Reconciling human development with conservation requires a comprehensive understanding of the current ecological condition and spatial distribution of land. Using recent and spatially explicit global datasets, this study quantifies the degree of human modification across all terrestrial lands, ecoregions, and biomes. The results suggest that fewer unmodified lands remain than previously reported and that the majority of the world is in a state of intermediate modification, with 52% of ecoregions classified as ‘moderately modified’. The researchers state that these regions are highly fragmented due to human activities and fall within critical land-use thresholds — they require urgent attention. These regions, therefore, require proactive spatial planning to maintain biodiversity and ecosystem function before vital environmental resources are lost.

Human activity is transforming the terrestrial biosphere, impacting on global biodiversity, affecting how ecosystems function and remain stable, and altering the services they provide — and upon which we depend. A number of international initiatives have been established with the goal of reconciling human development with conservation — the EU Biodiversity Strategy, for example. However, such efforts require detailed information on the current condition of terrestrial ecosystems, including on the extent and configuration of the lands most and least affected by human alteration, to be successful.

Previous global assessments of human land modification have largely focused on habitat conversion alone; this fails to capture both the variety of human activities involved — agriculture, urban settlements, roads, energy, mining, etc. — and the cumulative effects of multiple activities, which can be dire when numerous impacts coincide.

The researchers, therefore, conducted a comprehensive spatial assessment of the estimated impact of 13 anthropogenic stressors across all terrestrial lands, biomes and ecoregions (excluding Antarctica). Using datasets with a median year of 2016, the researchers modelled and mapped the spatial extent of each stressor over areas of 1 km². The stressors fell into five major categories:

- Human settlement (pollution density and built-up areas)
- Agriculture (cropland and livestock)
- Transportation (major roads, minor roads, two tracks and railroads)
- Mining and energy production (mining, oil wells and wind turbines)
- Electrical infrastructure (power lines and night-time lights)

To inform global and regional decision-making, the study assessed regional variation in land modification at the ecoregion and biome levels.
The path to a sustainable future will be charted somewhere between wild and urban

The researchers say that the resulting ‘cumulative human modification map’ represents the most current and comprehensive quantification of the influence of human activity on the world’s terrestrial lands. The results show that 95% of the global terrestrial surface has some indication of human modification and 84% is experiencing multiple human stressors, with more stressors being associated with higher degrees of modification. Only 30% of ecoregions are classified as having a low degree of land modification and retain most of their natural lands, whereas the majority of ecoregions (52%) are classified as moderately modified. Moderately modified ecoregions retain up to only 50% of low modified (natural) lands and fall within critical land-use thresholds, thus, warrant timely conservation attention. These regions require proactive land-use planning and strategic habitat protection and restoration strategies to help maintain critical extents and configurations of habitat that sustain biodiversity and ecosystem-service provisioning. These are also regions where it’s important to direct science research and policy action to manage the cumulative impact of different types of development to avoid reaching unsustainable development levels that may push natural systems over ecological thresholds or tipping points, say the researchers.

This research has limitations; for example, it does not account for all human stressors or for climate change. Nonetheless, the findings have high policy relevance and can be applied at global, national and regional levels. Specifically, the researchers call for a shift in conservation priorities towards moderately modified ecoregions; these fall within critical land-use thresholds and thus warrant elevated attention and proactive spatial planning to maintain biodiversity and ecosystem function, before important environmental values are lost.

3. For more information on study findings, see: http://gdra-tnc.org/current/.