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Land Use Policy

Viewpoint Paper

Title

Mitigating “displaced” land degradation and the risk of spillover through the decommodification of land products.

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Highlights

- Land degradation More than 70% of the Earth’s ice-free terrestrial ecosystems have been transformed from their natural state and countries have reported that 1/5 of all land (more than 2 billion hectares) is now considered degraded
- Telecoupling, that is linking consumption zones and production pose unprecedented challenges and opportunities for sustainability.
- Innovative blockchain solutions make 'farm-to-table' food traceability and will turn a commodity into a "decommodity"

1 **Mitigating “displaced” land degradation and the risk of spillover through the**
2 **decommoditization of land products**

3

4 **Abstract**

5 *Land degradation impacts human well-being and biodiversity while increasing*
6 *exposure to emerging infectious diseases. The primary indirect driver of land*
7 *degradation is consumption, which increasingly involves agricultural products*
8 *produced far away. Reversing these negative trends requires the decommoditization*
9 *of land products through consumer-transparent ‘farm to table’ information on land*
10 *health combined with **an efficient land use planning that is a** greater optimization of*
11 *land use and management decisions towards the achievement of multiple benefits.*

12

13 **Keywords:** Land degradation, telecoupling, decommoditization

14

15 The COVID-19 pandemic has highlighted the multiple and complex relationships
16 between biodiversity, anthropization of environments, zoonoses and human health.
17 Among the causes of the emergence of zoonoses are land degradation and contact
18 between societies and animals that are reservoirs for pathogens (Morand et al.,
19 2019). This pandemic has also reinforced the image of the "butterfly effect" and its
20 consequences thousands of kilometers away. Distant interactions between people
21 and the environment, referred to as telecoupling (Liu et al., 2013), pose
22 unprecedented challenges and opportunities for sustainability. Lenzen et al. (2012)
23 show that 30% of threats to biodiversity are due to international trade.

24 Land is the basis of all terrestrial ecological processes. Land degradation is
25 characterized by a negative trend in land condition (IPCC, 2019), involving the total
26 or partial loss of vegetation cover, soil fertility, productivity and/or biodiversity, leading
27 to a decline in ecosystem services as well as both ecosystem and community
28 resilience (UNCCD, 2017). More than 70% of the Earth’s ice-free terrestrial
29 ecosystems have been transformed from their natural state (IPBES, 2018; IPCC,
30 2019) and countries have reported that 1/5 of all land (more than 2 billion hectares) is
31 now considered degraded (UN-STATS, 2020). Economic losses equivalent of 10 to
32 17% of the world’s gross domestic product have been attributed to land degradation
33 and land use change (ELD, 2015) undermining the well-being of 3.2 billion people
34 (IPBES, 2018) and contributing to the projected extinction of 1 million species by

35 2050 (IPBES, 2019). Moreover, land use change is the primary transmission pathway
36 for emerging infectious diseases due to modification of natural habitats, which
37 expands the wildlife-human interface and heightens the risk of pathogen spillover
38 from wildlife to domestic animals and humans (Jones et al., 2013).

39 As much as 35% of all land is used for agricultural purposes and the rate of land
40 conversion for the provision of food products and materials for biofuels is
41 accelerating (IPCC, 2019). While land use is necessary for meeting human needs,
42 overexploitation of land by humans, is the main determinant of land degradation. The
43 concept of Human Appropriation of Net Primary Production (HANPP) has been
44 suggested as an integrated socio-ecological indicator of human intervention **of**
45 natural ecosystems (Haberl et al., 2014). However, this indicator does not factor in
46 the *imported* products that are consumed by the population. Embodied HANPP
47 (eHANPP) is an extension of the HANPP concept and is related to consumption. It
48 thus highlights both nationally-produced food and fiber, but also products (timber,
49 cereals, biomass, etc.) imported from other parts of the world for national
50 consumption. In short, the aim of the eHANPP concept is to better link land use with
51 consumption to be able to quantify environmental demands resulting from
52 consumption (Haberl et al., 2016). The eHANPP concept can be used to analyze
53 telecoupling and describe the balance/unbalance between production and
54 consumption areas, and thus highlight the importance of trade and the
55 connection/disconnection between these areas (Meyfroidt et al., 2013; Erb et al.,
56 2009).

57 Weinzettel et al. (2019) estimate that 23% of the ecological footprint of agriculture
58 results from the consumption of imported products. The wealthiest societies have a
59 particularly large per capita footprint, the majority of which comes from imported
60 products. Europe is among the ten regions of the world that import the most products
61 to meet consumer needs (Haberl et al., 2016). Consumption of imported products
62 may lead to economic benefits through exports, but it also effectively displaces land
63 degradation **towards the countries that become suppliers of products that are**
64 **imported. Although the consumption-based accounting is well documented, there is**
65 **also a need to reassess the role of “growth-oriented economies and the pursuit of**
66 **affluence” (Wiedmann et al., 2020).**

67 Taking into account future projections of population growth and consumption (Tilman
68 et al., 2011), rich countries will need to stabilize or even reduce their agricultural

69 footprint in order to (i) share the available primary productivity potential with poorer
70 countries and (ii) reverse land degradation. The reduction of food-waste (IPCC,
71 2019), balanced food diets (Alexander et al., 2016), the acceleration of the
72 transformation of food systems (Springmann et al., 2018) could bring solutions to
73 avoid, reduce and reverse land degradation. Transforming fashion supply chains
74 could also be part of these solutions (Caniato et al., 2012).

75 In today's telecoupled world, human-environment interactions need to be
76 documented to support sustainable development, conserve biodiversity and avoid the
77 risk of catastrophic pathogen spillover. This will require an integration of our efforts
78 towards the sustainable resource use in and among countries (SDG target 12.2) and
79 out efforts to ensure no further harm (in net terms) to land for each land type¹ in each
80 country (SDG target 15.3). The former includes the measurement of the material
81 footprint, the attribution of global material extraction to domestic final demand of a
82 country (analogous to eHANPP). The latter is a concept known as land degradation
83 neutrality (LDN), which is defined as "*a state whereby the amount and quality of land*
84 *resources necessary to support ecosystem functions and services and enhance food*
85 *security remain stable or increase within specified temporal and spatial scales and*
86 *ecosystems*" (UNCCD, 2016). It is a no-net loss approach that seeks to maintain or
87 enhance the natural capital of land, emphasizing the multiple benefits which can be
88 derived from land while fully recognizing that land is a limited resource. The focus is
89 thus on the optimization all land use planning decisions across the landscape so that
90 new degradation can be avoided (conservation), the risk of further degradation where
91 conversion has taken place can be reduced (sustainable land management), and
92 more of our future needs for land can be met through the reversal of past land
93 degradation (rehabilitation and restoration) (Cowie et al., 2018).

94 Linking consumption and production (measured as flows) to land degradation
95 (measured in area) requires embedding information about the sustainable use and
96 management of land into what consumers can learn about the products at the point
97 of purchase. However, information on the land use and management practices
98 associated with imported products is not typically accessible to consumers who may

¹ "Class of land with respect to land potential, which is distinguished by the combination of edaphic, geomorphological, topographic, hydrological, biological and climatic features that support the actual or historic vegetation structure and species composition on that land". In Orr, B.J., A.L. Cowie, V.M. Castillo Sanchez, P. Chasek, N.D. Crossman, A. Erlewein, G. Louwagie, M. Maron, G.I. Metternicht, S. Minelli, A.E. Tengberg, S. Walter, and S. Welton. 2017. Scientific Conceptual Framework for Land Degradation Neutrality. A Report of the Science-Policy Interface. United Nations Convention to Combat Desertification (UNCCD), Bonn, Germany.

99 wish to know the impact their diet has on land quality, biodiversity, ecosystem health
100 in production areas, far from home (Alexander et al., 2016). Innovative blockchain
101 solutions make 'farm-to-table' food traceability of this kind possible (Horton, 2020).
102 Encouraging such innovations can support the full emergence of what is currently a
103 niche market for producers and retailers that aim not to degrade land. Integrating
104 sustainable consumption with sustainable land management will turn a commodity
105 into a "decommodity" (Bennett et al., 2019), effectively incentivizing land restoration
106 and disincentivizing land conversion. Working to reduce "displaced" land degradation
107 with more informed consumer choices combined with more informed land use
108 planning decisions will reduce the pressure on biodiversity, while also helping close
109 down a primary transmission pathway for emerging infectious diseases.

110

111 "The views expressed herein are those of the authors and do not necessarily reflect
112 the views of the United Nations."

113

114 References

- 115 Alexander, P., Brown, C., Arneith, A., Finnigan, J., Rounsevell, M.D.A., 2016. Human appropriation of
116 land for food: The role of diet. *Glob. Environ. Change-Human Policy Dimens.* 41, 88–98.
117 <https://doi.org/10.1016/j.gloenvcha.2016.09.005>
- 118 Bennett, J.M., McBratney, A., Field, D., Kidd, D., Stockmann, U., Liddicoat, C., Grover, S., 2019. Soil
119 Security for Australia. *Sustainability* 11, 3416. <https://doi.org/10.3390/su11123416>
- 120 Caniato, F., Caridi, M., Crippa, L., Moretto, A., 2012. Environmental sustainability in fashion supply
121 chains: An exploratory case based research. *Int. J. Prod. Econ.* 135, 659–670.
122 <https://doi.org/10.1016/j.ijpe.2011.06.001>
- 123 Cowie, A.L., Orr, B.J., Castillo Sanchez, V.M., Chasek, P., Crossman, N.D., Erlewein, A., Louwagie,
124 G., Maron, M., Metternicht, G.I., Minelli, S., Tengberg, A.E., Walter, S., Welton, S., 2018. Land
125 in balance: The scientific conceptual framework for Land Degradation Neutrality.
126 *Environmental Science & Policy* 79, 25–35. <https://doi.org/10.1016/j.envsci.2017.10.011>
- 127 ELD, 2015. Pathways and options for action and stakeholder engagement, based on the 2015 ELD
128 Massive Open Online Course "Stakeholder Engagement". Practitioner's Guide.
- 129 Erb, K.-H., Krausmann, F., Lucht, W., Haberl, H., 2009. Embodied HANPP: Mapping the spatial
130 disconnect between global biomass production and consumption. *Ecological Economics*,
131 Special Section: Analyzing the global human appropriation of net primary production -
132 processes, trajectories, implications 69, 328–334.
133 <https://doi.org/10.1016/j.ecolecon.2009.06.025>

134 Haberl, H., Erb, K.-H., Krausmann, F., 2014. Human Appropriation of Net Primary Production:
135 Patterns, Trends, and Planetary Boundaries. *Annual Review of Environment and Resources*
136 39, 363–391. <https://doi.org/10.1146/annurev-environ-121912-094620>

137 Haberl, H., Kastner, T., Schaffartzik, A., Erb, K.-H., 2016. How Far Does the European Union Reach?
138 Analyzing Embodied HANPP, *Social Ecology: Society-Nature Relations Across Time and*
139 *Space*. Springer International Publishing Ag, Cham. [https://doi.org/10.1007/978-3-319-33326-](https://doi.org/10.1007/978-3-319-33326-7_16)
140 [7_16](https://doi.org/10.1007/978-3-319-33326-7_16)

141 Horton, C., 2020. From farm to fork: How blockchain is enabling transparency and traceability. *Food*
142 *and Farming Technology*. URL [https://www.foodandfarmingtechnology.com/features/from-](https://www.foodandfarmingtechnology.com/features/from-farm-to-fork-how-blockchain-is-enabling-transparency-and-traceability.html)
143 [farm-to-fork-how-blockchain-is-enabling-transparency-and-traceability.html](https://www.foodandfarmingtechnology.com/features/from-farm-to-fork-how-blockchain-is-enabling-transparency-and-traceability.html) (accessed
144 1.17.21).

145 IPBES (2018): The IPBES assessment report on land degradation and restoration. Montanarella, L.,
146 Scholes, R., and Brainich, A. (eds.). Secretariat of the Intergovernmental Science-Policy
147 Platform on Biodiversity and Ecosystem Services, Bonn, Germany. 744
148 pages.<https://doi.org/10.5281/zenodo.3237392>

149 IPCC, 2019: Climate Change and Land: an IPCC special report on climate change, desertification,
150 land degradation, sustainable land management, food security, and greenhouse gas fluxes in
151 terrestrial ecosystems [P.R. Shukla, J. Skea, E. Calvo Buendia, V. Masson-Delmotte, H.-O.
152 Pörtner, D. C. Roberts, P. Zhai, R. Slade, S. Connors, R. van Diemen, M. Ferrat, E. Haughey,
153 S. Luz, S. Neogi, M. Pathak, J. Petzold, J. Portugal Pereira, P. Vyas, E. Huntley, K. Kissick,
154 M. Belkacemi, J. Malley, (eds.)]. In press.

155 Jones, B.A., Grace, D., Kock, R., Alonso, S., Rushton, J., Said, M.Y., McKeever, D., Mutua, F., Young,
156 J., McDermott, J., Pfeiffer, D.U., 2013. Zoonosis emergence linked to agricultural
157 intensification and environmental change. *PNAS* 110, 8399–8404.
158 <https://doi.org/10.1073/pnas.1208059110>

159 Lenzen, M., Moran, D., Kanemoto, K., Foran, B., Lobefaro, L., Geschke, A., 2012. International trade
160 drives biodiversity threats in developing nations. *Nature* 486, 109–112.
161 <https://doi.org/10.1038/nature11145>

162 Liu, J., Hull, V., Batistella, M., DeFries, R., Dietz, T., Fu, F., Hertel, T., Izaurralde, R.C., Lambin, E., Li,
163 S., Martinelli, L., McConnell, W., Moran, E., Naylor, R., Ouyang, Z., Polenske, K., Reenberg,
164 A., de Miranda Rocha, G., Simmons, C., Verburg, P., Vitousek, P., Zhang, F., Zhu, C., 2013.
165 Framing Sustainability in a Telecoupled World. *Ecology and Society* 18.
166 <https://doi.org/10.5751/ES-05873-180226>

167 Meyfroidt, P., Lambin, E.F., Erb, K.-H., Hertel, T.W., 2013. Globalization of land use: distant drivers of
168 land change and geographic displacement of land use. *Current Opinion in Environmental*
169 *Sustainability, Human settlements and industrial systems* 5, 438–444.
170 <https://doi.org/10.1016/j.cosust.2013.04.003>

171 Morand, S., Blasdell, K., Bordes, F., Buchy, P., Carcy, B., Chaisiri, K., Chaval, Y., Claude, J., Cosson,
172 J.-F., Desquesnes, M., Jittapalapong, S., Jiyipong, T., Karnchanabanthoen, A., Pornpan, P.,

173 Rolain, J.-M., Tran, A., 2019. Changing landscapes of Southeast Asia and rodent-borne
174 diseases: decreased diversity but increased transmission risks. *Ecol. Appl.* 29, UNSP e01886.
175 <https://doi.org/10.1002/eap.1886>

176 The Sustainable Development Goals Report 2020 <https://unstats.un.org/sdgs/report/2020/goal-15/>

177 Springmann, M., Clark, M., Mason-D’Croz, D., Wiebe, K., Bodirsky, B.L., Lassaletta, L., de Vries, W.,
178 Vermeulen, S.J., Herrero, M., Carlson, K.M., Jonell, M., Troell, M., DeClerck, F., Gordon, L.J.,
179 Zurayk, R., Scarborough, P., Rayner, M., Loken, B., Fanzo, J., Godfray, H.C.J., Tilman, D.,
180 Rockstrom, J., Willett, W., 2018. Options for keeping the food system within environmental
181 limits. *Nature* 562, 519-+. <https://doi.org/10.1038/s41586-018-0594-0>

182 Tilman, D., Balzer, C., Hill, J., Befort, B.L., 2011. Global food demand and the sustainable
183 intensification of agriculture. *Proc. Natl. Acad. Sci. U. S. A.* 108, 20260–20264.
184 <https://doi.org/10.1073/pnas.1116437108>

185 UNCCD, 2016. Report of the Conference of the Parties on its twelfth session, held in Ankara from 12
186 to 23 October 2015. Part two: Actions. ICCD/COP(12)/20/Add.1. United Nations Convention to
187 Combat Desertification (UNCCD), Bonn. [http://www.](http://www.unccd.int/Lists/OfficialDocuments/cop12/20add1eng.pdf)
188 [unccd.int/Lists/OfficialDocuments/cop12/20add1eng.pdf](http://www.unccd.int/Lists/OfficialDocuments/cop12/20add1eng.pdf).

189 UNCCD, 2017. Global Land Outlook, First Edition. Bonn, Germany.

190 Weinzettel, J., Vačkářů, D., Medková, H., 2019. Potential net primary production footprint of
191 agriculture: A global trade analysis. *Journal of Industrial Ecology* 23, 1133–1142.
192 <https://doi.org/10.1111/jiec.12850>

193 Wiedmann, T., Lenzen, M., Keysser, L.T., Steinberger, J.K., 2020. Scientists’ warning on affluence.
194 *Nat. Commun.* 11. <https://doi.org/10.1038/s41467-020-16941-y>

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