Land-System Change: The Catalyst of Climate Change and Biodiversity Loss

A Corporate and Market-Based Approach to the Reduction of Deforestation

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This policy brief is aimed at attendees of the UN Climate Summit, specifically the governments and trans-national corporations who greatly influence the changing of land systems. Governments have the power to set laws and regulations and corporations have the power to implement sustainable business practices.

EXECUTIVE SUMMARY

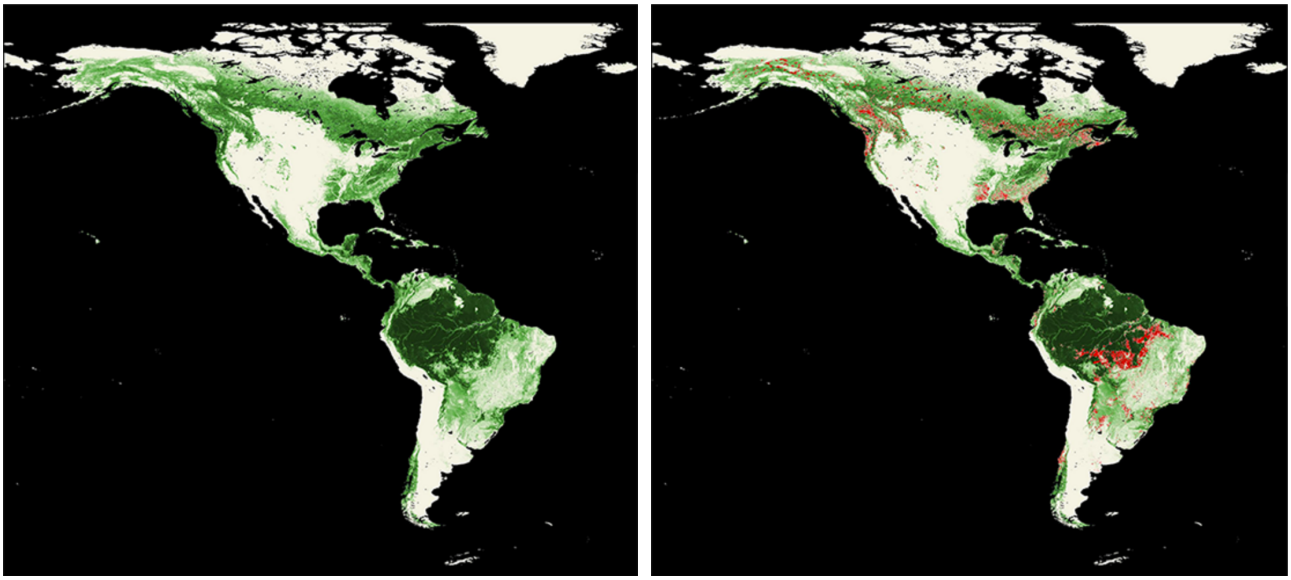
It has been proposed that no more than "15 percent of global ice-free land should be converted to cropland" (1, p17) to avoid irreversible changes to the environment. The primary concern arising from land-system change is its close relation to other planetary boundaries, such as climate change, biodiversity loss and freshwater use. It has immense impact on sustainable development, as it directly affects three out of the eight other planetary boundaries. The conversion of rainforest to pastures and cropland results from increasing agricultural demands. This results in a loss of biodiversity, which provides regulation for ecosystems, as well as services to humans, including flood and erosion prevention. The rainforest regulates climate change as it curbs carbon emissions. The livestock sector releases high amounts of methane and nitrous oxides, as well as harmful waste products. This has led to soil and water degradation. As land health regulates soil health and nutrients, deforestation and agriculture remove these services. This threatens future agricultural endeavours and environmental health, as the soil does not retain arability. Existing forms of governance are limited in their approach and methodology. This arises from their non-binding nature. The close relationship between the economics of agriculture and land conversion limits the extent to which corporations and nations act. Policies need to tackle corporate practice and consumerism. Governments need to set regulations and laws in connection to land management and the agricultural practices of trans-national corporations. These need to focus on the implementation of sustainable farming methods, as well as the protection of land, through the limitation of land conversion. As consumerism drives the conversion of land, there needs to be an initiative to decrease the consumption of meat and dairy products. Food prices should be altered to reflect the cost of production, thereby affecting demand and consumption. Awareness needs to be raised of the effects of diet on environmental change, as the connection between animal agriculture and environmental degradation is not well-known.

EMPIRICAL ANALYSIS

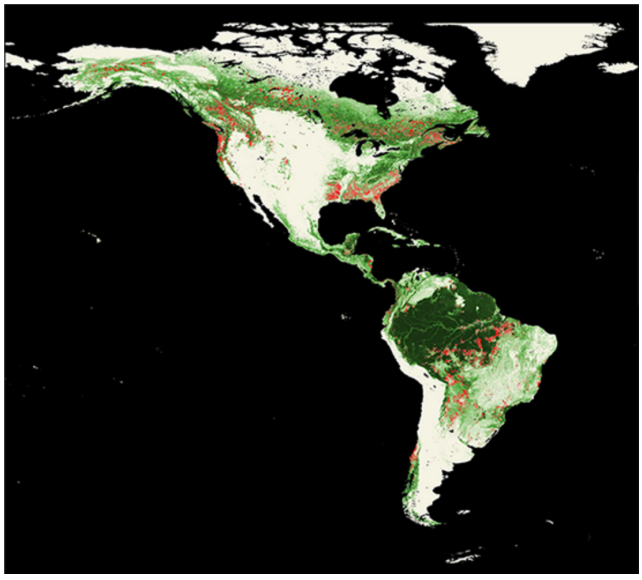
Industrial agriculture accounts for nearly 91 percent of rainforest deforestation (2, p9). 20 percent of forests were cleared between 1990 and 2005 in 18 tropical countries (3, p1). Approximately 40 percent of the Earth's land surface has been converted to cropland and pastures (4, p570).

Figure 1

Forest cover loss in North and South America from 2000 to 2010 (5)



Percent Tree Cover, 2000 Forest Cover Loss 2000 - 2005



Forest Cover Loss 2005 - 2010

Deforestation and the conversion of land has led to four major environmental concerns:

1. BIODIVERSITY LOSS

Biodiversity is essential for the functioning of ecosystem services, which include pollution breakdown and absorption (6), climate, soil and water regulation (7), and the resistance to infectious diseases (7). Biodiversity provides humans with beneficial services such as "erosion prevention, flood control, water treatment, fisheries protection and pollination functions" (8, p17). Two thirds of all known species and 65 percent of the 10,000 endangered species inhabit the rainforest (8, p16). Daily, up to 137 species of plants and animals are lost due to deforestation (9, p3). The FAO contends that 15 out of 24 important ecosystem services are in decline, and livestock has been identified as the primary reason (10).

2. SOIL DEGRADATION

Deforestation and intensive agriculture have led to soil and water degradation due to the disruption of the ecosystem's regulatory services. Deforestation, fertilisation and overgrazing reduce soil nutrients and quality, and increase the prevalence of soil erosion, desertification and salinisation (11). As a result, soil loses its arability. As much as 40 percent of global croplands experiences reduced fertility, soil erosion and overgrazing (4, p570). Many agricultural lands are only cultivated for short periods of time before being deserted due to rapid productivity loss (12).

3. FRESHWATER SCARCITY

The conversion to agricultural land contributes to the globe's freshwater scarcity, as the livestock sector uses one-third of global freshwater (13, p20888). Further, "animal wastes, antibiotics and hormones, chemical from tanneries, fertilisers and the pesticides used to spray feed crops" (10, p1)

contribute to euthropication and water pollution. As a result of deforestation and biodiversity loss, ecosystems are unable to breakdown and absorb these pollutants.

4. THE AIDING OF CLIMATE CHANGE

The conversion of rainforests to agricultural land is aiding climate change. After fossil fuel combustion, land-use change is the second largest emitter of greenhouse gases (12, p331). Trees are a vital component in the carbon cycle as they curb carbon emissions, thereby decreasing the concentration of atmospheric CO_2. Further, industrial agriculture releases harmful gases. According to the UN Food and Agriculture Organisation more global warming greenhouse gases are generated by cattle-rearing than the transportation sector (14, pxxi). For example, the livestock sector emits 65 percent of anthropogenic nitrous oxide, which has 296 times the global warming potential of CO_2 (14, pxxi).

EXISTING GOVERNANCE

Local and national actions have been taken to protect land. The Nature Conservancy has a program in which they buy a share of a nation's debt for the guarantee that some of its forest will be preserved (3). Brazil, by 2013, reduced deforestation by 71 percent of the annual average between 1996 and 2005 (15, p8). The New York Declaration on Forests (2014) was a breakthrough on the international scale, signed by over thirty countries and thirty trans-national corporations, all pledging to support the goal to "cut natural forest loss in half by 2020, and strive to end it by 2030" (15, p2)

ASSESSMENT / ANALYSIS OF EVIDENCE

Land-system change is primarily connected to the agricultural sector, specifically animal agriculture, as rainforests are mainly cleared for cattle ranching and crop production (4). Land conversion is important for food security, and has deep economic and consumerist connections. This is problematic as the change in western dietary patterns to those which are highly concentrated in meat and dairy product increases the demand for the expansion of the agricultural sector. With population increase, so does the demand for food. While increased land-system change has led to increased food production, these agricultural practices are causing long-term harm to ecosystem services, many of which are vital for agriculture (4). This threatens future food security, but also the livelihoods of those who are directly dependent on the rainforest's resources.

The main concerns that arise from land-system change are its complexity and its effects on other planetary boundaries. Deforestation has immediate influence on biodiversity, which is vital for ecosystems to perform their services. This directly affects climate change, as well as soil and water regulation and health. Due to the nature of land-system change and its disturbance of multiple planetary boundaries, proper governance, on both corporate and national levels, will reduce deforestation and land degradation. It will further aid in the regulation of climate change, reduction of biodiversity loss and sustainable freshwater use. This increases the sustainability of the planet by slowing down and decreasing the degradation of the other boundaries.

The issues with existing policies arise on three fronts:

1. THE NON-BINDING CONDITIONS

Frameworks such as the UN's Land Degradation Neutrality (LDN) have outlined measures to decrease the degradation of land and overturn previous degradation, to aid nations in the operationalisation (16). These are only theoretical and suggestive and thereby do not demand any

extent of action. Many of the signed agreements which approach land-system change, such as the New York Declaration are non-binding. This means that while, both, national and trans-national corporations have agreed to drastically decrease forest loss, there is no law-binding commitment or obligation.

2. THE ECONOMIC CONNECTIONS

As land-system change is deeply rooted in business and the economics of the agricultural sector, corporations and countries are forced to make the decision between profit or sustainability. In a capitalist society, short-term profit is chosen over long-term sustainability (17). This economic connection hinders the creation of policies due to the connection between agriculture and national GDP. The politics around money limits the desire of corporations and nations to take the necessary means of action. In order to decrease land-system change there will ultimately be a decrease in corporate profit.

3. THE IGNORANCE OF ANIMAL AGRICULTURE

This leads to the next concern which is that existing laws fail to recognise the role of animal agriculture in environmental degradation. For example, in the United States and Brazil farm animals are exempt from many of the laws (18). Meat producers are usually exempt from environmental regulations. In the case that they are not, issues, such as the inadequate funding, the inability or lack of enforcement, and corruption, deny regulation (18). Further, there is a lack of public awareness of the role of agriculture on climate change. The discourse surrounding climate change is oftentimes limited to the combustion of fossil fuels, thereby marking the reduction of these emissions as the solution to climate change. There is little to no mention of the impact that the agricultural industry is having on climate change, or the action that can be taken to reduce this.

CONCLUSION, RECOMMENDATIONS AND OUTLOOK

The main issue with existing governance and approaches to land-system change is that the majority are on an international scale and therefore theoretical and non-binding. This leaves nations or corporations with the decision of how much they will do to support the effort. Action needs to be taken on national front, with emphasis on corporate practice and consumerism. While land-system change is inevitable due to population demand and growth, governments need to set laws that regulate corporations and monitor their practices. This needs to be done in three steps:

1. RESEARCH

There needs to be increased research into the field of land-system change. This should be sponsored by both national and international agencies, as the effects of land-system change have impacts worldwide. This will allow for an increased understanding into the functioning of ecosystems, specifically soil and water regulation. Thereby, allowing for the optimisation of agricultural practices. Further, it will allow for better understanding of the effects of land-system change on the other planetary boundaries, and what action can be taken to minimalise these.

2. LAND ARCHITECTURE

There needs to be a form of land architecture. With increased awareness of the functioning of ecosystems, agriculture needs to be limited to the most productive areas, where soil health will provide long-term support. As mentioned, currently, most agricultural land is deserted after short periods of time due to productivity loss (12). Agricultural allocation must be combined with a new regiment of sustainable farming methods, which focus on maintaining soil health, managing water and reducing air pollution. Following the guidelines of the LDN, there needs to be an initiative to reverse past degradation. This will reduce overall deforestation and biodiversity loss.

3. MARKET-LIKE REGULATIONS

As land-system change is driven by consumerism and the market, there needs to be an implementation of market-like regulations. Currently, countries such as the United States provide large corporations with regulatory, legal and economic support (19). Industry and governmental actions have offered subsidies to large corporate producers, thereby increasing the consumerism of animal products through their low prices (19). This needs to be reversed, and factors such as public and environmental health costs, work conditions and animal cruelty must be internalised in food prices. As there is little public awareness of the short and long term effects of diet and agriculture on the environment, there needs to be an initiative to raise awareness. This can be done through coverage in the mainstream media. As well as, social media campaigns and school presentations, which focus on the younger generation.

LIST OF CITED REFERENCES

(1) Rockström J, Steffen W, Noone K, Persson Å, Chapin III FS, Lambin E, Lenton T, Scheffer M, Folke C, Schellnhuber HJ, Nykvist B. Planetary boundaries: exploring the safe operating space for humanity. Ecology and society. 2009 Nov 18;14(2).

(2) Margulis, Sergio. Causes of Deforestation in the Brazilian Amazon [Internet]. Washington: World Bank Publications; 2003. Available from: ProQuest Ebook Central.

(3) Theilmann J. Deforestation. Salem Press Encyclopedia Of Science [serial on the Internet]. (2017, January). Available from: Research Starters.

(4) Foley JA, DeFries R, Asner GP, Barford C, Bonan G, Carpenter SR, Chapin FS, Coe MT, Daily GC, Gibbs HK, Helkowski JH. Global consequences of land use. Science. 2005 Jul 22; 309(5734): 570-4.

(5) NASA, USGS, UMD, SDSU. GMM: Amazon Deforestation In Rondonia, Brazil, 2000-2010 [Internet]. Available from: https://svs.gsfc.nasa.gov/vis/a010000/a010800/a010872/compare_global_deforestation.html

(6) Verma SK. Environmental Crisis and Conservation. Solapur: Laxmi Book Publication; 2015.

(7) Foley JA, Asner GP, Costa MH, Coe MT, DeFries R, Gibbs HK, Howard EA, Olson S, Patz J, Ramankutty N, Snyder P. Amazonia revealed: forest degradation and loss of ecosystem goods and services in the Amazon Basin. Frontiers in Ecology and the Environment. 2007 Feb 1;5(1): 25-32.

(8) Chakravarty S, Ghosh SK, Suresh CP, Dey AN, Shukla G. Deforestation: causes, effects and control strategies. Global perspectives on sustainable forest management. 2012;1:1-26.

(9) NASA Facts. Tropical deforestation. The Earth enterprise series. [November 1998]. Available from: https://msu.edu/~urquhart/professional/NASA-Deforestation.pdf

(10) Food and Agricultural Organisation of the United Nations. Livestock a major threat to environment. [19 November 2006] Available from: http://www.fao.org/newsroom/en/news/2006/1000448/index.html

(11) Wu J. Land Use Changes: Economic, Social, and Environmental Impacts. Choices [Internet]. 2008; 23(4). Available from: http://www.farmdoc.illinois.edu/policy/choices/20084/theme1/2008-4-02.pdf

(12) Sohng J, Singhakumara B, Ashton M. Effects on soil chemistry of tropical deforestation for agriculture and subsequent reforestation with special reference to changes in carbon and nitrogen. Forest Ecology and Management. 2017;389:331-340.

(13) Herrero M, Havlik P, Valin H, Notenbaert A, Rufino M, Thornton P et al. Biomass use, production, feed efficiencies, and greenhouse gas emissions from global livestock systems. Proceedings of the National Academy of Sciences. 2013;110(52):20888-20893.

(14) Steinfeld H, Gerber P, Wassenaar TD, Castel V, de Haan C. Livestock's long shadow. 1st ed. Rome: Food and Agriculture Organization of the United Nations; 2006.

(15) United Nations Climate Summit. Forests: action statements and action plans. United Nations Headquarters. New York: 2014. Available from: http://www.un.org/climatechange/summit/wp-content/uploads/sites/2/2014/07/New-York-Declaration-on-Forest-%E2%80%93-Action-Statement-and-Action-Plan.pdf

(16) UNCCD/Science-Policy-Interface. Land in balance. The scientific conceptual framework for land degradation neutrality (LDN). Science-Policy Brief 02. United Nations Convention to Combat Desertification (UNCCD). Bonn, September 2016. Available from: ISBN: 978-92-95110-35-9.

(17) Gray R. Is accounting for sustainability actually accounting for sustainability…and how would we know? An exploration of narratives of organisations and the planet. Accounting, Organizations and Society. 2010;35(1):47-62.

(18) Bennett E. Animal agriculture laws on the chopping block: Comparing United States and Brazil. Pace Environmental Law Review. 2014;31(2):531-564.

(19) Broad GM. Animal production, Ag-gag laws, and the social production of ignorance: Exploring the role of storytelling. Environmental Communication. 2016;10(1):43-61.