

Letters to Nature

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Global patterns in human consumption of net primary production

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The human population and its consumption profoundly affect the Earth's ecosystems^{1,2}. A particularly compelling measure of humanity's cumulative impact is the fraction of the planet's net primary production that we appropriate for our own use^{3,4}. Net primary production—the net amount of solar energy converted to plant organic matter through photosynthesis—can be measured in units of elemental carbon and represents the primary food energy source for the world's ecosystems. Human appropriation of net primary production, apart from leaving less for other species to use, alters the composition of the atmosphere⁵, levels of biodiversity⁶, energy flows within food webs⁷ and the provision of important ecosystem services⁸. Here we present a global map showing the amount of net primary production required by humans and compare it to the total amount generated on the landscape. We then derive a spatial balance sheet of net primary production 'supply' and 'demand' for the world. We show that human appropriation of net primary production varies spatially from almost zero to many times the local primary production. These analyses reveal the uneven footprint of human consumption and related environmental impacts, indicate the degree to which human populations depend on net primary production 'imports' and suggest policy options for slowing future growth of human appropriation of net primary production.

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