESTROYED.>
- (7) WWF: What are the biggest drivers of deforestation? Webpage. Accessed on 3 November 2020 <https://www.worldwildlife.org/magazine/issues/summer-2018/articles/what-are-the-biggest-drivers-of-tropical-deforestation>
- (8) WWF. 2018. Living Planet Report - 2018: Aiming Higher. Grooten, M. and Almond, R.E.A.(Eds). WWF, Gland, Switzerland.
- (9) WWF (2020) Living Planet Report 2020 - Bending the curve of biodiversity loss. Almond, R.E.A., Grooten M. and Petersen, T. (Eds). WWF, Gland, Switzerland.
- (10) United Nations Department of Economic Social Affairs Sustainable Development <https://sdgs.un.org/goals/goal6>
- (11) United Nations Department of Economic Social Affairs Sustainable Development <https://sdgs.un.org/goals/goal13>
- (12) United Nations Department of Economic Social Affairs Sustainable Development <https://sdgs.un.org/goals/goal14>
- (13) United Nations Department of Economic Social Affairs Sustainable Development <https://sdgs.un.org/goals/goal15>