NATURE-BASED SOLUTIONS INITIATIVE

UNIVERSITY OF OXFORD

Kleinman Center for Energy Policy

The case for Nature-based Solutions to Climate Change

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from: Seddon, Smith et al (2021) Getting the message right on nature-based solutions to climate change. *Global Change Biology.* (doi: 10.1111/gcb.15513)

NbS can reduce impacts of climate change

- **PROTECTION –** e.g. protecting ecosystems defend against storm surges, salt water intrusion and erosion (e.g. kelp, seagrass meadows, saltmarshes, coral and oyster reefs)

- **RESTORATION –** e.g. restoring forests and wetlands secures and regulates water supplies, shields communities and infrastructure from floods, erosion and landslides

- **IMPROVED MANAGEMENT –** e.g. nature-based agriculture such agroforestry or floating gardens can increase resilience of food supplies to pests, diseases and climate extremes (floods, droughts)

- **CREATION –** e.g. green and blue infrastructure in cities to help with cooling and flood abatement, while reducing air pollution, providing health benefits.

www.naturebasedsolutionsevidence.info

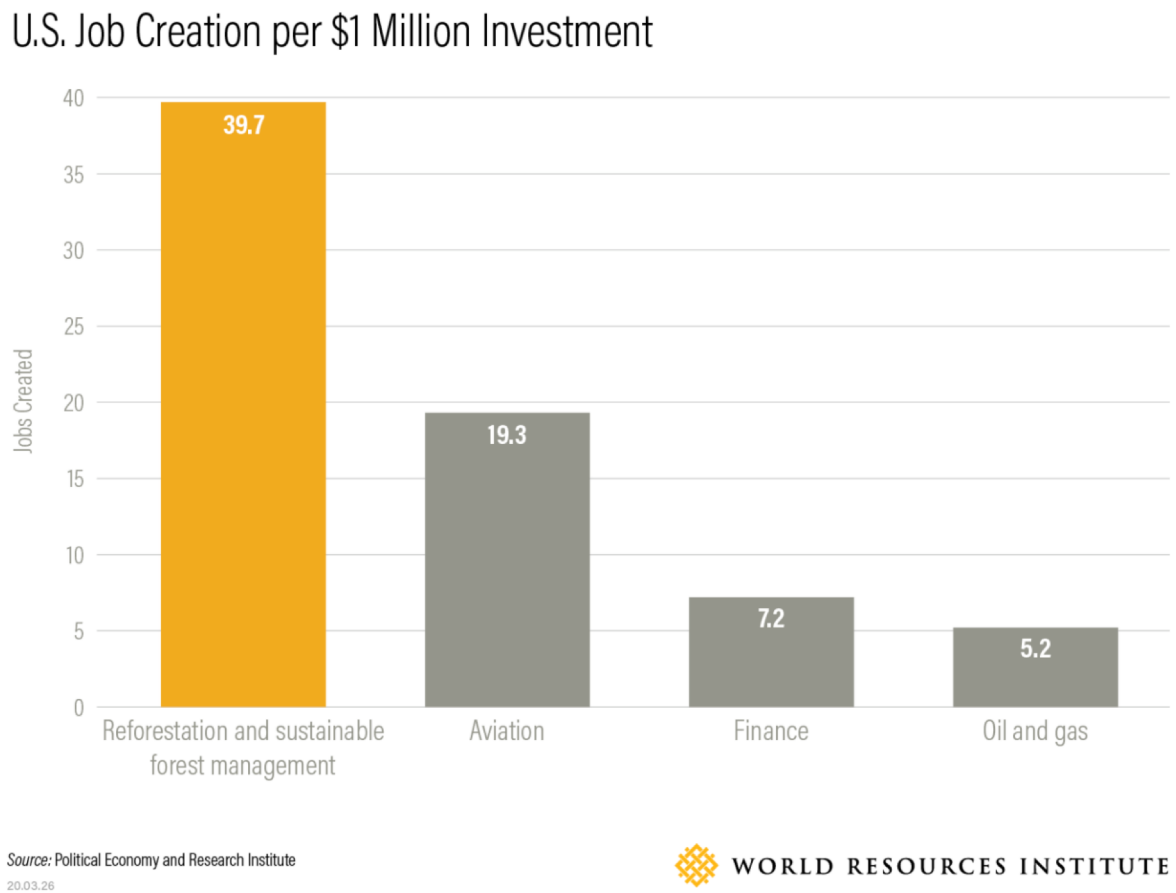
Chausson, Turner et al. (2020) *Global Change Biology*

Nature-based Solutions make economic sense

- Benefits of **mangrove restoration** (fisheries, forestry, recreation and disaster risk reduction) are up to 10 times the costs[1]
- **Nature-based coastal defense projects** are 2-5 times more cost-effective compared to engineered structures[2]
- **Saltmarshes** protect 23BnUS$ worth of property during hurricanes each year in NE USA[3]
- Annual damages from flooding would double and costs from storms would triple in absence of **reefs** globally[4]

[1] Global Commission on Adaptation (2019) Adapt now: a global call for leadership on climate resilience
[2] Narayan S et al. (2016) The effectiveness, costs and coastal protection benefits of natural and nature-based defences. PLoS ONE 11
[3] Browder G et al. (2019) World bank report. See https://www.wri.org/publication/integrating-greengray.
4 Beck et al (2018) The global flood protection savings provided by coral reefs. Nat. Commun. 9, 2186.

Nature-based Solutions can stimulate the economy



- **For every $1 million invested in coastal habitat restoration in the US, 40 new jobs are created**; compared to 19 for investment in the aviation industry, 7 for finance, and 5 for oil and gas[1]

- New **investment of $350 billion a year in sustainable food and land use systems** could create more than **120 million new jobs** and **$4.5 trillion in business opportunities** globally each year by 2030[2]

[1]Edwards et al. (2013) Marine Policy; [2]Food and Landuse Coalition (2020)

To what extent can NbS limit warming?

- NbS can reduce emissions arising from our use of lands and oceans whilst securing C stocks
- **Land source**: agriculture, forestry and other land-use activities account for c. 13% of total anthropogenic emissions of CO2
- **Land sink**: ecosystems absorb c.29% of anthropogenic CO2

The biosphere has the potential to remove and store considerably more – how much more?

(Griscom et al. 2017, 2020; Le Quéré, C. et al. 2018; IPCC Land & Climate Report 2019)

These estimates come with many caveats

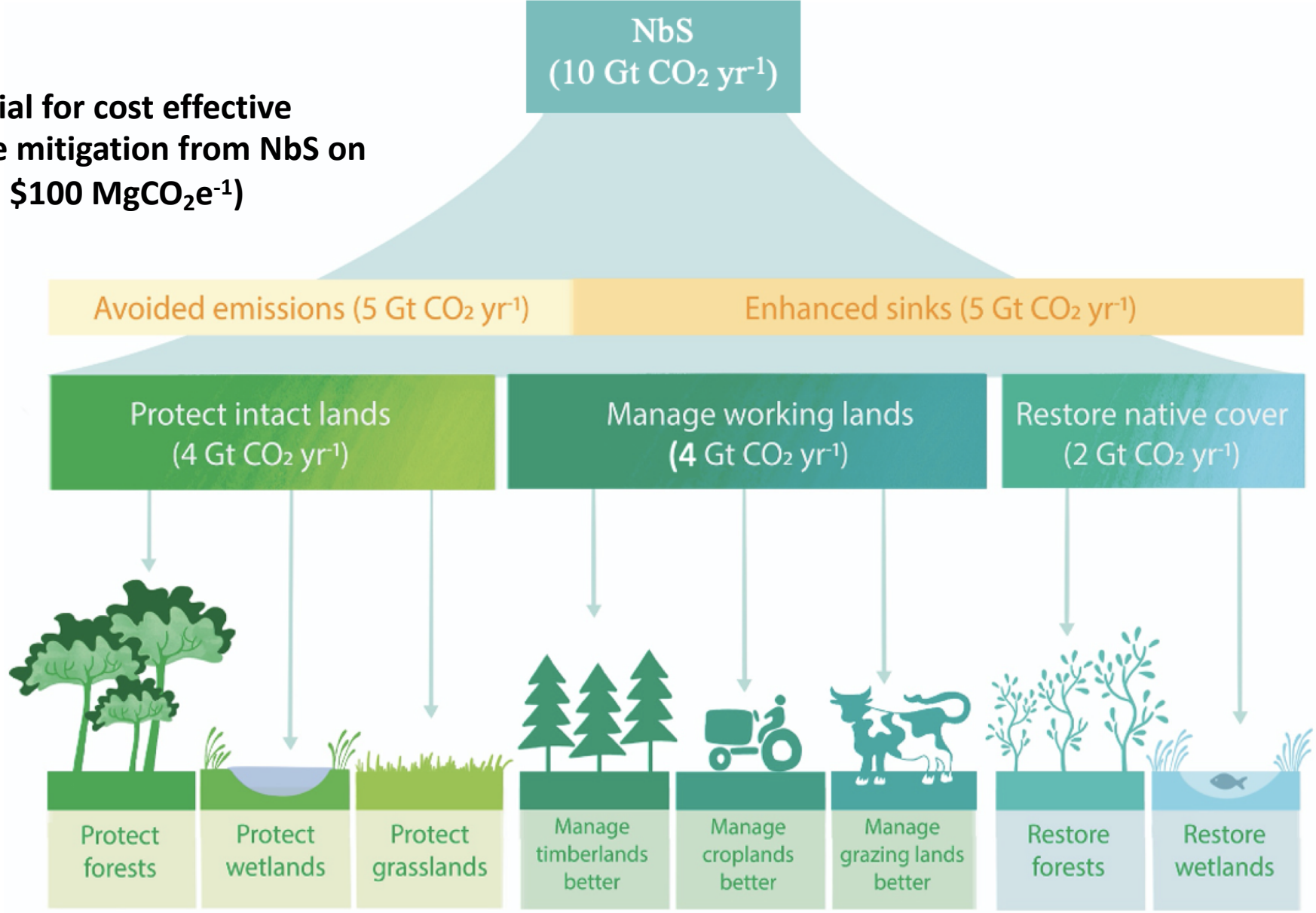
Constraints and safeguards that need to be applied to NbS models:

- **Biodiversity safeguards** - restore forest ecosystems in areas ecologically appropriate for forests
- Exclude boreal biomes due to **albedo**
- Saturation of ecosystem carbon sequestration rates
- **Food security** (exclude existing croplands)
- Fibre security
- Sensitive to **cost (≤ $100 $MgCO_2e^{-1}$)**

Estimates currently do not account for:

- Complexities of **governance** issues (land rights, conflicts between land ownership and management, inequalities)
- Lack of information about the role of **marine** ecosystems
- **Impacts of climate change** on the biosphere
- ...

Potential for cost effective climate mitigation from NbS on land (≤ $100 $MgCO_2e^{-1}$)

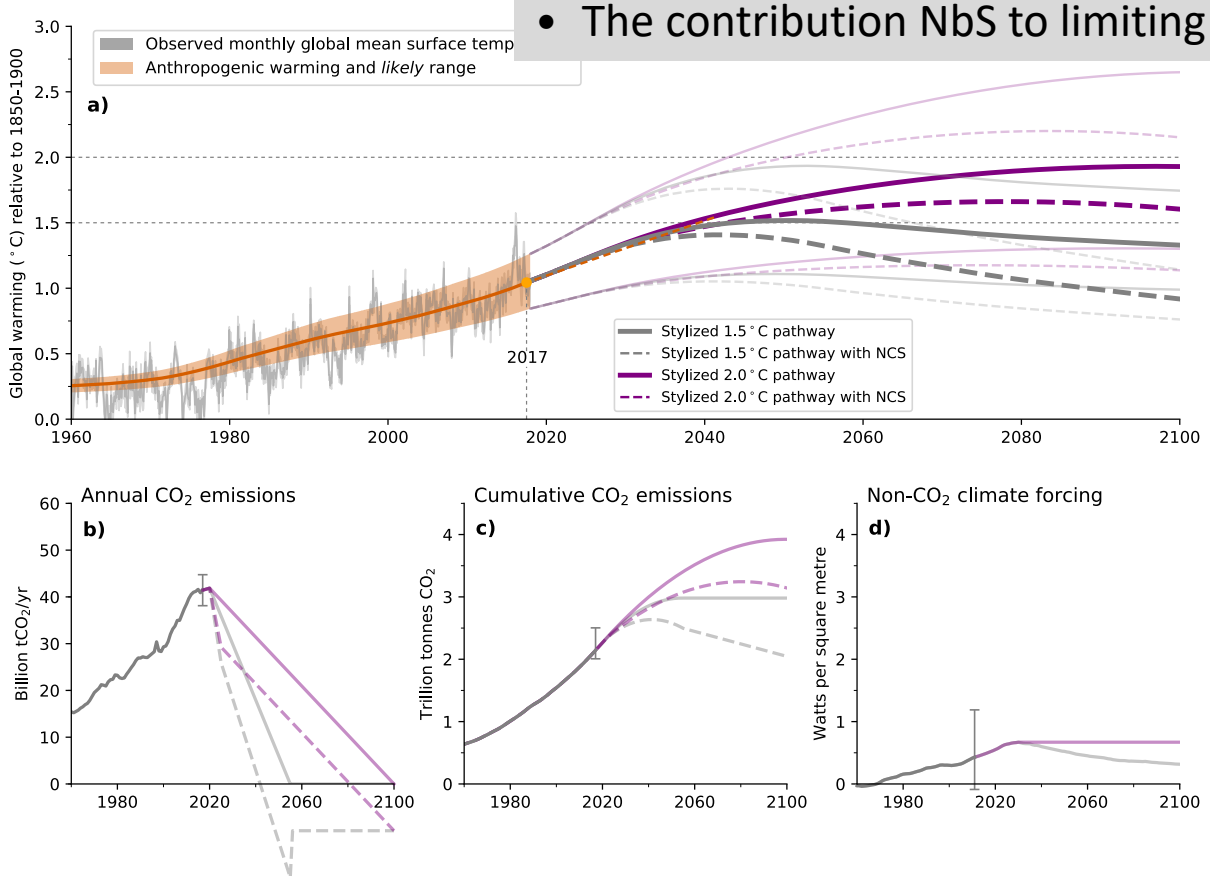


Girardin et al., in review

Based on estimates from
Griscom et al., 2017
Griscom et al., 2020
Busch et al., 2019

& consistent with
Roe et al., 2019

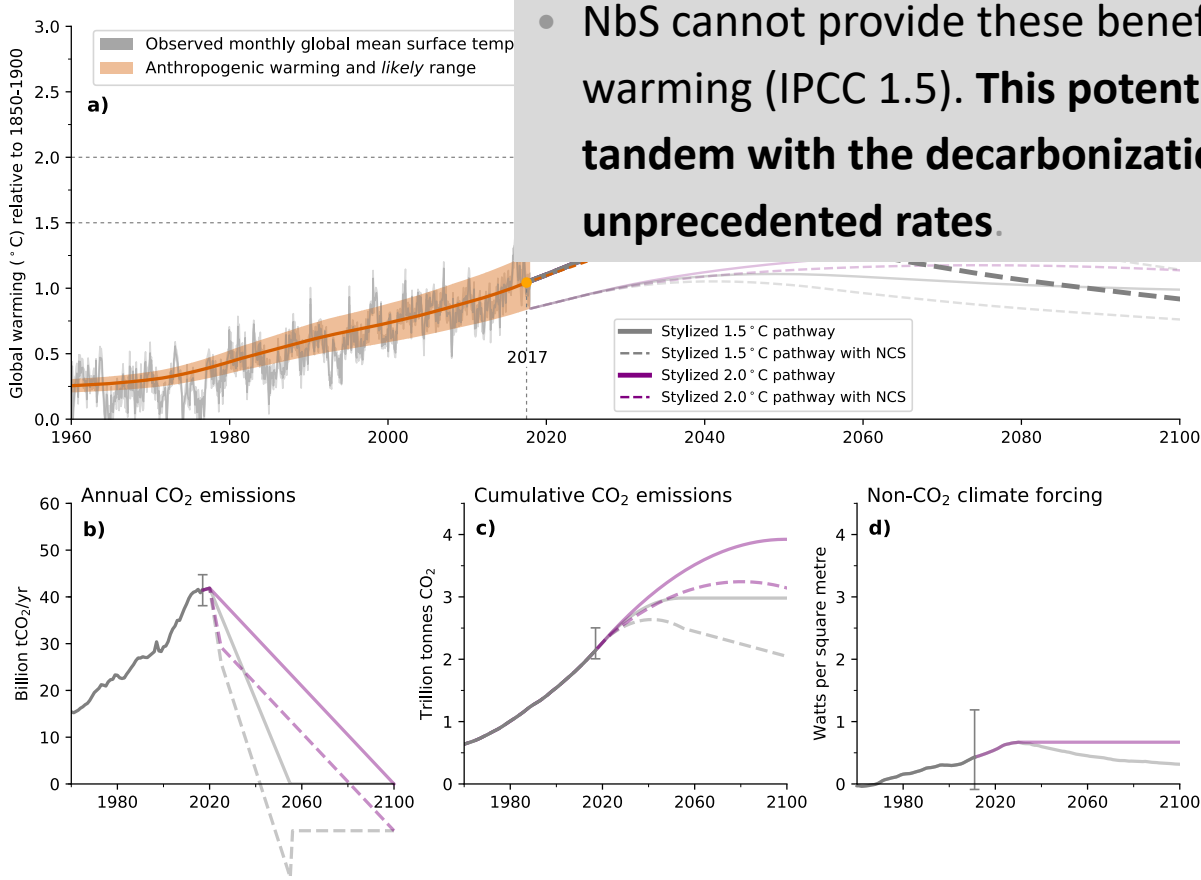
- NbS have a key role to play in mitigating climate change.
- NbS keep acting well after the peak in global warming.
- The contribution NbS to limiting peak warming is time-sensitive.



Girardin, C.A.J., Jenkins, S., Seddon, N., Allen, M., Lewis, S.L., Wheeler, C., Griscom, B.W., Malhi, Y., in press

NbS make an important contribution to cooling *this century*, with the potential to reduce peak warming up to 0.1 degrees if global warming peaks at 1.5 degrees in 2050, 0.3 degrees if peaks at 2 degrees by 2075.

- However, their capacity is finite
- Warming compromises permanence
- NbS cannot provide these benefits if we go beyond 1.5C peak warming (IPCC 1.5). **This potential can only be achieved in tandem with the decarbonization of the global economy at unprecedented rates**.



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Global momentum for Nature-based Solutions

- Leaders Pledge for for Nature (led by the UK)
- UN Biodiversity Summit 2020
- NbS are a core theme at the UK-hosed UN Climate meeting CoP26 in Glasgow, UK
- Dozens of new funding streams for NbS
- WEF 2020: Trillion Trees Platform
- Business for Nature coalition
- ...but focus on NbS for climate change mitigation, especially tree planting

Potential pitfalls of NbS

1. Investing in NbS for carbon offsets is distracting from the need for rapid phase out of fossil fuels.
2. Over-emphasis on tree-planting for rapid carbon gain rather than a wide range of NbS.

   ⇒Adverse impacts on local communities

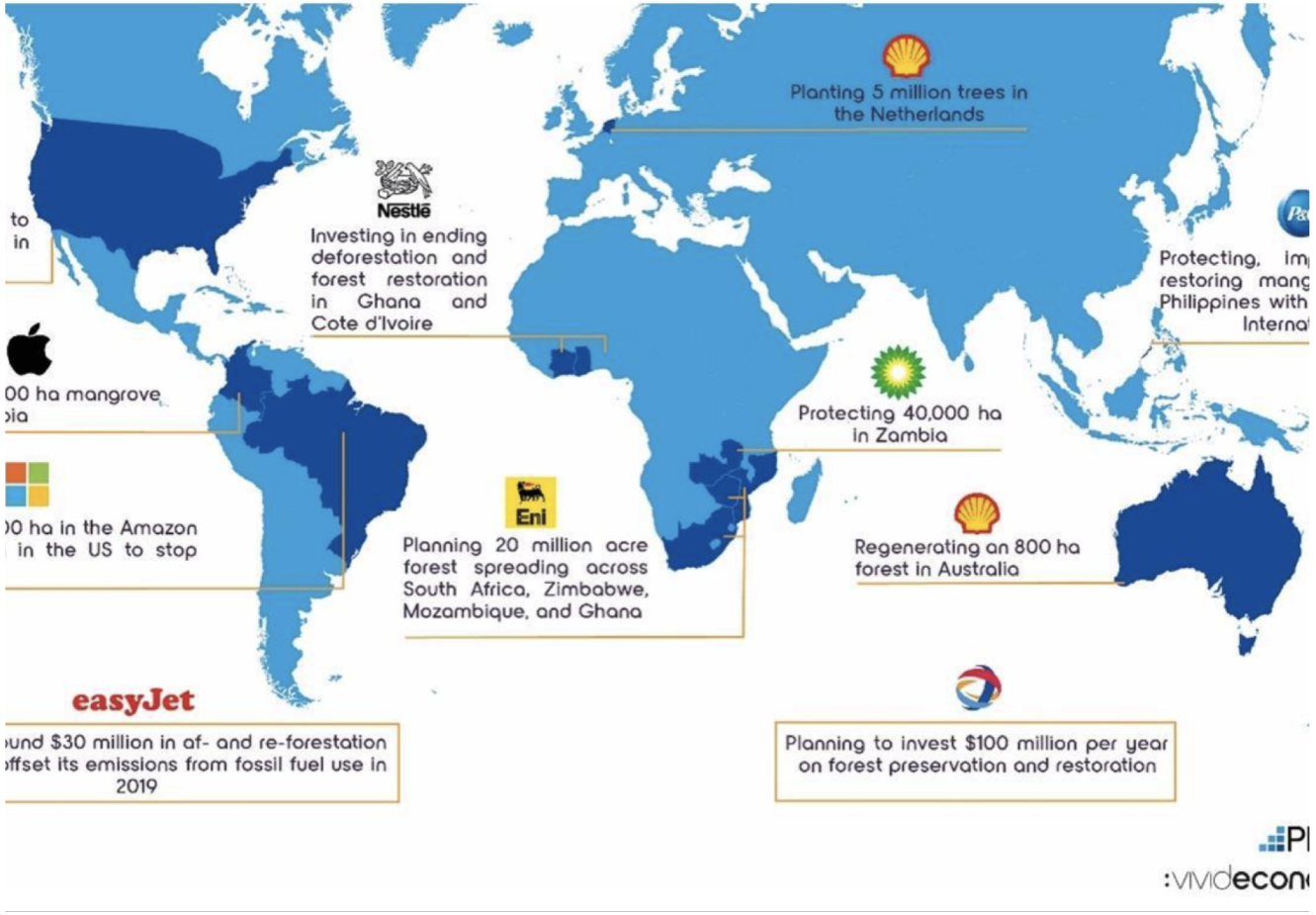
   ⇒Adverse impacts on biodiversity

We must caution against focussing on carbon as the main metric of success for NbS projects. This poses a threat to biodiversity, human rights, and the climate.

Carbon offsets & greenwashing

*"Within NETs, Nature-based solutions to the climate crisis focused on **reforestation and afforestation** are the most viable nearterm opportunity 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."*

- Vivid economics investor guide to Negative Emissions Technologies



& Taskforce on Scaling Voluntary Carbon Market (M. Carney, 2020)

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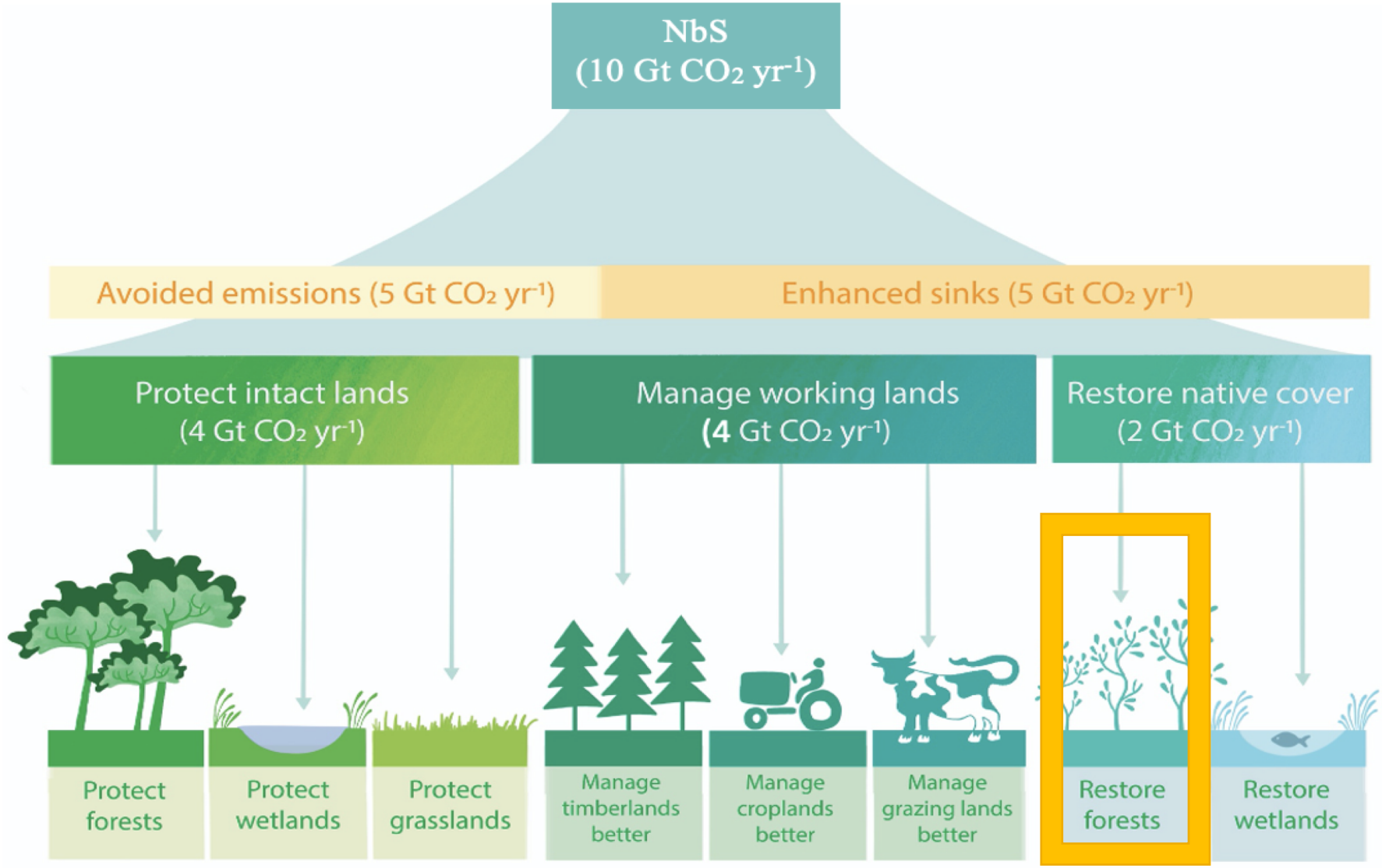

Girardin et al., in press

Based on data from
Griscom et al., 2017
Griscom et al., 2020
Busch et al., 2019
Lewis et al., 2020

~ 20% from restoring ecosystems

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Problems with a focus on afforestation as a climate solution

- **Distracts from the need to keep fossil fuels in the ground –** unless we rapidly decarbonize our economies, global heating will damage our ecosystems beyond recovery
- Plantations offer **short term high-risk carbon stores** – much harvested wood is for short-lived products and plantations tend to involve low diversity non-native species and hence have low resilience to pests and climate extremes
- **Distracts from the urgent need to protect intact ecosystems, and can threatens other critically important habitats –** such as wetlands, peatlands, grasslands which are rich in both carbon and biodiversity; natural forests often replaced by plantations leading to a net loss of biodiversity and carbon

Problems with a focus on afforestation as a climate solution

- **Adverse impacts on local communities**– on whose land will these trees be planted? Resource and cultural rights and knowledge can be ignored; loss of livelihoods; projects not sustainable or ethical.

Cambodia

- 34,007 ha concession in name of climate change mitigation
- Replaced by an *Acacia* monoculture
- Local communities dispossessed from land
- Net loss of carbon and biodiversity

Scheidel & Work (2018*) Land Use Policy*

Chile In 1986-2011:

- Govt subsidized plantation forests > x2
- Carbon stored increased c.2%
- Native *Nothofagus* forests shrunk by 13%
- Subsidies accelerated biodiversity loss

Heilmayr et al (2020) *Nature Sustainability*

One clear voice on successful, sustainable NbS

- NbS Guidelines (NbSI 2020)
- FEBA framework for EbA criteria and standards (Bertram et al. 2017)
- World Bank principles on NbS for disaster risk reduction and water management (World Bank 2017)
- WWF principles (WWF 2020)
- IUCN Global Standard for NbS (IUCN 2020)

Four guidelines for successful, sustainable Nature-based Solutions

1) Are a vitally important part of the climate solution but are **not a substitute for a rapid fossil fuel phase-out** and must not delay urgent action to decarbonise our economies; *any funding for NbS from offsetting must only come from those entities with credible ambitious net-zero plans*
2) Involve the **protection and/or restoration of a wide range naturally occurring intact ecosystems** on land and in the sea (not just woodland/forests) and **improved management of working lands and seas** globally
3) Are implemented with **full consent and engagement of IPs and local communities, including women and farmers**
4) **Sustain or enhance a diversity of native species and habitats** (single species plantations are crops not nature-based solutions)

See: www.nbsguidelines.info
sent to UK government on 13 Feb 2020

New boundary initiatives:
www.TerraMatch.org - W*orld Resources Institute*
www.carbon-direct.com

Key messages about NbS and climate change mitigation

- NbS make a vital contribution to cooling this century, with the potential to reduce peak warming up to 0.3 degrees by 2075.
- However, this can only be achieved in tandem with decarbonising the economy as otherwise warming will turn ecosystems into net sources of CO2.
- NbS may be financed in the short term through "offsetting" schemes provided that
  a) those investing have verifiable, ambition, credible decarbonisation plans (*Mitigation Hierarchy*), and
  b) the projects in which they invest meet guidelines for good, sustainable, ethical NbS *(NbS guidelines / NbS Global Standard / Oxford Principles for Net Zero aligned offsetting).*
- By mid-century NETs need to have shifted away from biological stores to carbon removal in low-risk permanent geological storage (Allen et al., 2020).
- Anticipate in medium term, flow of finance will come form the carbon market; longer term, will need alternative finances from public funding, risk management, blended finance, including NbS in existing certification schemes.
- **We need to invest in NbS now for the multiple benefits they bring – mitigation, adaptation, biodiversity, health.**

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