11

Introduction to the Land System Change Boundary

SIMON P. MEISCH

As early as 1819, the polymath Alexander von Humboldt observed a massive land system change in the Lake Valencia region of present-day Venezuela. To create agricultural land for colonial commodities such as sugar, indigo, and cotton, European settlers were cutting down large areas of the nearby tropical forests, with serious detrimental consequences for water flows, soils, biodiversity, and the regional climate system (von Humboldt et al. 1814: 142–145). What makes Humboldt's observation still relevant is how he linked ideology (colonialism, extractivism) and specific social practices (agriculture) to the negative effects of land system changes, including local climate change. Forests played a crucial role in his assessment.

A similar rationale drives the planetary boundary on land system change. Since the 2015 update, the control variable of this boundary is the amount of remaining forest cover (in per cent) compared to the pre-industrial Holocene state (100 per cent). In particular, this takes into account the importance of tropical forests for evapotranspiration and boreal forests for land surface albedo effects, which refers to the proportion of solar radiation reflected back into space (Steffen et al. 2015). There are two types of boundary value: a global value for all forests relative to the preindustrial Holocene base value (75 per cent), and values specific to the three major forest biomes: boreal, temperate, and tropical. In the 2023 update to the planetary boundaries framework, the current global value is 60 per cent of Holocene forest cover, exceeding the boundary value of 75 per cent. The biome-specific thresholds have also been exceeded, with deforestation continuing (Richardson et al. 2023).

As with other planetary boundaries, the control variable for land system change has changed since the concept was introduced. Originally, the variable referred to the 'percentage of global land cover converted to cropland'. The underlying rationale was that '[l]and-system change, driven primarily by agricultural expansion and intensification, contributes to global environmental change, with the risk of undermining human well-being and long-term sustainability'

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 19 Nov 2026 at 17:22:56, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/9781009443586.016

(Rockström et al. 2009). This reference to agriculture disappeared in later updates. An interesting feature of the original definition is that it was a rare occasion when the framework mentioned a social sector as responsible for profound planetary changes. It has since been criticized for its silence on the social processes and key actors that are pushing humanity beyond a safe operating space; the framework would gain political teeth if it related the environmental changes to actual human action and social organizations (Biermann & Kim 2020).

An ethical discussion of land system change, therefore, needs to 'put people on the map' (Ellis & Ramankutty 2008). Humans have always altered the Earth's surface because, like almost all other creatures, they metabolize and cannot help but consume the resources grown on or extracted from the land. What is needed, however, is an ethical discussion about morally acceptable cultivation of and changes to land systems. The two chapters in this book address this issue in different ways.

In their text, Joana Castro Pereira and Carlota Houart draw on their research in the Amazon, one of the hotspots of land system change. They are critical of those who view the region as merely a bioeconomy and suggest instead the concept of 'forestzenship' that 'refers to understanding human beings as one among many members of a forest community, each contributing to the preservation and development of the entire community' (Chapter 12, Section 12.2.2). In this way, Castro Pereira and Houart argue for a multi-species ethic of land use that rejects anthropocentric arguments in favour of an inclusive and intercultural ethic that empowers local communities, respects the rights of ecosystems and animals, and embraces diverse knowledge systems for transformative change and sustainable progress. Their text underscores the relevance of governance for implementing more ethical policies.

Alice Benessia's text is in the form of a diary. She gives the reader insights into her daily work at the Pianpicollo Selvatico Foundation in Northern Italy, which is dedicated to research at the intersection of art, deep ecology, and regenerative agriculture. Benessia talks about the conversations she and the Foundation's guests have with the land, and what it means to physically engage with a land that has long been transformed by an agro-industrial system. Her focus is on living with the land and all that lives in and on it – rather than mastering and possessing it – and on healing the land in challenging times of climate change. With her work, Benessia explicitly suggests a different form of knowledge co-production for land system change.

References

Biermann, F., & Kim, R. E. (2020). The Boundaries of the Planetary Boundary Framework: A Critical Appraisal of Approaches to Define a 'Safe Operating Space' for Humanity. *Annual Review of Environment and Resources.* 45(1), 497–521. DOI: 10.1146/annurev-environ-012320-080337.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 19 Nov 2026 at 17:22:56, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/9781009443586.016

Ellis, E. C., & Ramankutty, N. (2008). Putting People in the Map: Anthropogenic Biomes of the World. *Frontiers in Ecology and the Environment.* 6(8), 439–447. DOI: 10.1890/070062.

von Humboldt, A., Bonpland, A., & Williams, H. M. (1814). *Personal Narrative of Travels to the Equinoctial Regions of the New Continent during the Years 1799–1804 by Alexander de Humboldt and Aimé Bonpland: With Maps, Plans &c*. London: Printed for Longman, Hurst, Rees, Orme, and Brown. DOI: 10.5962/bhl.title.87614.

Richardson, K., Steffen, W., Lucht, W., et al. (2023). Earth beyond Six of Nine Planetary Boundaries. *Science Advances.* 9(37), eadh2458. DOI: 10.1126/sciadv.adh2458.

Rockström, J., Steffen, W., Noone, K., et al. (2009). Planetary Boundaries: Exploring the Safe Operating Space for Humanity. *Ecology and Society.* 14(2), 32. DOI: 10.5751/ES-03180-140232.

Steffen, W., Richardson, K., Rockström, J., et al. (2015). Planetary Boundaries: Guiding Human Development on a Changing Planet. *Science.* 347(6223), 1259855. DOI: 10.1126/science.1259855.

Downloaded from https://www.cambridge.org/core. UNIVERSIDAD AUTONOMA METROPOLITANA, on 19 Nov 2026 at 17:22:56, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/9781009443586.016