Communicating the health of the planet and its links to human health

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The Rockefeller Foundation–*Lancet* Commission on planetary health[1] in 2015 argued that although human health has improved dramatically between 1950 and 2010, this gain was accompanied by unprecedented environmental degradation that now threatens both human health and life-support systems. The sixth Global Environment Outlook (GEO-6)—*Healthy Planet, Healthy People*—a report adopted by 193 countries in March, 2019, reinforces this message by showing how the state of the environment has further deteriorated with increasing consequences for human health. GEO-6 goes beyond single-issue assessments (eg, climate change [Intergovernmental Panel on Climate Change], biodiversity [Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services], and ocean health [Ocean Health Index]) and health assessments of specific risks to assess the state of the environment, policies, and outlooks for the future in an 800-page report (assessing more than 3880 sources). The report is a product of 146 authors, with input from a High-Level Intergovernmental and Stakeholder Advisory Group, a Scientific Advisory Panel, and an Assessment Methodology Group and has been subject to 14 388 review comments by 1370 reviewers. Here, we integrate and focus this information to convey the subtitle of the report: *Healthy Planet, Healthy People* (figure).

GEO-6 assesses the different earth system components (air, land, freshwater, oceans, and biodiversity) but considers each separately. Here, we integrate knowledge on the health of the planet and humans across these components and rank the impacts. First, we build on the UN's Sustainable Development Goals, which present the goals as linked and indivisible from the underlying system components and requires that no one be left behind and that the furthest behind should be prioritised. Second, we rank the damage to these components from 1–5 (worst to least affected) taking a medium-term (years 2018–50) perspective locally through to globally, focusing on reversibility of the damage—ie, can a system recover by 2050 if action is taken now? If a system cannot easily recover, its ability to flourish and contribute to human wellbeing in the future is reduced. Third, we rank consequent harm to human health and wellbeing from 1–5 (worst to least affected) directly (eg, non-communicable or infectious diseases via unclean air and water), but also indirectly (eg, through effects on food and livelihoods). Because of data limitations, we focus on mortality and morbidity; to a limited extent we take displacement, with loss of lives, livelihoods, and homes as a proxy for the loss of wellbeing. We emphasise the furthest behind first notion by accounting for local effects. About 70% of the world's poorest people depend directly on ecosystem services for their survival; hence, the disruption of ecosystem services disproportionately affects their wellbeing, and this information is inadequately captured in national economic indicators.

For more on the **GEO** see https://www.unenvironment.org/global-environment-outlook

We conclude that biodiversity is the worst affected component, followed by air, oceans, freshwater, and land (figure; appendix). The irreversibility of biodiversity loss (from genes to ecosystems, including, for example, pollinators) at all levels reflects an ongoing major extinction event.[2] These losses are exacerbated by the spread of invasive species and the rising illegal trade in wildlife, timber, and fisheries. The impacts on air,

See **Online** for appendix

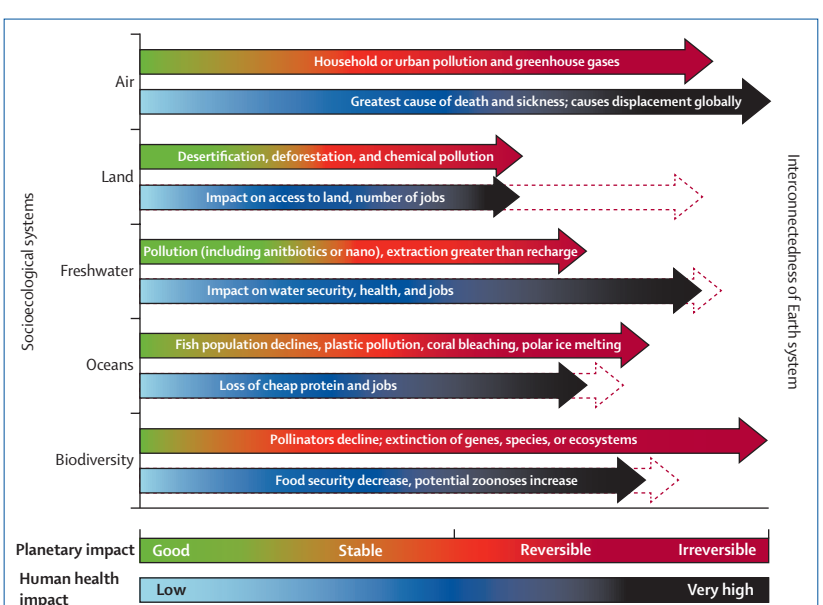

Figure: **Global impacts on health of the planet and human health, 2018–50**
Length of bars indicates severity of impact on the planet or humans: the worse the impact, the longer the bar. Dotted lines reflect the cumulative nature of a locally occurring problem and its effects on the most vulnerable, showing that these effects might be more serious in some areas than others shown by the solid bar.

including climate change, are ranked second, because global warming has already exceeded 0·8–0·9°C in relation to preindustrial levels and the 1·5°C mark will be crossed in the 2030s if policies are not drastically changed and new technologies implemented.[3] Outdoor air pollution exceeds WHO guidelines for 90% of city dwellers, especially in middle-income and low-income countries,[4] but is reversible. Severe household air pollution occurs in low-income homes of the global south, but is also reversible. The impact on the oceans ranks third because the oceans are severely affected by melting sea ice (resulting in sea level rise), increasing water temperatures (affecting global weather patterns), biodiversity loss and loss of fish stocks, coral bleaching events, low-oxygen zones, and increasing chemical and plastic pollution. Effects on freshwater health are ranked fourth and include climate change (changing rainfall patterns and melting glaciers), groundwater pumping beyond recharge levels, chemical and waste pollution (antimicrobial compounds, endocrine disruptors, microplastics and nanoplastics, and nutrients), and biological pollution (spread of pathogens). Finally, ranked fifth, the health of land is affected through land degradation, transformation, and chemical and waste pollution. The costs of the degrading health of land is estimated at US$20 trillion per year.[5] Most of the effects on oceans and land and many of the effects on freshwater are only partly reversible.

Impacts on the different system components act in synergistic ways, creating feedback and cascading effects on other components. These interactions might push the Earth system towards multiple tipping points through which planetary health deteriorates with increasing speed. A healthy planet was conservatively valued at $125 trillion annually in 2007,[6] several times greater than annual global GDP at that time.

The consequences for human health of crossing planetary tipping points are immense (figure; appendix). We rank the impacts on human health as being worst for air, then freshwater, biodiversity, oceans, and land. Outdoor and indoor air pollution is the biggest environmental public health risk, causing 6–7 million premature deaths annually[7] and about $5 trillion in welfare losses. These impacts are followed by the health effects of freshwater in terms of water scarcity and the effects of disasters (both slow onset and sudden floods), which have displaced three times as many people as conflict. For example, in 2016, 24·2 million people were displaced in 118 countries by water-related disasters whereas 6·9 million were affected by conflict and violence.[8] Exposure to polluted freshwater is associated with about 1·7 million deaths annually.[7] Without effective countermeasures, antibiotic, antimicrobial, and other chemical compounds might make unhealthy freshwater a leading cause of death by 2050. Ranked third, biodiversity loss reduces adaptive potential to global change and the loss of species (eg, pollinators) and ecosystem degradation is affecting food security, decreasing income, and increasing the spread of zoonotic disease, which accounts for 60% of all infectious disease. Potential economic costs are large, with the value of pollinator services alone estimated at $200 billion annually. Fourth, the risks associated with unhealthy coasts and oceans include loss of employment and sustainable livelihoods for more than 1 billion people and food insecurity for 3·1 billion people who depend on fish for food. Coral reefs and fisheries provide services valued annually at approximately $29 billion (coral reefs) and $253 billion (fisheries), with the fishing industry employing 58–120 million people.[9] Sea level rise might present an existential threat to coastal inhabitants, affecting livelihoods and displacing people. Fifth, land degradation and chemical pollution are affecting 3·2 billion people globally in terms of reduced food security, loss of livelihoods and displacement, and disease outbreaks which, when coupled with monocropping, can affect food production.

Simplifying knowledge in the way we have here has limitations. It cannot reflect the systemic links between ecosystems and planetary cycles; compartmentalising climate change under the category of air and ranking contextual health effects raises questions; and including populations who are the so-called furthest behind is problematic because available supporting data is scarce and major gaps in knowledge exist. The health ranking is a snapshot and might change (eg, air pollution is largely reversible). Finally, our focus on medium-term irreversibility does not imply that nothing can be done, but calls for urgent action.

Investing in the environment generates benefits for human health and the economy. Policymakers must use GEO-6 and other evidence-based scientific reports to fundamentally change the pathway of human economic and social development towards ensuring a healthier planet and healthier people.

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