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"Nature-based Solutions" and the Biodiversity and Climate Crises

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Contents

Chapter One

INTRODUCTION

"NATURE-BASED solutions" (NbS)[1] is a contested term. Academics write long peer-reviewed articles laying out criteria by which so-called NbS might be evaluated,[2] whilst oil majors create new "nature-based solutions" business units unaligned with the basic elements of the definitional criteria being set out by the academics.[3] At the end of the day, NbS means what the powerful actors using it to green their images want it to mean.

The phrase "nature-based solutions" says everything and nothing at the same time. Its proponents argue that such a broadly encompassing term provides opportunities to highlight a whole range of beneficial, biodiversity-protecting practices at the same time, and that packaging all these together in this term might help mobilize protection from a range of drivers of biodiversity and ecosystem loss by calling attention to the myriad ways in which societies benefit from "nature".

But the opportunities provided by the catchall term must be weighed against the risks and dangers of catching too much, providing a convenient cloak for practices that destroy biodiversity. One of the most dramatic examples might be the oil company proclaiming to be saving nature while using the green image to hide continued exploration, extraction, and burning of fossil fuels, an example that is at the same time illustrative

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1 Both NbS and NBS can be used as the abbreviation for "nature-based solutions."

2 Seddon, N. et al. 2021. Getting the message right on nature-based solutions to climate change. *Global Change Biology.* DOI: 10.1111/gcb.15513

3 https://www.total.com/group/commitment/climate-change/carbon-neutrality; https://www.shell.com/energy-and-innovation/new-energies/nature-based-solutions.html#iframe=L3dlYmFwcHMvMjAxOV9uYXR1cmVfYmFzZWRfc29sdXRpb25zL3VwZGF0ZS8

and illuminating of how actors make a term mean what they need it to mean. While academics and advocates have devoted large amounts of human and financial resources to developing standards, guidelines and frameworks putting boundaries around NbS,[4] none of those are adequate to protect nature from the fossil fuel and other extractive industries seeking convenient public relations cover for their devastating operations. Indeed, the term "nature-based solutions", for the biodiversity-destroying industries, is an enormous public relations gift. The fossil majors liberally wrapping themselves in NbS demonstrates its PR value.

While greenwashing may be the first and most visible of the dangers posed by the term, the full range of threats is broader and deeper. "Nature-based solutions" may be used to justify dispossession through land grabbing and "fortress conservation".[5] Land-based carbon offsets, biodiversity offsets, and "fortress conservation"-style "protected areas"[6] are all NbS strategies of corporations and other powerful actors that will require land and ecosystems not yet under their control. Those strategies threaten to displace or otherwise dispossess the current owners and stewards of targeted lands – in particular indigenous peoples and local communities.

Equity becomes a central concern in this contested space. Powerful actors demand and secure access to lands and forests, prioritizing the needs of wealthy countries, corporations, and other global elites to offset their

[4] IUCN Global Standard for NbS. 2020. https://www.iucn.org/theme/nature-based-solutions/resources/iucn-global-standard-nbs; Nature-based solutions to climate change. 2020. https://nbsguidelines.info/

[5] "Fortress conservation" is a term used to describe conservation efforts that evict and exclude humans from their traditional lands and sources of livelihood to "protect" an ecosystem of value to some other, usually non-local, entities such as international conservation organizations. https://redd-monitor.org/2020/06/24/fortress-conservation-disneys-offsets-are-paying-for-heavily-armed-park-rangers-in-conservation-internationals-alto-mayo-redd-project-in-peru/; https://www.anthropology-news.org/index.php/2020/02/11/conservations-not-so-secret-war/; Richards, C. and K. Lyons. 2016. The new corporate enclosures: plantation forestry, carbon markets and the limits of financialised solutions to the climate crisis. *Land Use Policy* 56: 209-216; Benjaminsen, T.A. and I. Bryceson. 2012. Conservation, green/blue grabbing and accumulation by dispossession in Tanzania. *The Journal of Peasant Studies* 39(2): 335-355; Cornered by Protected Areas, https://www.corneredbypas.com/.

[6] Particularly those protected areas under strict protection.

consumption and destruction over the needs and rights to land, life, and livelihoods of indigenous peoples, local communities, species, and ecosystems.

One of the main means by which nature is turned into NbS is through the narratives, techniques, and technologies of economic valuation. In this time of climate crisis, ecosystems are reduced in value to the carbon they contain.[7] Once reduced to their constituent carbon, the carbon-rich elements of ecosystems – most often trees and soils – can be traded on markets. The carbon in land and forests may be further reinvented and repackaged as an "asset class" for new means of capital accumulation through speculation and financialization.[8]

Carbon gains in value as its scarcity rises. Scarcity is currently being manufactured through thousands of "net zero" pledges and the misunderstandings, unintentional or deliberate, of what "net zero" actually means and what sorts of actions it requires.[9] The erroneous interpretation holds that emissions might continue as long as there are offsets available to be purchased in carbon-rich lands and forests. However, the actions "net zero" actually requires preclude offsetting – fossil fuel emissions must be reduced to as close to zero as possible *and* ecosystems restored and protected.[10]

If misinterpretations are ignored and emissions-as-usual continue, there will be little contribution that nature can make in the end to addressing climate change. As temperatures rise, ecosystems will begin to collapse,

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7 Gifford, L. 2020. "You can't value what you can't measure": a critical look at forest carbon accounting. *Climatic Change* 161: 291-306.

8 Principles for Responsible Investment. 2020. New investor guide to negative emission technologies and land use. https://www.unpri.org/news-and-press/new-investor-guide-to-negative-emission-technologies-and-land-use/6655.article

9 World Economic Forum and McKinsey & Company. 2021. Consultation: Nature and net zero. https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/Why%20investing%20in%20nature%20is%20key%20to%20climate%20mitigation/Nature-and-net-zero-vF.pdf

10 ActionAid et al. 2020. Not zero: How 'net zero' targets disguise climate inaction. https://demandclimatejustice.org/wp-content/uploads/2020/10/NOT_ZERO_How_net_zero_targets_disguise_climate_inaction_FINAL.pdf

liberating carbon and further contributing to catastrophic positive feedback cycles. Climate change is, of course, one of the primary drivers of biodiversity loss. The threat of runaway climate change is creating a landing ground for arguments to expand geoengineering research and experimentation, which pose other unique dangers for biodiversity, indigenous peoples, and local communities.

The storyline from NbS to geoengineering has its twists and turns, through "net zero" pledges and the financialization of nature. And it has common threads holding it together, philosophies and ideologies that underpin its neoliberal and neocolonial approaches to nature and its defenders.

Chapter Two

THE MANY DEFINITIONS OF "NATURE-BASED SOLUTIONS"

NbS has attracted many followers in its relatively short existence as a policy idea. That said, there are almost as many definitions as followers. Some institutions with significant investment in its use, such as the International Union for Conservation of Nature (IUCN), are dedicating considerable resources to standardizing its use. However, standardization is likely to prove very difficult in the long term, as fuzzy definitions provide the flexibility necessary for many of those who wish to don the green cloak of NbS. Indeed, climate-mitigation-centric uses of the term currently dominate the policy space, which will drive future understandings about which NbS might have value (those which can mitigate carbon emissions) and whose problems "nature" might be called upon to solve (those actors with large emissions).

A. The genesis and evolution of the term

IUCN introduced the term "nature-based solutions" into the global policy space in 2016. The use of the term has accelerated in recent years and so have the attempts to define it. IUCN has recently taken further steps to clarify the concept, while a range of other actors have also contributed to the refining and further definition of NbS. These include academics associated with the Nature-based Solutions Initiative at Oxford University and ad hoc groupings that have come together to set out guidelines for using the term.

The IUCN definition of NbS. In its recently published global NbS standard, IUCN defines "nature-based solutions" as "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits".[11]

IUCN specifies seven societal challenges: climate change mitigation and adaptation, disaster risk reduction, economic and social development, human health, food security, water security, and reversing ecosystem degradation and biodiversity loss.

From the academy: Oxford scientists define NbS. Academics associated with the Nature-based Solutions Initiative at Oxford University have come up with a more expanded definition of NbS:

> NbS involve working with and enhancing nature to help address societal challenges. They encompass a wide range of actions, such as the protection and management of natural and semi-natural ecosystems, the incorporation of green and blue infrastructure in urban areas, and the application of ecosystem-based principles to agricultural systems. The concept is grounded in the knowledge that healthy natural and managed ecosystems produce a diverse range of services on which human wellbeing depends, from storing carbon, controlling floods and stabilizing shorelines and slopes to providing clean air and water, food, fuel, medicines and genetic resources. NbS is an "umbrella concept" for other established "nature-based" approaches such as ecosystem-based adaptation (EbA) and ecosystem-based mitigation, eco-disaster risk reduction and green infrastructure. More recently, the term "natural climate solutions" (NCS) entered the lexicon. NCS also falls under the umbrella of NbS, but refers explicitly to conservation and management actions that reduce greenhouse gas (GHG) emissions from ecosystems and harness their potential to store carbon.[12]

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[11] https://www.iucn.org/theme/ecosystem-management/our-work/iucn-global-standard-nature-based-solutions

[12] Seddon, N. et al. 2020. Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B* 375. https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0120

Nathalie Seddon, convenor of the Oxford Initiative, describes four broad types of NbS and their benefits: protection, restoration, improved management, and creation. Examples of NbS and benefits of each type include:

> Protection: protecting grasslands, forests and wetlands secures and regulates water supplies, shields communities and infrastructure from floods, erosion and landslides, while protecting carbon
>
> Restoration: restoring coastal wetlands and reefs protects against storm surges, salt water intrusion and erosion and enhances absorption of GHGs
>
> Improved management: of working lands to improve crop yields in drier, more variable climates, while reducing emissions and increasing absorption of GHGs
>
> Creation: green infrastructure in cities to help with cooling and flood abatement, while reducing air pollution, providing health benefits, and increasing absorption of GHGs.[13]

Clearly there are many beneficial practices that proponents include within the definition of NbS. However, there is obviously also not a particularly bounded definition of what is, or is not, NbS.

Standards and guidelines. To further codify the term and increase its utility in policy contexts, IUCN recently released a set of standards and indicators to provide greater clarity to NbS, and perhaps also to preclude the use of the term in ways that might dilute its meaning.[14] UK conservation and research institutions have put forward a much smaller set of NbS guidelines in a more publicly digestible form, through a very prominent open letter targeting the UK presidency of the 26th session of the Confer-

[13] https://www.youtube.com/watch?v=vopEyqhmNE4&t=2093s

[14] https://www.iucn.org/theme/ecosystem-management/our-work/iucn-global-standard-nature-based-solutions

ence of the Parties (COP 26) to the United Nations Framework Convention on Climate Change (UNFCCC), with the intent to be complementary to the more detailed IUCN guidelines.[15] The letter emphasizes that NbS are "not a substitute for the rapid phase-out of fossil fuels". The signatories call on those committing to NbS to uphold four principles: cut emissions, conserve and protect existing ecosystems, be socially responsible, and be ecologically responsible. While good in principle, these guidelines are not specific enough to really function as a benchmark against which to judge the abuse of NbS.

The fuzzier the better? In contrast to the efforts by some to further refine and delineate what is and is not NbS, the Commission of the European Union has crafted perhaps one of the least explicit formulations of the term:

> Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions.[16]

B. Many NbS definitions foreground climate change mitigation

In its broadest definition (IUCN), NbS are human-ecosystem solutions to societal problems, and there is a range of possible societal problems that might be addressed. Climate change is only one of seven societal challenges noted in the IUCN definition. Yet the term is exceedingly popular in the climate change context, as reflected in the focus of the letter to the COP 26 presidency mentioned above. Its use on the climate change front is growing, including through the statements and other efforts of the UN Secretary-General.

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15 https://NBSguidelines.info/; https://medium.com/@naturebasedsolutions32/and-also-not-either-or-the-need-to-restore-nature-and-cut-emissions-9ef7cfda17e6\

16 https://ec.europa.eu/info/research-and-innovation/research-area/environment/nature-based-solutions_en

IUCN and others use NbS in the climate change context in reference to both climate change **adaptation** and **mitigation**, and often also linking with the climate change aspects of **disaster risk reduction** (see Box 1 for definitions of these terms).[17] The proposed EU strategy on adaptation to climate change, for example, includes a section on promoting NbS for adaptation, noting that "protecting and restoring wetlands, peatlands, coastal and marine ecosystems; developing urban green spaces and installing green roofs and walls; promoting and sustainably managing forests and farmland will help adapt to climate change in a cost-effective way".[18] However, despite the broad climate change tent of NbS, mitigation has attracted the most attention and is the context in which references to NbS are most numerous. The mitigation uses are also the focus of this paper. The most frequent reference to NbS (or sometimes "natural climate solutions", NCS) includes the disputable claim that NbS could provide around one-third of the global mitigation effort needed by 2030 (see Box 2 unpacking the problems around that figure).

[17] Chausson, A., B. Turner et al. 2020. Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology* 26: 6134-6155.

[18] https://ec.europa.eu/clima/sites/clima/files/adaptation/what/docs/eu_strategy_2021.pdf

Box 1: Definitions – Mitigation, adaptation, disaster risk reduction[19]

Mitigation (of climate change). A human intervention to reduce emissions or enhance the sinks of greenhouse gases.[20]

Adaptation. In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.[21]

Disaster risk reduction. Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.[22]

Examples of "nature-based" adaptation and/or disaster risk reduction practices include "restoring and protecting coastal ecosystems [to] defend against flooding and storm surges" and "restoration and protection of forests and wetlands [to] improve water security, and reduce risk of floods, soil erosion and landslides".[23]

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19 All definitions are sourced from reports of the Intergovernmental Panel on Climate Change (IPCC). IPCC definitions may evolve over time and the most recent relevant formulations are provided here.

20 IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland.

21 IPCC. 2018. Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor and T. Waterfield (eds.)].

22 IPCC. 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

23 Seddon et al. 2021.

There are also more pecuniary descriptions of NbS, such as being described as "an investable asset class", that is, ecosystems reduced to carbon content for valuation and sale in a market.[24]

UN Secretary-General's climate change summit and the NbS manifesto. One of the most prominent recent linkages of NbS to climate change was at the 2019 UN Secretary-General's climate summit. NbS was one of the action tracks at the summit, and one of the public summit outcomes was a Nature-Based Solutions Manifesto. This move attracted quite a bit of high-profile political attention to the concept and mobilized key UN agencies and initiatives, such as the UN Environment Programme (UNEP) and the UN Global Compact. It built on ongoing work by IUCN as well as the work by large environmental organizations such as Conservation International (CI) and The Nature Conservancy (TNC) to promote natural climate solutions. The summit launched an NbS for Climate Coalition with a manifesto and a platform for countries and organizations to showcase projects, with 196 projects registered at this point.[25] The high-level engagement with the term continues in publications and political initiatives such as the High Ambition Coalition for Nature and People; the World Economic Forum's Global Future Council on NbS; and UNEP's recent Adaptation Gap report.[26]

NbS, natural climate solutions, and climate mitigation potential. The term "natural climate solutions" is often used interchangeably with NbS in the climate change context, although the terms are not actually synonymous. As mentioned above, Seddon et al. note that NCS refers explicitly to conservation and management actions that reduce GHG emissions from ecosystems and harness their potential to store carbon.[27] NCS have been

[24] https://www.ieta.org/page-18192/8185755; https://www.the-ive.com/the-solution; https://www.cleantech.com/regenerative-agriculture-a-new-asset-class-for-agriculture-and-nature-based-solutions-investors-part-3/; https://www.iucn.org/content/could-conservation-become-a-new-investment-asset-class

[25] https://wedocs.unep.org/bitstream/handle/20.500.11822/29705/190825NBSManifesto.pdf?sequence=1&isAllowed=y

[26] https://www.campaignfornature.org/high-ambition-coalition; https://www.weforum.org/communities/gfc-on-nature-based-solutions; https://sdg.iisd.org/news/uneps-adaptation-gap-report-focuses-on-nature-based-solutions/

[27] Seddon et al. 2020.

sorted into three different types of climate mitigation actions: protecting ecosystems (particularly forests), better managing ecosystems under human control (forests, croplands, grazing lands), and restoring ecosystems (forests, mangroves, peatlands).[28] These nature-based or "natural" practices could either reduce/avoid emissions, for example by not cutting down trees or by avoiding the use of synthetic nitrogen fertilizers, or enhance sinks, for example by planting trees in agroforestry systems.

Whilst the term NCS might superficially provide more clarity than NbS, given the discrete set of 20 practices referred to in the original article that launched the term (see Box 2), it has in fact led to significant misinterpretation, misuse, conflation, and obfuscation, and the estimates of potential contributions widely debated.[29] Proponents of NbS and NCS regularly make the claim that some one-third of global mitigation can come from "nature-based solutions" or "natural climate solutions."[30] Any assertion that NbS can provide "30%," or "one-third," or "37%," or "over one-third," or "close to one-third" of "the mitigation effort needed until 2030 to limit warming to 2°C" should be viewed with suspicion and critically scrutinized. Even sources as authoritative as the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)

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[28] Girardin, C.A.J. et al. 2021. Nature-based solutions can help cool the planet – if we act now. *Nature* 593: 191-194.

[29] Pörtner, H.O., R.J. Scholes, J. Agard, E. Archer, A. Arneth, X. Bai, D. Barnes, M. Burrows, L. Chan, W.L. Cheung, S. Diamond, C. Donatti, C. Duarte, N. Eisenhauer, W. Foden, M.A. Gasalla, C. Handa, T. Hickler, O. Hoegh-Guldberg, K. Ichii, U. Jacob, G. Insarov, W. Kiessling, P. Leadley, R. Leemans, L. Levin, M. Lim, S. Maharaj, S. Managi, P.A. Marquet, P. McElwee, G. Midgley, T. Oberdorff, D. Obura, E. Osman, R. Pandit, U. Pascual, A.P.F. Pires, A. Popp, V. Reyes-García, M. Sankaran, J. Settele, Y.J. Shin, D.W. Sintayehu, P. Smith, N. Steiner, B. Strassburg, R. Sukumar, C. Trisos, A.L. Val, J. Wu, E. Aldrian, C. Parmesan, R. Pichs-Madruga, D.C. Roberts, A.D. Rogers, S. Díaz, M. Fischer, S. Hashimoto, S. Lavorel, N. Wu and H.T. Ngo. 2021. IPBES-IPCC co-sponsored workshop report on biodiversity and climate change; IPBES and IPCC. DOI:10.5281/zenodo.4782538.

[30] For example, the documentation for the 2020 UN Summit on Biodiversity claims that "nature-based solutions can provide approximately one third of the solutions needed to achieve the climate mitigation targets of the Paris Agreement." https://www.un.org/pga/75/united-nations-summit-on-biodiversity/

have conflated and confounded the data and conclusions of the original article.[31]

Box 2: Natural climate solutions (NCS)

Griscom et al. described 20 types of NCS – for mitigation – in a prominent scientific article published in 2017 entitled "Natural climate solutions."[32] These 20 NCS include: reforestation, avoided forest conversion, natural forest management, improved plantations, avoided woodfuel use, fire management, biochar, trees in croplands, nutrient management, grazing (feed, animal management, optimal stocking intensity, legumes), conservation agriculture, improved rice management, avoided grassland conversion, coastal restoration, peat restoration, avoided peat impacts, and avoided coastal impacts. The largest mitigation contributions potentially come from reforestation and avoided forest conversion.

The article concludes that "Natural climate solutions [the 20 listed above] can provide 37% of cost-effective CO_2 mitigation needed through 2030 for a >66% chance of holding warming to below 2°C." Note that the article looks only at mitigation needed until 2030, and that the mitigation objective defined in the analysis is to hold warming to below 2°C, and only with a 66% chance of reaching that objective. Somewhat surprisingly, one of the assumptions used in their model is that fossil fuel emissions continue unchanged throughout the decade of analysis, rather than the steep reductions in emissions that would actually be required to keep temperature rise below 2°C or 1.5°C.

Whether the total amount of mitigation effort required and undertaken is small or large makes a difference to the resulting fractional contribution of NCS (i.e., x% of mitigation needed – see graphic). If the overall economy-wide mitigation effort assumed by Griscom et al. is rather underestimated in relation to what is actually necessary to meet the goals of the Paris Agreement,[33]

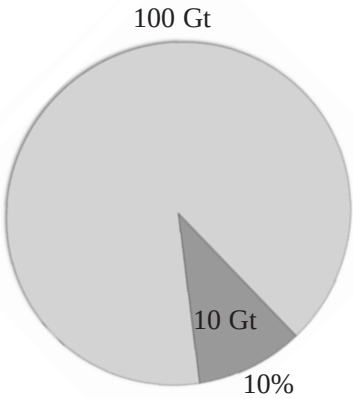
[31] For example, note the sweeping claim about the mitigation benefits of reversing land degradation, based on the Griscom et al. 37% figure, in this quote from the IPBES Assessment Report on Land Degradation and Restoration: "Actions to avoid, reduce and reverse land degradation can provide more than one third of the most cost-effective climate mitigation needed to keep global warming under 2°C by 2030 (established but incomplete)." https://ipbes.net/assessment-reports/ldr

[32] Griscom, B.W. et al. 2017. Natural climate solutions. *PNAS* 114(44): 11645-11650. https://www.pnas.org/content/114/44/11645

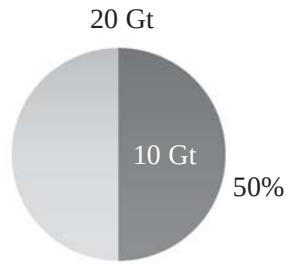
[33] The Paris Agreement on climate change aims to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels and [pursue] efforts to limit the temperature increase to 1.5°C above pre-industrial levels."

the potential contribution of NCS to that effort would look large. Conversely, if the mitigation effort needed between now and 2030 were much greater than that assumed in the article, then the fractional contribution of NCS to that mitigation effort would be a good deal smaller than 37%. Indeed, if one wanted to overestimate the contribution of NCS, one approach would be to underestimate the total mitigation effort to be undertaken.

Percentage contribution of 10 Gt of NCS under different mitigation scenarios (example, not to scale)



If total mitigation 100 Gt
10 Gt is 10% of the total mitigation



If total mitigation 20 Gt
10 Gt is 50% of the total mitigation

The resulting fractional contribution to the mitigation effort depends on the overall mitigation effort

The amount of mitigation effort needed for just a 66% chance of staying below 2°C warming is *far smaller* than the amount of mitigation effort needed for a 90% chance of staying below 1.5°C. Assuming that "fossil fuel emissions are held level over the next decade"[34] will also make the NCS contribution look much larger than if the authors' models had assumed the steady,

[34] Griscom et al. 2017.

dramatic reductions in fossil fuel emissions that are required to reach the goals set out in the Paris Agreement.

These assumptions used by Griscom et al. should be fully understood and explained, so that overinflated or erroneous claims are not made about the mitigation potential of NCS and NbS.[35]

Trees and forests as NbS and NCS: REDD 2.0.[36] Within nature-based climate mitigation approaches, trees and forests attract the most attention, reflecting the fact that most mitigation potential does reside there, as established by Griscom and others.[37] Certain tree-centred approaches – in particular large-scale afforestation and reforestation – can sequester a lot of carbon quickly, although not necessarily effectively or with a long lifetime or without enormous associated ecological and human impacts.[38] Forests provide an added benefit for mitigation carbon accountants and creditors: carbon in forests is much easier to measure and monitor than in other ecosystems or agroecosystems. The most high-profile tree-centred approach currently may be the Trillion Trees initiative, although it seems that these days everyone wants to plant trees.[39]

[35] Notably, in the most recent paper by Girardin et al. (2021), of which Griscom is a co-author, the approach to determine a percentage contribution to mitigation effort is abandoned completely and a 1.5°C temperature target is added.

[36] REDD+ is the UNFCCC COP-created framework on reducing emissions from deforestation and forest degradation, as well as the sustainable management of forests and the conservation and enhancement of forest carbon stocks in developing countries. https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd

[37] In the 2017 paper by Griscom et al., reforestation was found to have the most mitigation potential (sequestered carbon) followed by avoided forest conversion (avoided emissions). In a more recent paper focusing on national mitigation potential, these practices were reversed in order of their mitigation potential. See Griscom, B.W. et al. 2020. National mitigation potential from natural climate solutions in the tropics. *Philosophical Transactions of the Royal Society B* 375: 20190126. http://dx.doi.org/10.1098/rstb.2019.0126

[38] Lewis, S.L. et al. 2019. Regenerate natural forests to store carbon. *Nature* 568: 25-28.

[39] 1t.org; https://www.carbonbrief.org/analysis-shell-says-new-brazil-sized-forest-would-be-needed-to-meet-1-5c-climate-goal

Corporate framings of NbS. Fossil fuel companies in particular seem keen to invest in NbS. Shell has started a new Nature-Based Solutions business initiative.[40] Total has a new unit called Total Nature-Based Solutions.[41] As NbS are warm, fuzzy, and poorly defined, they are really quite useful for all sorts of public relations (or greenwashing?) efforts and the fossil fuel industry in particular seems to have noticed their utility.

Shell defines NbS as "projects which protect, transform or restore land."[42] The company says it "intends to make significant investments in projects that use nature to reduce CO_2 emissions." It goes further to talk about tree-planting projects in the Netherlands, Spain, and Scotland which will be used to offset emissions in its operations, adding that "these projects can lead to the marketing, trading and sale of carbon credits."[43] Beyond its own investments, it is buying carbon credits from other NbS projects that it will sell to buyers of its petrol to enable its consumers to offset their own emissions. (Carbon credits and offsetting are discussed in more detail in a later chapter on "net zero" and carbon markets, including further elaboration on the interest of fossil fuel companies in "nature-based" offsets.)

Here is how Shell describes its recent purchase of a carbon-offset developer in Australia and its new "Nature-Based Solutions business":

> Shell Australia will acquire 100% of Select Carbon, a specialist company that partners with farmers, pastoralists and other landowners to develop carbon farming projects throughout Australia.

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40 https://www.shell.com/energy-and-innovation/new-energies/nature-based-solutions.html#iframe=L3dlYmFwcHMvMjAxOV9uYXR1cmVfYmFzZWRfc29sdXRpb25zL3VwZGF0ZS8; https://www.shell.com.au/media/2020-media-releases/shell-to-acquire-environmental-services-company-select-carbon.html °

41 https://www.total.com/sites/g/files/nytnzq111/files/atoms/files/biodiversite_180710_va.pdf; https://www.total.com/group/commitment/climate-change/carbon-neutrality

42 See https://www.shell.com

43 https://www.shell.com/business-customers/trading-and-supply/trading/shell-energy-europe/clean-energy-solutions/voluntary-carbon-credits.html

> This is Shell's first acquisition globally for its Nature-Based Solutions business, which invests in forests, grasslands, wetlands and other natural ecosystems around the world to reduce emissions and capture more CO_2 while benefiting biodiversity and local communities. It will contribute to Shell's ambition to be a net-zero emissions energy business by 2050 or sooner, in step with society. This ambition also involves working with customers to reduce or offset the emissions generated when they use Shell products, such as through the use of carbon credits. There is no single solution to tackling climate change and Shell supports nature-based carbon credits as one addition to robust decarbonisation throughout the global economy.[44]

C. Defining "nature" as "solution": Whose nature? Whose solution?

As we have explored above, NbS is a contested term. Framing nature as "solution" brings a lot of controversy along with it and provokes many questions: A solution to whose problems? A solution to the desire of various actors to maintain emissions-as-usual while appearing to be addressing the problem of emissions by planting trees? Whose nature is being asked to solve which problems?

Who is allowed to appropriate nature-as-solution? Who gets to decide which problems nature will solve? These are fundamental questions of equity at the heart of the contest over the definition of NbS, particularly when climate mitigation is defined as the problem.

Indigenous peoples and local communities (IPLCs) have been stewards of local natures and forests for generations upon generations. The lands and forests that IPLCs inhabit and protect are home to massive stores of valuable, diverse ecosystem carbon.[45] In this new frame, where forests and their carbon are "natural climate solutions", forests-as-solution can

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[44] https://www.shell.com.au/media/2020-media-releases/shell-to-acquire-environmental-services-company-select-carbon.html. To be perfectly clear, carbon credits to compensate for burning fossil fuels are not *de*carbonization. At most, they help people feel less guilty about burning fossil fuels (which actually is carbonization).

[45] https://rightsandresources.org/wp-content/uploads/2016/10/Toward-a-Global-Baseline-of-Carbon-Storage-in-Collective-Lands-November-2016-RRI-WHRC-WRI-report.pdf

be used to justify the dispossession and violation of the rights to land, life, and livelihoods of indigenous peoples, local communities, species, and ecosystems.[46]

Reducing forests and other natural or human-managed ecosystems, from coral reefs to agroforestry systems, to the carbon they contain provides more powerful actors with a justification and mechanism to claim the carbon – and lands and forests – for themselves.[47] When the problem to be solved is defined as an urgent, global threat – such as climate change – the motives of the individual actors seeking to appropriate "nature" can be easily painted over with a lovely green colour.

Defining nature as a "solution" effectively confiscates that nature for particular ends, ends that are set by those who write the definitions. These unequal power relations are unfortunately reflected time and again – IPLCs, although they are the major guardians of biodiversity, often have had the least voice and say, and worse, stand to be disproportionately adversely affected.

[46] Recent research shows that 300 million are at risk from the Half Earth proposal to set aside half of the earth's terrestrial ecosystems in protected areas. Schleicher, J. et al. 2019. Protecting half the planet could directly affect over one billion people. *Nature Sustainability* 2: 1094-1096; https://www.mappingforrights.org/MFR-resources/mapstory/cbddrive/300_million_at_risk_from_cbd_drive

[47] "Irrecoverable carbon" is one of the latest framings by large conservation organizations of the need for protecting biodiversity-rich ecosystems. Goldstein, A. et al. 2020. Protecting irrecoverable carbon in Earth's ecosystems. *Nature Climate Change* 10: 287-295.

Chapter Three

"NET ZERO" AND NATURE

ONE of the main problems that NbS are being asked to solve is that of achieving "net-zero" emissions.

A. How "net zero" creates a need for "nature"

The mitigation goal of the Paris Agreement is found in Article 4.1:

> In order to achieve the long-term temperature goal set out in Article 2,[48] Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

Many people use the term "net zero" to capture the idea of balancing greenhouse gas emissions and removals. Governments and corporations are making pledges to become "net zero" by 2050. Exactly how they will do that is not particularly clear in the pledges. Pledges usually rely on a large, and largely fabricated, amount of carbon dioxide removal (CDR) to achieve "net zero". CDR, when explicitly included in plans, is either nature-based or technology-based (geoengineering).

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[48] "Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels."

Sinks and associated **reservoirs** remove and store carbon or carbon dioxide – although the length of time in storage will vary. Reservoirs can accumulate greenhouse gases and they can also release greenhouse gases. (See Box 3 for further elaboration on the terms in bold.)

The possibilities for removals by sinks are all currently found in nature – in the carbon sequestration potential of trees, soils, wetlands, and grasslands. Oceans, soils, and forests are all reservoirs where carbon might be stored in nature. (Some envision an increasing role in the future for technological options such as enhanced weathering, direct air capture, or bioenergy carbon capture and storage. But those options are dangerous and problematic and not viable on any effective scale at this point.)

Box 3: Making sense of terms, part I[49]

Our land use and carbon vocabulary before the Paris Agreement. The UNFCCC was agreed in 1992. The IPCC Fifth Assessment Report (AR5) was published in 2013-14.

Emissions. The *release* of greenhouse gases and/or their precursors into the atmosphere over a specific area and period of time. (UNFCCC)

Reservoir. A component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is *stored*. (UNFCCC) A component of the climate system, other than the atmosphere, which has the capacity to *store*, *accumulate* or *release* a substance of concern, for example, carbon, a greenhouse gas or a precursor. Oceans, soils and forests are examples of reservoirs of carbon. "Pool" is an equivalent term (note that the definition of pool often includes the atmosphere). (IPCC AR5)

Sink. Any process, activity or mechanism which *removes* a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere. (UNFCCC and IPCC AR5)

Source. Any process or activity which *releases* a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol into the atmosphere. (UNFCCC)

[49] These terms have been defined in either the UNFCCC (Article 1) or IPCC AR5 or both. https://www.ipcc.ch/about/

These ecosystems, and the ecosystem properties of removal and storage, are the nature-based "solutions" to the "net zero" problem of balancing emissions and removals.

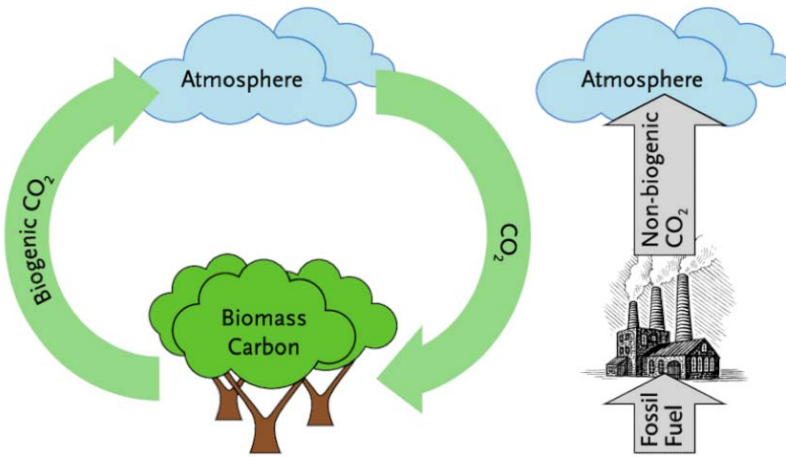
B. Dangerous myths and scientific realities of carbon removal

It might be useful at this point to explore in more depth the life cycle of carbon, with a goal of unpacking further the term "net zero" and how it relates to "nature".

The "net zero" interpretation of Article 4.1 assumes that terrestrial and fossil sources of carbon are interchangeable in the planetary carbon cycle. It also assumes that natural sinks will store carbon on time frames relevant to addressing climate change. Both of these assumptions are problematic.

In a very important sense, fossil carbon – carbon resulting from the burning of fossil fuels – is never going back into the ground where it came from. We are extracting carbon that was put into the earth millions of years ago and releasing it into the atmosphere as carbon dioxide. It is not

Figure 1: The terrestrial and fossil carbon cycles



going back to being fossil carbon in this geologic age. Carbon dioxide has a residence time in the atmosphere of hundreds to thousands of years. That's the core of the problem.

It is true that carbon, including that released through the burning of fossil fuels, is taken up by trees, soils and grasslands and such, but on a temporary basis. It cycles, as part of the fast carbon cycle, between the atmosphere, ocean, and land pools. So some of that fossil carbon we are emitting into the atmosphere does get taken up by trees, but when the tree dies or gets made into paper or wood products that eventually degrade, that carbon dioxide makes its way back into the atmosphere. The carbon in the terrestrial and ocean pools *is subject to reversals*, including climate-induced reversals, as is expected to happen as the climate warms: forests degrade due to drought, heat, and fire; soils and grasslands lose carbon as temperatures warm; wetlands lose carbon as they dry.[50]

Balancing out fossil emissions with natural removals, as in the "net zero" formulation of the Paris Agreement, is fundamentally flawed. Natural removals should not be "balanced" against emissions. Indeed, to get to "net zero" safely, understanding the threat of reversals, will actually require fossil emissions to be reduced to as close to zero as possible.

C. The scale of what nature can provide in removals

Pete Smith, a leading Intergovernmental Panel on Climate Change (IPCC) expert on terrestrial carbon, points out the folly of "trying to sequester the geosphere in the biosphere."[51] We cannot take all the carbon released from burning fossil fuels and fit it all into our forests and grasslands and wetlands.

[50] Anderegg, W.R.L. et al. 2020. Climate-driven risks to the climate mitigation potential of forests. *Science* 368: eaaz7005. DOI: 10.1126/science.aaz7005

[51] Smith, P. 2010. Carbon sequestration in agricultural soils – a global perspective. Carbon credits for sustainable land use systems (CaLas). Scientific basis and practical implications – reality and visions. Frick, Switzerland. 15 December.

Current global anthropogenic carbon dioxide emissions are approximately 43 gigatonnes of carbon dioxide (Gt CO_2) per year.[52] Carbon emissions from the land sector, excluding non-CO_2 emissions from agriculture, are approximately 6.6 Gt CO_2 per year. Plants and soils absorb 11.3 Gt CO_2 per year, so at present terrestrial ecosystems provide a net sink of approximately 4.7 Gt CO_2 per year.[53] In response to rising temperatures, however, scientists anticipate that the land sink will eventually turn into a net source of carbon, as ecosystems degrade and fail.[54]

Girardin and colleagues provide the most recent accounting for the potential contribution of "nature" to climate mitigation.[55] They conclude that 10 Gt CO_2 overall mitigation is possible, through either avoided emissions (5 Gt) or carbon sequestration (5 Gt). Roughly 2 Gt CO_2 could be sequestered per year through forest and wetland restoration. Avoiding emissions by protecting existing ecosystems could reduce land sector emissions by 4 Gt CO_2. Improved forest and soil management practices could reduce emissions and increase sequestration, which they conclude could add up to an additional 4 Gt CO_2 per year of the land sector contribution to mitigation.

These numbers might seem abstract to those not used to thinking in terms of gigatonnes of carbon. Girardin puts a figure to the amount of land that would be required for forest restoration to deliver 2 Gt of sequestration: 678 million hectares. That is about twice the land area of India (328.7 million hectares) or a little less than the land area of Brazil (851.6 million hectares). For context, consider that the Environmental Defense Fund has

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52 Friedlingstein, P. et al. 2020. Global carbon budget 2020. *Earth System Science Data* 12: 3269-3340.

53 Ibid.

54 Duffy, K.A. et al. 2021. How close are we to the temperature tipping point of the terrestrial biosphere? *Science Advances* DOI: 10.1126/sciadv.aay1052. Scientists have recently announced that southeast Amazonia is now no longer a carbon sink, but a net source of carbon. Denning, S. 2021. Southeast Amazonia is no longer a carbon sink. *Nature* 595: 354-355.

55 Girardin, C.A.J. et al. 2021. Nature-based solutions can help cool the planet – if we act now. *Nature* 593: 191-194.

suggested that 2.5 Gt of sequestered CO_2 might be needed to offset the emissions of *just the aviation sector*.[56]

A common characteristic of "net zero" pledges is silence on how much emissions will be reduced and how much carbon dioxide is expected to be removed through NbS or NCS. Technical analyses are not yet available, but it seems possible to come to a very rough conclusion that, given the number of pledges and the lack of emissions reduction mitigation ambition in those pledges, several planets' worth of forest and other ecosystem sinks would be needed for the anticipated removals.

Another rough conclusion can be made here – that posing "nature" as a carbon removal "solution" in "net zero" strategies is setting the stage for the introduction of geoengineering CDR technologies (see Chapter 5).

D. There is no way to zero without decarbonization

The only real way to stop climate change is to stop the burning of fossil fuels. Natural sinks certainly play an important *but limited* role in the global carbon budget.[57] To achieve a balance between emissions and removals by mid-century, there must be massive decarbonization to get as close to zero as possible. The limited additional removals that are possible, given the very real limitations of nature, will fill in the remaining gap. NCS (and NbS) "do not lessen the need for mitigation from energy and industrial sectors."[58]

Removals can neither offset nor compensate for emissions – fossil and terrestrial carbon are not interchangeable. We must both decarbonize *and* sequester.

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[56] https://www.edf.org/climate/icaos-market-based-measure

[57] House, J. et al. 2002. Maximum impacts of future reforestation or deforestation on atmospheric CO2. *Global Change Biology* 8(11): 1047-1052.

[58] Anderson, C.M. et al. 2019. Natural climate solutions are not enough. *Science* 363: 933-934.

Box 4: Net zero maths: two different "net zero" equations

Net zero: emissions minus removals (in an ideal world) equals zero

Paris-aligned strategy: Emissions are reduced as much as possible and limited removals compensate for the residual emissions.

0 = 10 - 10

Emissions-as-usual (offsetting) strategy: Emissions continue, while "nature" is dangerously assumed to be able to compensate (offset) those emissions by removals.

0 = 100000 - 100000

Chapter Four

"NET ZERO", CARBON OFFSET MARKETS, AND "NATURE-BASED" DECEPTIONS

"NET ZERO" pledges, by focusing on the "net" and not the "zero", are providing a convenient smokescreen for governments and corporations. Having a target that is 30 years in the future – 2050 – helps to further obscure the inaction that is hidden behind the term "net". Simply put, it is quite easy to make a "net zero" pledge without giving any real details about how ambitious it really is and how that pledge might be fulfilled. Adding "nature" to the pledge makes it rather charismatic and photogenic and further hides how empty and dangerous most pledges actually are.

Companies and governments are exploiting ambiguities around **residual emissions** and **carbon offsets** to further obscure their climate inaction. Realistically, carbon dioxide emissions cannot be reduced completely to zero – some amount of residual emissions will remain. In a best-case scenario, the limited amount of nature-based **carbon removal** that exists would be used to compensate for *legitimate* residual emissions. (See Box 5 on the relationships between these three important terms.)

But the "net zero" plans of many companies and governments assume continued emissions far into the future and assume that those emissions will be offset through buying carbon offset credits in a carbon market. Some fossil majors are planning to increase fuel production in the short term, claiming that the tree plantations they are investing in will offset these increased emissions. These entities very clearly understand the climate science. Relying on offsets is deceptive and greedy; these powerful actors are effectively deciding that the world's forests and natural systems should be used to offset *their* emissions, often instead of providing

livelihoods for those now dependent on those systems. It is a form of what some have labelled "carbon colonialism".[59]

Box 5: Distinguishing offsets, removals, and residual emissions

The IPCC defines a carbon **offset** as a unit of CO_2-equivalent emissions that is reduced, avoided, or sequestered to compensate for emissions occurring elsewhere.[60] The offset, often called a "credit", is usually measured in tons of carbon and valued in terms of US dollars. Entities that are responsible for carbon emissions will buy offset credits, assuming that their emissions are somehow being cancelled out by emissions being avoided or sequestered elsewhere.

In the "net zero" conversation, the term "**residual emissions**" refers to those emissions that will be extremely difficult to bring to zero. For example, even with a real dedication to removing emissions from agricultural production through agroecological approaches, the processes of growing, marketing, cooking, eating, and disposing of food waste will still be responsible for some emissions. To reach "net zero", residual emissions will need to be compensated for with removals.

It should come as no surprise that large fossil-consuming industries are using the terms "residual" or "hard-to-decarbonize" to describe the large amounts of their own emissions that they would rather not try to eliminate. These are fundamentally misleading uses of the terms.

"**Removals**" refer to carbon dioxide that is taken out of the atmosphere by carbon sinks. Removals can happen quite slowly, such as through the gradual processes of rock weathering, or more quickly, with the growth of trees or absorption by oceans.

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59 Lyons, K. and P. Westoby. 2014. Carbon colonialism and the new land grab: plantation forestry in Uganda and its livelihood impacts. *Journal of Rural Studies* 36: 13-21.

60 Allwood, J.M., V. Bosetti, N.K. Dubash, L. Gómez-Echeverri and C. von Stechow. 2014. Glossary. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Clarity in the use of these three terms – offsets, removals, and residual emissions – is important in the "net zero" conversation because conflation and confounding hide inaction and deliberate misuse.

Sometimes the word "offset" is used in its more general sense (in English) of "compensate for." Companies talk about their strategies for offsetting their residual emissions, in this more general sense. This is rather common in corporate "net zero" language. In this general way, "removals" are implied to be "offsetting" "residual emissions." It is true that in the case of hard-to-eliminate, residual emissions, reaching "net zero" will require a balance of emissions by sources and removals by sinks. But using the word "offset" in this more general sense of "compensation" muddies the waters.

The main danger in this conflation of terms is that carbon offsets are seen as a legitimate or appropriate mechanism by which "net zero" can be achieved. And here is where clarity is most necessary: carbon offsets enable an emitter to keep emitting and this is completely incompatible with Paris Agreement targets. There is no possibility to stay below 1.5°C warming if we do not rapidly and massively decarbonize *and* enhance removals.

The key point with offsets is that ***one entity gets to keep emitting***, while another entity either avoids emissions or removes and sequesters them, for example, by avoiding deforestation or through ecosystem restoration. Offsetting is not a strategy compatible with the Paris Agreement mitigation goals.

Inspired by what they see as the commercial potential of "net zero" pledges, made possible through the confounding of offsets with the balancing of residual emissions, major actors are building the foundations for a greatly increased carbon-offset market. Scaling up the offset market means scaling up the buying and selling of credits for removing CO_2 from the atmosphere, putting a huge emphasis on apparently green credits from NbS and NCS. There is quite some talk these days about planting trees, ignoring the scientific understanding that forest restoration is far superior to tree plantations for sequestering and storing carbon.[61] The image of a trillion trees being planted plays into a frame that says that if we just keep

[61] Lewis, S.L. et al. 2019. Restoring natural forests is the best way to remove atmospheric carbon. *Nature* 568: 25-28.

growing forests and increasing other NbS, we can still continue to burn fossil fuel.

"Net zero" pledges are fuelling carbon-offset markets. The offset-dependent "net zero" pledges of the fossil fuel industry are helping to signal future growth in demand for carbon offsets, spurring investors in those markets. For example, Shell is planning to keep selling fossil fuels and to sell "nature-based" carbon-offset credits to its customers to go along with the petrol they purchase. This strategy is not just Shell's, but is pervasive throughout the fossil fuel industry. Chevron's Arthur Lee wants "a well-designed market in which carbon offsets resulting from natural climate solutions could be traded."[62] Italian fossil fuel giant Eni is planning to increase oil and gas production by 3.5% per year until 2025, and reduce its carbon footprint by 80% by 2050, including 30 million tons a year by 2050 of carbon offsets from primary and secondary forest conservation projects.[63]

The organization Principles for Responsible Investment, linked with the UN Environment Programme's Finance Initiative and the UN Global Compact, recently released its new investor guide to negative emission technologies and land use.[64] In the accompanying press release, PRI seems rather giddy about the scale of potential profit-making opportunities for carbon offsets in the land sector:

> Corporate demand for forest-related carbon removal [offsets] could generate $800bn in annual revenues by 2050, worth a market capitalisation of $1.2 trillion today...
>
> Nature-based solutions (NBS) to the climate crisis focused on reforestation and afforestation could generate US$800 billion in annual revenues by 2050 with assets valued well over US$1.2 trillion, surpassing the current market capitalisation of the oil & gas majors.

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62 https://wrm.org.uy/articles-from-the-wrm-bulletin/section1/new-name-for-old-distraction-nature-based-solutions-is-the-new-redd/

63 https://www.eni.com/en-IT/media/press-release/2020/02/long-term-strategic-plan-to-2050-and-action-plan-2020-2023.html

64 https://www.unpri.org/new-investor-guide-to-negative-emission-technologies-and-land-use/6655.article

Offsets as deception: they do not stop climate change because they do not stop the accumulation of greenhouse gases in the atmosphere. Continued emissions lead to continued warming. The most critical misconception, and one that underlies the "net zero" strategies of the fossil fuel industry, is that the sequestration potential of NbS can offset continued burning of fossil fuels. Recall that Shell is planning to sell carbon offsets to its fuel customers, with the implication that they can keep buying and burning petrol if they just invest in a few trees. But offsets do not stop climate change because emissions continue. With continued emissions, carbon dioxide continues to accumulate in the atmosphere where it resides for hundreds to thousands of years, and the temperature of the planet continues to increase. There is no way to keep temperature rise to 1.5°C or even 2°C without quickly decarbonizing. As emphasized in the previous chapter, there is not enough nature and land on this planet to soak up continued emissions.

Box 6: Total and Shell pioneer making liquefied natural gas "carbon-neutral"

Total recently claimed to have completed a shipment of "carbon-neutral"[65] liquefied natural gas (LNG).[66] Total claims that the entire shipment was carbon-neutral as the emissions from the shipment were offset by providing financing for a wind power project in China and a forest protection project in Zimbabwe. But all those emissions are now in the atmosphere and will stay there for hundreds to thousands of years and neither the wind power project nor the forest protection project will reverse that.

Shell has recently signed a five-year contract with PetroChina International (PCI) for the supply of "carbon-neutral" LNG. "PCI and Shell will cooperate to offset life-cycle carbon dioxide equivalent (CO_2e) emissions generated across the LNG value chain, using high-quality carbon credits from nature-based projects."[67]

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65 "Carbon-neutral", like "net zero", is another term that wrongly implies that emissions and removals can cancel each other out.

66 https://www.total.com/media/news/communiques-presse/total-delivers-its-first-carbon-neutral-lng-cargo

67 https://www.shell.com/business-customers/trading-and-supply/trading/news-and-media-releases/shell-and-petrochina-sign-world-s-first-term-contract-for-carbon.html

Yet all the major oil companies are planning to continue with exploration and new extraction projects. None of them have plans for a managed decline of production that is anywhere near in line with the Paris goal aiming to limit warming to 1.5°C.[68] All of them intend to rely heavily on carbon offsetting to keep drilling and emitting-as-usual. The race is on now to find the most photogenic and seductive kinds of offsets – NbS and NCS – to distract attention from emissions-as-usual strategies.[69] Many of the same actors, like Shell, are also directly profiting off the carbon-offset market.

Several large Northern conservation organizations, well funded by corporations, have been willing partners in the effort.[70] Conservation International, the Environmental Defense Fund, and The Nature Conservancy have led work at this interface for many years, and indeed have invested a significant amount of effort and political attention in promoting the offsetting potential of nature. All three run offsetting projects, and all three are involved in a variety of private-sector partnerships, including participation on advisory panels for the International Emissions Trading Association initiative, "Markets for Natural Climate Solutions", and the Task Force on Scaling Voluntary Carbon Markets.[71] Much of their work is now including NbS or NCS in naming and framing.

As the need for offsets increases, NbS in the global South are prioritized for their photogenic and charismatic "nature." Developers of offset projects have consistently located their efforts in the global South, for a variety of reasons, including the structural demands of the Kyoto

[68] http://priceofoil.org/2020/09/23/big-oil-reality-check/

[69] Distraction and deception are certainly important results of offsetting strategies. Lohmann identifies three further strategic uses of offsets and markets more generally: "institutionalized defossilisation of the global warming problem; institutionalized deresponsibilisation of industrialised countries; and the financialisation of climate change action." Lohmann, L. 2012. Beyond patzers and clients – strategic reflections on climate change and the 'Green Economy'. *Development Dialogue* 61: 295-326.

[70] https://www.ecosystemmarketplace.com/articles/natural-climate-solutions-win-big-in-bezos-grants/

[71] https://ncs.ieta.org/governance/; https://www.iif.com/tsvcm.

Protocol's Clean Development Mechanism and the fact that there are many tropical forests to "save" or "protect." Mitigation in the global South is low-hanging fruit for global elites, who will pay for others to offset their emissions rather than reduce their own, fitting in perfectly with neocolonial structures and mindsets. Offset projects are not exclusive to developing countries – recall the Shell example from earlier where the carbon sequestration projects might be in fields and pastures of Australia. But they also might be on indigenous lands in Australia. Shell is planting trees in the Netherlands and Spain, but also investing in tree plantations in China, Ghana, Kenya, and India.[72]

Offsetting is theft.[73] No doubt, this is a strong assertion. Still, there are already numerous documented examples of dispossession, land grabbing, and violation of rights of indigenous peoples and local communities associated with nature-carbon projects, including REDD, voluntary offset projects, and "fortress conservation". These resource grabs will continue and increase as the market for carbon offsets grows.

There is a second way in which offsetting is theft, which is less tangible but with no less impact. An equitable approach to the distribution of emissions would allocate those emissions more or less on a per capita basis. If humans can only emit so much carbon dioxide through the burning of fossil fuels, then it is important to divide up that "atmospheric space" equitably, over time.[74] The wealthiest of the world have already used up their fair share, and then some.[75] Offsets effectively steal atmospheric space as the wealthy of the world continue their emissions, paying others to not emit.

[72] https://www.shell.com/energy-and-innovation/new-energies/nature-based-solutions.html#iframe=L3dlYmFwcHMvMjAxOV9uYXR1cmVfYmFzZWRfc29sdXRpb25zL3VwZGF0ZS8

[73] For an insightful and theoretically rigorous treatment of dispossession and theft through property claims, see Nichols, R. 2020. *Theft Is Property!: Dispossession and Critical Theory*. Duke University Press.

[74] Stilwell, M. 2012. Climate debt – A primer. *Development Dialogue* 61: 41-46.

[75] http://civilsocietyreview.org/files/COP24_CSO_Equity_Review_Report.pdf

These two types of theft combine – dispossession and appropriation of lands or forests for sequestration – in order to continue to colonize atmospheric space for ongoing consumption. It is not difficult to envision the origins of the term "carbon colonialism".[76]

[76] Ahmed, N. 2014. Carbon colonialism: how the fight against climate change is displacing Africans. Vice, 1 December. https://www.vice.com/en/article/kbzn9w/carbon-colonialism-the-new-scramble-for-africa

Chapter Five

CONNECTING THE CLIMATE AND BIODIVERSITY DOTS: IMPLICATIONS FOR BIODIVERSITY GOVERNANCE

AS we consider the complex linkages between nature and carbon, two important themes surface with a bearing on biodiversity governance: spectres of geoengineering rise as the limits of nature-as-solution are crossed; and old ideas for the not-quite-so-innovative financing of biodiversity conservation are revived, repackaged as NbS.

A. Biodiversity, climate change, and geoengineering

Nature has a critical role to play in the collective global effort to address climate change. However, it cannot be overemphasized that the most significant effort that must be undertaken is *reducing emissions to as close to zero as possible* – from the burning of fossil fuels, emissions from industrial agriculture, deforestation – in order to make it possible for existing and restored ecosystems to remove and store as much carbon dioxide as possible.

Climate action pledges of "net zero" or "carbon neutrality" that are not grounded in deep decarbonization are leading to a huge demand for nature-based removals, far greater than what is physically possible on this planet.

Close observers will have noted a recent shift in the vocabulary of carbon accountants. The category of mitigation actions which includes nature-based removals is now often spoken of as Carbon Dioxide Removal – capitalized, with an abbreviation, CDR. The line between natural and geoengineered removals is being blurred, in parallel with messages that if emissions are not reduced in time, removals will need to be engineered,

whether by large-scale afforestation and reforestation or technological approaches of bioenergy carbon capture and storage (BECCS), direct air carbon capture and storage (DACCS) and other speculative technologies.

Recent publications by some academics and policy think-tanks indicate a seemingly organic evolution from nature-based removals to engineered CDR. A group of Oxford academics have published a set of guidelines for how offsetting might be aligned with "net zero", recommending two important shifts in how offsets are prioritized.[77] The first shift recommended is away from avoided emissions projects, which have comprised the vast majority of offsetting projects to date, and towards carbon removal projects. The second shift recommended is away from less permanent carbon removal by natural sinks to technological forms of carbon removal, such as BECCS and DACCS, which the authors see as able to provide much longer-term storage than natural ecosystems.

This transition from "carbon dioxide removal" to Carbon Dioxide Removal is worthy of attention. The think-tank Perspectives hosted a webinar in October 2020 on carbon markets and negative emissions, where the negative emissions technologies they reviewed included the entire spectrum, from nature-based removals to technological options such as BECCS and DACCS.[78] In their webinar presentation, the re-insurance giant Swiss Re envisions a transition from offsets to "carbon removal certificates," and offers an explicit critique of offsets as incompatible with "net zero". Their new CO_2NetZero Programme slogan: "do our best, remove the rest." They propose setting separate targets for emissions and removals and echo other predictions that carbon removal will grow into an industry the size of oil and gas (see Figure 2). However, they are clear in their assertions that this carbon removal is not going to be done by trees, and they were dismissive of large-scale afforestation as "meaningless".

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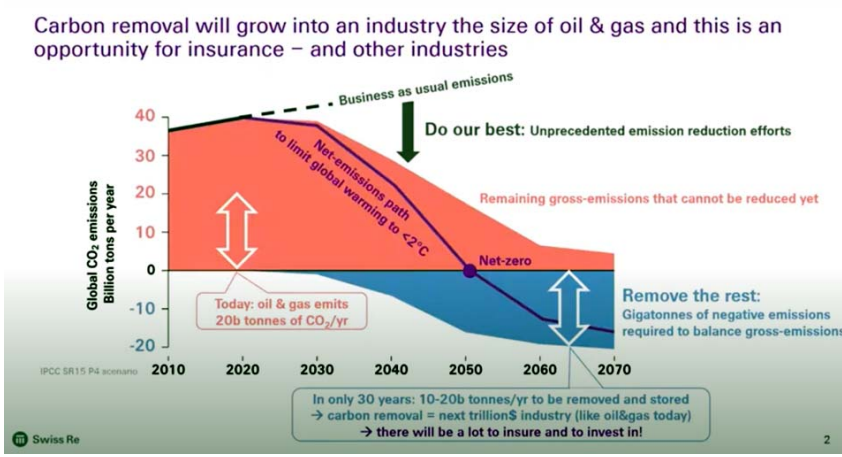
[77] With the slightly pretentious title of "Oxford principles for net-zero aligned carbon offsetting". https://www.smithschool.ox.ac.uk/publications/reports/Oxford-Offsetting-Principles-2020.pdf

[78] https://www.youtube.com/watch?v=JZ7kDNYl2YY&feature=youtu.be

Figure 2: How some investors imagine the growth of the carbon removal industry



Source: Swiss Re (Mischa Repmann) presentation to the Zurich Carbon Market Association webinar on net zero and negative emissions. https://www.youtube.com/watch?v=JZ7kDNYl2YY&t=2230s

Some industry observers are aware of the scale of the negative emissions challenge if emissions-as-usual continue. For Swiss Re, carbon removal might be the next trillion-dollar industry, through geoengineering technologies. None of the hoped-for geoengineering technologies are viable right now, and all of the risks of this planetary-scale experiment remain. Still, the dreams of a geoengineered future seem to provide comfort and excuses for those who want to carry on emitting-as-usual.

The *de facto* moratorium on geoengineering activities that may affect biodiversity, established in decision X/33 by the Conference of the Parties to the Convention on Biological Diversity (CBD),[79] is as relevant as ever.

Box 7: Making sense of terms, part II

Additions to our vocabulary post-Paris (with some exceptions[80]), which have been included in the IPCC special reports on 1.5 (SR15), published in 2018,[81] and/or climate change and land (CCL), published in 2019[82]

Carbon Dioxide Removal (CDR). Anthropogenic activities removing CO_2 from the atmosphere and durably storing it in geological, terrestrial or ocean

[79] CBD decision X/33, paragraph 8:
"*Invites* Parties and other Governments, according to national circumstances and priorities, as well as relevant organizations and processes, to consider the guidance below on ways to conserve, sustainably use and restore biodiversity and ecosystem services while contributing to climate change mitigation and adaptation:...
(w) Ensure, in line and consistent with decision IX/16 C, on ocean fertilization and biodiversity and climate change, in the absence of science based, global, transparent and effective control and regulatory mechanisms for geo-engineering, and in accordance with the precautionary approach and Article 14 of the Convention, that no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities and appropriate consideration of the associated risks for the environment and biodiversity and associated social, economic and cultural impacts, with the exception of small scale scientific research studies that would be conducted in a controlled setting in accordance with Article 3 of the Convention, and only if they are justified by the need to gather specific scientific data and are subject to a thorough prior assessment of the potential impacts on the environment;
(x) Make sure that ocean fertilization activities are addressed in accordance with decision IX/16 C, acknowledging the work of the London Convention/London Protocol"

[80] IPCC AR5 included definitions for Carbon Dioxide Removal and decarbonization. Sequestration (without the modifier "carbon") was defined as "the uptake (i.e., the addition of a substance of concern to a reservoir) of carbon containing substances, in particular carbon dioxide, in terrestrial or marine reservoirs".

[81] IPCC 2018.

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

reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical sinks and direct air capture and storage, but excludes natural CO_2 uptake not directly caused by human activities. (IPCC CCL)

Carbon sequestration. The process of storing carbon in a carbon pool. (IPCC CCL)

Decarbonization. The process by which countries, individuals or other entities aim to achieve zero fossil carbon existence. (IPCC SR15)

Greenhouse gas removal (GGR). Withdrawal of a greenhouse gas and/or a precursor from the atmosphere by a sink. (IPCC SR15)

Negative emissions. Removal of greenhouse gases from the atmosphere by deliberate human activities, i.e., in addition to the removal that would occur via natural carbon cycle processes. (IPCC SR15)

Negative emissions technologies. An activity or mechanism that results in negative emissions. (IPCC CCL)

Net negative emissions. A situation of net negative emissions is achieved when, as a result of human activities, more greenhouse gases are removed from the atmosphere than are emitted into it. (IPCC SR15)

Net-zero CO_2 emissions. Conditions in which any remaining anthropogenic CO_2 emissions are balanced by anthropogenic CO_2 removals over a specific period. (IPCC CCL)

Net-zero emissions. Net-zero emissions are achieved when emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals. (IPCC CCL)

Pool, carbon and nitrogen. A reservoir in the earth system where elements, such as carbon and nitrogen, reside in various chemical forms for a period of time. (IPCC CCL)

Sink. A reservoir (natural or human, in soil, ocean, and plants) where a greenhouse gas, an aerosol or a precursor of a greenhouse gas is stored. (IPCC SR15)

Uptake. The addition of a substance of concern to a reservoir. (IPCC CCL)

B. Financing conservation

Much has been written about the biodiversity financing gap and the potential for "innovative" market-based approaches to fill that gap. As with carbon offsets, a focus on market-based approaches to address biodiversity loss draws attention away from those causing that loss and from governments with the responsibility and mandate to stop biodiversity loss, and towards dollar signs and photogenic nature. In the conservation sphere, there is also a push to commodify and financialize nature, both its constituent carbon and beyond, with "biodiversity offsets".[83]

Box 8: Biodiversity offsets

Biodiversity offsets are modelled on carbon offsets and their working (and erroneous) assumption – that harmful actions in one place might be adequately compensated by reparative actions somewhere else. A companion concept is the idea of "no net loss" – that overall the quantum of biodiversity might be the same after some is destroyed and some repaired. "Biodiversity offsets are measurable conservation outcomes resulting from actions that compensate for the residual impacts of development projects after full mitigation. Offsets should be designed to achieve a no net loss of biodiversity or preferably, a net gain."[84]

"Biodiversity offsets are mechanisms that companies can use to compensate for 'unavoidable' biodiversity impacts of their practices at an 'offset site.' For expanding the Airbus plant in Hamburg, Germany, the Senate of Hamburg permitted, for example, the destruction of a unique freshwater tidal swamp and assigned a new area, the Elbe river island of Hahnöfersand, for recreating the destroyed swamp."[85]

Carbon offsets make no biogeochemical sense. When carbon enters the atmosphere, it will be there for hundreds to thousands of years, no matter how many wind turbines are built or trees planted. Biodiversity offsets make no biological sense. When a "unique freshwater tidal swamp" is destroyed, it is destroyed.

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[83] https://greenfinanceobservatory.org/wp-content/uploads/2019/05/50-shades-biodiversity-final.pdf

[84] https://www.iucn.org/sites/dev/files/content/documents/understanding_government_biodiversity_offset_policies_in_the_mining_sector_november_2017.pdf

[85] Hein, J. and J.C. Rodriguez. 2016. Carbon and biodiversity offsetting: A way towards sustainable development? German Development Institute. 21 March.

The species, species relationships, complex ecological functioning, all that is gone. Complex ecosystems cannot be re-created at will.

IUCN has been a thought leader in developing guidelines for biodiversity offsets.[86]

Some of the leaders in this area have been Credit Suisse and McKinsey, publishing a series of reports over the last decade with various NGO actors, including IUCN and WWF, that detail both the biodiversity financing gap as well as one of their main answers to address the gap: financializing nature.[87] One of the latest assessments of the financing gap, by a new combination of institutions (Paulson Institute, TNC, and the Cornell-Atkinson Center for Sustainability) but some of the same authors, estimates the gap at between $598 and $824 billion per year.[88] They also estimate the potential flow of finance from NbS and carbon markets to addressing the finance gap at $25-40 billion per year, and predict that by 2030 biodiversity offsets might provide $162-168 billion in financing.

The authors of the recent report argue that public sector finance is insufficient and therefore there is a continuing need for creating investible conservation assets. In this latest version of the argument, forest carbon becomes a key strategy for mobilizing conservation finance. “When countries allow the creation of carbon offsets from forest practices or other natural and land-based projects, the sale of these credits can create an important source of funding for forest and biodiversity conservation.”

Revenues from forest carbon offsets are seen as potential seed finance or shorter-term risk-mitigating finance that could provide revenue to inves-

[86] https://www.iucn.org/theme/business-and-biodiversity/our-work/business-approaches-and-tools/biodiversity-offsets; https://portals.iucn.org/library/sites/library/files/resrecfiles/WCC_2016_RES_059_EN.pdf

[87] A 2016 joint report by Credit Suisse and McKinsey was titled “Conservation finance: from niche to mainstream: the building of an institutional asset class.” https://portals.iucn.org/library/sites/library/files/documents/2016-001.pdf

[88] Financing nature: closing the global biodiversity financing gap. 2020. https://www.paulsoninstitute.org/key-initiatives/financing-nature-report/

tors in bundled assets that include forest carbon projects and longer-term and more risky biodiversity conservation projects. The next section provides an example of what that might look like in a new Nature+ Accelerator Fund.

NbS financing and the World Bank, Green Climate Fund, and Global Environment Facility. NbS and NCS provide charismatic and photogenic solutions for the offset projects of the fossil majors. They are also attractive to actors in the area of conservation finance, including the main global multilateral financing institutions of the World Bank, the Global Environment Facility (GEF), and the Green Climate Fund (GCF). Each of these institutions seems to be working to find its niche across the NbS-NCS financing space. The GCF has been financing NbS-climate change adaptation projects, highlighting a wetlands project in Uganda on its website.[89] The World Bank is financing NbS through climate change adaptation, disaster risk reduction, and nature-based infrastructure projects.[90]

The GEF is the institution most obviously looking at the mitigation potential of NbS and the contributions that monetary returns from carbon offsetting might make to blended instruments and co-financing of projects. The GEF is the financial mechanism for the UN CBD and one of the operating entities of the financial mechanism of the UNFCCC, so it is the best positioned of the three to explore and develop "innovative" financial instruments at the intersection of biodiversity and climate change. Innovation for the GEF includes non-grant and blended private finance, and it is in the context of this non-grant area of work that it is engaging most actively in the area of NbS. It has recently committed $8 million to a new Nature+ Accelerator Fund, along with IUCN and the Coalition for Private Investment in Conservation, managed by Mirova Natural Capital, to drive investment in nature-based solutions.[91]

[89] https://www.greenclimate.fund/story/using-ecosystems-counter-climate-crisis-only-natural

[90] https://www.worldbank.org/en/topic/disasterriskmanagement/brief/nature-based-solutions-cost-effective-approach-for-disaster-risk-and-water-resource-management

[91] https://www.thegef.org/news/iucn-and-partners-launch-novel-fund-drive-investment-nature-based-solutions

The idea behind the Nature+ Accelerator, articulated in a 2016 publication by Credit Suisse and McKinsey on conservation finance, is that projects are aggregated, either within sectors or across sectors, in a new "institutional asset class."[92] The projects can be aggregated into a standard debt or equity product, which then might possibly be securitized. Multilateral institutions, such as the GEF, can provide seed money or risk guarantees, as with the Nature+ Accelerator. Aggregated NbS include sustainable forestry, sustainable agriculture and seafood, ecotourism, water and associated payments for ecosystem services, and the latest, most promising money-maker: carbon sinks.

NbS: carbon markets and conservation finance, together at last. It is clear that, for the actors trying to develop the financial instruments of conservation finance, the carbon content of biodiversity is an important part of the financial equation. Carbon offset projects in effect become seed projects that can contribute to expanded conservation finance, itself often channelled through a "fortress conservation" model, further exacerbating inequities for IPLCs. In the early years of a project, sinks might generate cash needed to provide investment returns, so the integration of carbon and biodiversity finance, through the NbS framing, sustains conservation finance initiatives. The carbon-cash potential of sinks provides the rationale for all these actors, including NGO proponents of private conservation finance such as WWF and TNC, as well as IUCN, to support and encourage the expansion of carbon offset markets.

But markets do not create themselves, and to create the trust needed in new financial instruments government rules are necessary. Policy needs to create the incentives for investment. The development of global rules and policy, in particular through ongoing negotiations on carbon markets under the UNFCCC and on a new global biodiversity framework (GBF) under the UN CBD, should be examined in that context. Finance, in the context of resource mobilization and the post-2020 GBF, will be a key topic of negotiations leading up to and at CBD COP 15. Another linked issue is the proposed "protected area target" under the GBF, which could

[92] https://portals.iucn.org/library/sites/library/files/documents/2016-001.pdf

further cement exclusionary conservation areas, at the expense of IPLCs. At the UNFCCC COP, negotiators may finalize rules on carbon markets established by Article 6 of the Paris Agreement. Business always wants clear rules and stability; prominent carbon-market-focused corporate and NGO actors, in particular, seem to be keenly anticipating the outcomes of the upcoming biodiversity and climate COPs.[93]

[93] https://www.theguardian.com/environment/2021/jul/17/regulate-business-to-tackle-climate-crisis-urges-mark-carney

Chapter Six

CONCLUDING THOUGHTS ON THE NATURE AND CLIMATE CRISES

BIODIVERSITY and climate change are intimately linked. Climate change is one of the main drivers of biodiversity loss. To stop the loss of biodiversity, it is necessary to stop climate change. But stopping climate change cannot be at the expense of biodiversity. We cannot sacrifice our biodiverse forests and grasslands for land-intensive climate mitigation technologies, as doing so threatens our existence in other ways. We depend deeply on the biodiversity of the planet, regardless of whether we live in cities or in forests. We also cannot sacrifice the lives and livelihoods of indigenous peoples and local communities directly dependent on diverse ecosystems. They are the stewards, guardians, managers, and protectors of diversity and we will be lost without their wisdom and knowledges of relationships with the non-human world.

Schemes where nature is reduced to its constituent carbon, to be sold to the highest bidder, will never be "solutions". Nature-based offsets turn attention away from the necessity to rapidly and completely decarbonize, tempting us to look at the beautiful scenes of national parks and tropical forests, encouraging us to "look over there!" whilst fossil fuel and other consumers and destroyers of nature carry on their rampaging of the planet and its climate. To call these strategies nature-based "solutions" is a bold-faced lie.

Equitable climate action and just strategies to protect biodiversity and those whose lives and livelihoods depend on that biodiversity are based on common principles, rather than charismatic and fuzzy terminology. Land tenure and rights to resources of indigenous peoples and local communities must be protected, to enable IPLCs to carry on as guardians and

protectors of the planet's wealth of biodiversity. A radical and just transformation of our economies away from fossil fuels is needed urgently to prevent warming above 1.5°C above pre-industrial levels. Deep decarbonization strategies undertaken by global elites and the global North are necessary first steps towards a just distribution of effort.[94] First World nations have colonized the atmosphere with their historical emissions – decolonizing the atmosphere must start with deep decarbonization on the part of developed countries and their corporations.[95]

These are simple and profound principles and objectives that should guide our actions. Questions of equity and justice must serve as metrics for assessing the adequacy of our actions, whether in national biodiversity strategies and action plans, nationally determined contributions, or "net zero" pledges.

[94] https://royalsocietypublishing.org/doi/10.1098/rstb.2019.0120; Anderson, C.M. et al. 2019. Natural climate solutions are not enough. *Science* 363: 933-934.

[95] https://therednation.org/2020/04/27/the-red-nation-launches-part-three-heal-our-planet-of-the-red-deal/

"NATURE-BASED SOLUTIONS" AND THE BIODIVERSITY AND CLIMATE CRISES

"Nature-based solutions" (NbS) have been defined as "actions to protect, sustainably manage and restore natural or modified ecosystems that address societal challenges…". The societal challenge to which NbS are most commonly applied at present is the mitigation of climate change.

In this context, emissions of the greenhouse gases that cause global warming, such as carbon dioxide, are sought to be offset by safeguarding forest, soil and other ecosystems which can remove and store atmospheric carbon. While this approach has attracted corporate interest and spawned a huge market for carbon offset credits, the mitigation potential of nature is limited. To effectively counter climate change, there is thus no avoiding the need to reduce emissions to as close to zero as possible.

Despite their shortcomings, carbon markets and the NbS model have also been held out as a means of financing conservation of biological diversity. Appropriating forests and lands to serve such NbS strategies, however, threatens to dispossess the indigenous peoples and local communities who are the true stewards of the planet's biodiversity.

In light of the dangers and drawbacks of turning to "nature-based solutions", this paper poses the question: Whose nature is being asked to solve which problems?

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