

CHAPTER 41: ALTRUISM FOR THE SAKE OF FUTURE GENERATIONS

1. Rockström, J., & Klum, M., *The Human Quest: Prospering Within Planetary Boundaries*, Bokförlaget Langenskiöld, 2012, p. 112.
2. Hawks, J., et. al. (1999). Population bottlenecks and Pleistocene human evolution. *Molecular Biology and Evolution*, 17(1). According to another theory, around seventy thousand years ago, the human population may have been reduced to about ten thousand people following a catastrophic volcanic eruption that profoundly altered the world's climate. See Dawkins, Richard, *The Ancestor's Tale: A Pilgrimage to the Dawn of Life*, Houghton Mifflin, 2004, p. 416.
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4. Richardson, K., Steffen, W., & Liverman, D., *Climate Change: Global Risks, Challenges and Decisions*, Cambridge University Press, 2011, Chapter 1, p. 4.
5. <http://www.ccema-portal.org/article/read/planetary-boundaries-a-safe-operating-space-for-humanity>. See also Steffen, W., Persson, Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K.,... Gordon, L. (2011). The Anthropocene: From global change to planetary stewardship. *Ambio*, 40(7), 739–761.
6. Ellis, E. C., Klein Goldewijk, K., Siebert, S., Lightman, D., & Ramanakutty, N. (2010). Anthropogenic transformation of the biomes, 1700 to 2000. *Global Ecology and Biogeography*, 19(5), 589–606; Taylor, L., *The Healing Power of Rainforest Herbs: A Guide to Understanding and Using Herbal Medicinals*, Square One Publishers, 2004. As much as 90% of Western Africa's coastal rainforest has disappeared since 1900. In Southern Asia, around 88% of the tropical rain forest has been lost. A large part of the remainder of the world's tropical rainforest is located in the Amazon basin, covering an area of around 4 million km⁵. In Central America, two thirds of the low-altitude tropical rainforest has been transformed into farmland since 1950, and 40% of all forestry has been lost over the course of the last forty years. Madagascar has seen the destruction of 90% of its eastern tropical rainforest. For all scientific references, see the Wikipedia article on "Deforestation."
7. Some scientists place the start of the Anthropocene further back, in the eighteenth century. Most environmentalists, however, consider

- the “Great Acceleration” of 1950 as the beginning of this era, by virtue of the wide-ranging ecological shifts that began happening then.
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 9. Deforestation and resulting forest fires represent as much as 20% at least of man-made CO₂ emissions.
 10. Wijkman, A., & Rockström, J. (2013). *Op. cit.*; Lenton, T. M., Held, H., Kriegler, E., Hall, J. W., Lucht, W., Rahmstorf, S., & Schellnhuber, H. J. (2008). Tipping elements in the Earth’s climate system. *Proceedings of the National Academy of Sciences*, 105(6), 1786–1793.
 11. Wijkman, A., & Rockström, J. (2013). *Op. cit.*, p. 117.
 12. Rockström, J., Steffen, W., Noone, K., Persson, Chapin, F. S., Lambin, E. F.,... Schellnhuber, H. J. (2009). A safe operating space for humanity. *Nature*, 461(7263), 472–475.
 13. *Ibid.*
 14. Guinotte, F. (2008), Ocean acidification and its potential effects. *Annals of New York Academy of Sciences*, 1134, 320–342.
 15. Díaz, S., *et al.*, “Biodiversity Regulation of Ecosystem Services” in *Ecosystems and Human Well-being: Current State and Trends* (Hassan, H., Scholes, R. & Ash, N. [eds.]), Island Press, 2005, pp. 297–329.
 16. Aerosol particles in the atmosphere are responsible for around 800,000 premature deaths each year worldwide. The quantity of aerosols is significant enough for them to feature among the “planetary boundaries,” but the safety threshold has not yet been determined in sufficiently accurate quantitative terms.
 17. Mace, G., *et al.*, “Biodiversity” in *Ecosystems and Human Well-being*, pp. 79–115.
 18. According to the “2014 Living Planet Report” issued by the WWF.
 19. WWF (October 2004). Bad blood? A survey of chemicals in the blood of European ministers. www.worldwildlife.org/toxics/pubs/badblood.pdf. Cited in Rockström, J., & Klum, M. (2012). *Op. cit.*, p. 209.
 20. Rockström, J., Steffen, W., Noone, K., Persson, Chapin, F. S., Lambin, E. F.,... Schellnhuber, H. J. (2009). A safe operating space for humanity. *Nature*, 461(7263), 472–475.
 21. Diana Liverman, personal conversation at the Mind and Life Institute meeting: “Ecology, Ethics, and Interdependence.” Dharamsala, October 2011.

22. According to an evaluation by the Millennium Ecosystem Assessment (MEA), a United Nations initiative.
23. Pavan Sukhdev, in the preface of Wijkman, A., & Rockström, J. (2013). *Op. cit.* Sukhdev is also the founder of Corporation 2020, an organization that promotes environmentally friendly business.
24. According to the World Meteorological Organization, press release No. 1002, September 9, 2014.
25. This global warming, which reflects the general changes in climate over the course of the last century, must not be confused with variable meteorological patterns, which—though sometimes extreme—come about whatever the circumstances in some places. The winter of 2010, for example, was particularly cold in Scandinavia, Russia, and the east coast of the United States, but it was hotter than normal in the rest of the world. In the Arctic and in Canada, temperatures were 4°C above average.
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 67. Including Fredrick Robelius, a member of the Swedish team headed up by Kjell Aleklett (Global Energy System in Uppsala), who looked into the world's entire oil reserves; the APSO (Association for the Study of Peak Oil and Gas), also presided over by Professor Aleklett; the German Central Bank and Merrill Lynch & Co.; the "Sustainable Energy and Security" report published by the insurance market Lloyd's; "The Oil Crunch," a report written by several business heads assembled by Richard Branson; and the UK Industry Task Force on Peak Oil and Energy Security. All cited in Wijkman, A., & Rockström, J., *Bankrupting Nature: Denying Our Planetary Boundaries*, Routledge, 2013, p. 69.
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