



THE UNIVERSITY OF
MELBOURNE

Climate change and the Land Gap

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The University of Melbourne

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Outline

- Science
- Land Gap
- Policy



“Net-zero’ in the Paris Agreement



2015 COP 21 - Paris Agreement Art. 4.1

“...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....”

1997 COP 3 - Kyoto Protocol Art. 3.3

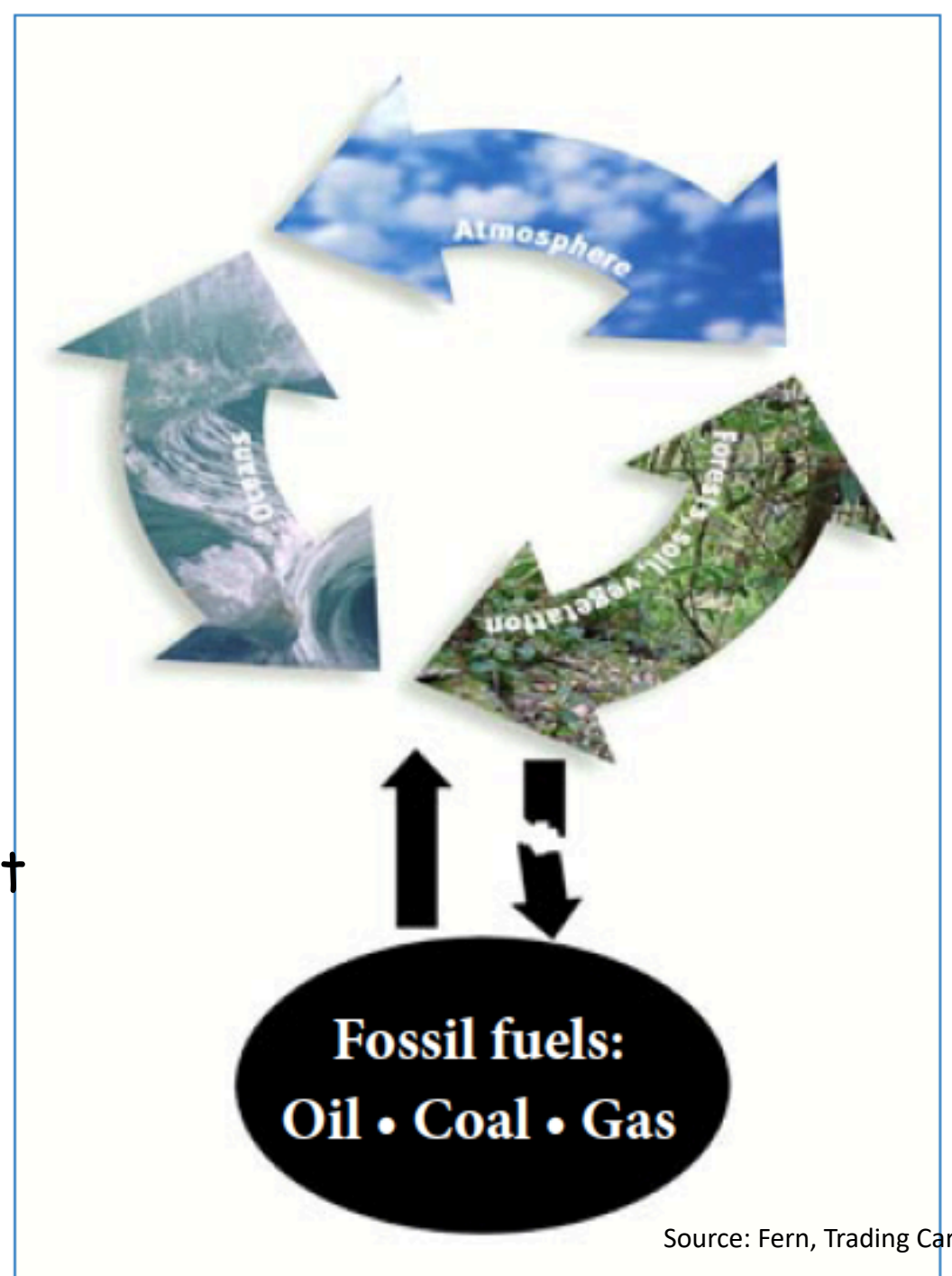
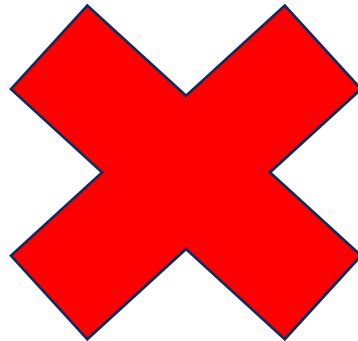
"The net changes in greenhouse gas emissions by sources and removals by sinks... limited to afforestation, reforestation and deforestation since 1990..."



1. Cumulative CO₂ emissions drive warming

Net-zero goals that allow ongoing fossil fuel emissions add to the active carbon cycle in aggregate

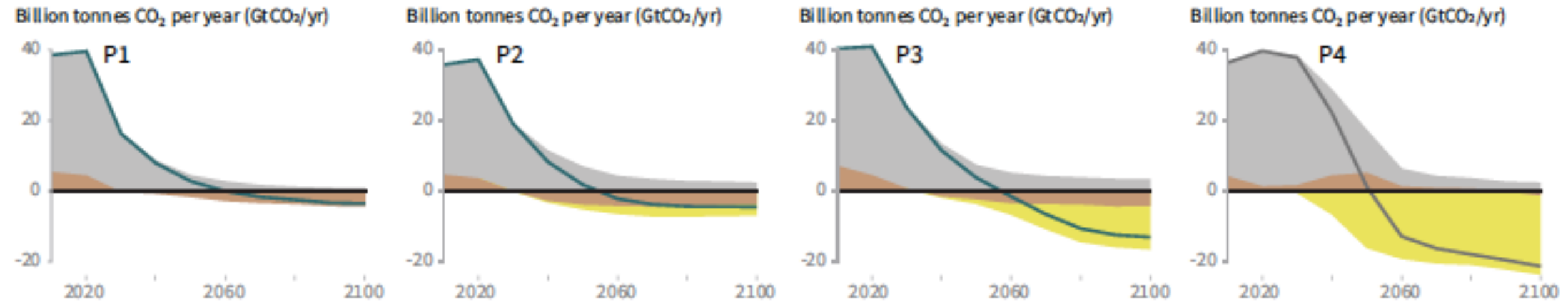
1 tonne fossil fuel emissions - 1 tonne forest sequestration = net-zero



2. Delay requires greater removals

Breakdown of contributions to global net CO₂ emissions in four illustrative model pathways

● Fossil fuel and industry ● AFOLU ● BECCS

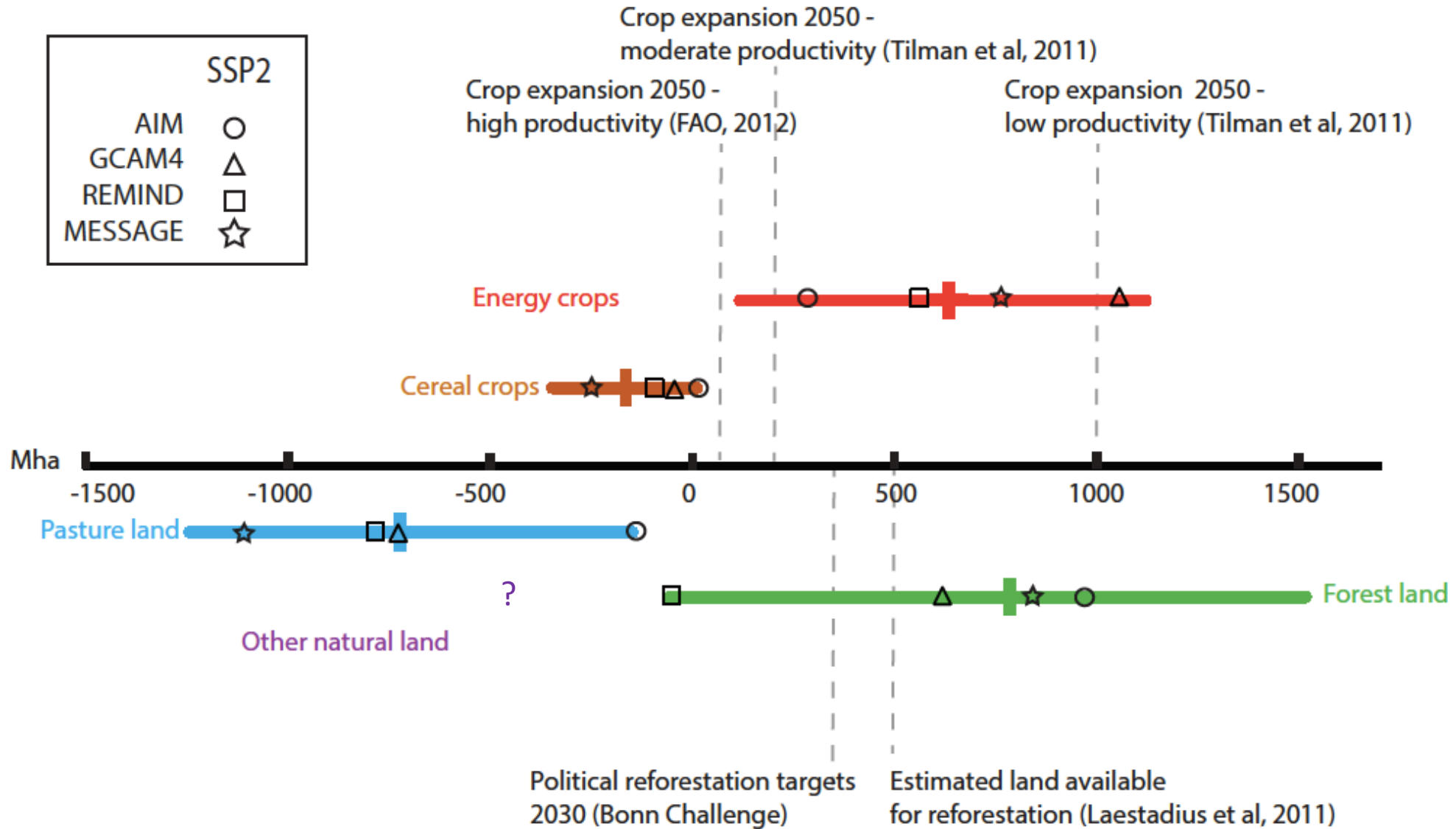


Source: IPC SR1.5 SPM

Most mitigation pathways rely on land



Land-use change in 1.5°C pathways



Land-use change in 2100 relative to 2010 under SSPx-1.9

Direct drivers to biodiversity loss



Climate Change

- Major driver of change in nature, with strong direct global impacts. Examples of climate change impacts on nature include sea-level rise and ocean acidification.
- Average global temperature increase passed 1°C in 2015.
- Increasingly exacerbates the impact of other drivers to biodiversity loss.
- Extinction risk is predicted to increase 3-fold at 3°C warming, increasing further for higher warming levels.



Changes in land and sea-use

- Agricultural expansion is the most widespread form of land-use change, mostly at the expense of old-growth forests, wetlands and grasslands.
- Land degradation is occurring in all land cover, land-use and landscape types, in all countries, with the largest relative negative impact on terrestrial and freshwater ecosystems since 1970.
- Land-use change is a major contributor to climate change.
- Intensive land use can lead to progressive changes in ecosystem function resulting in land abandonment.



Invasive species

- Negatively impacts native species, ecosystem function and services, economies and human health.
- Increase of 40% in cumulative records since 1980, 20% of the earth surface at risk.
- No substantial impact on other drivers.
- Trade, travel, habitat degradation and climate change exacerbate invasions.



Resource extraction

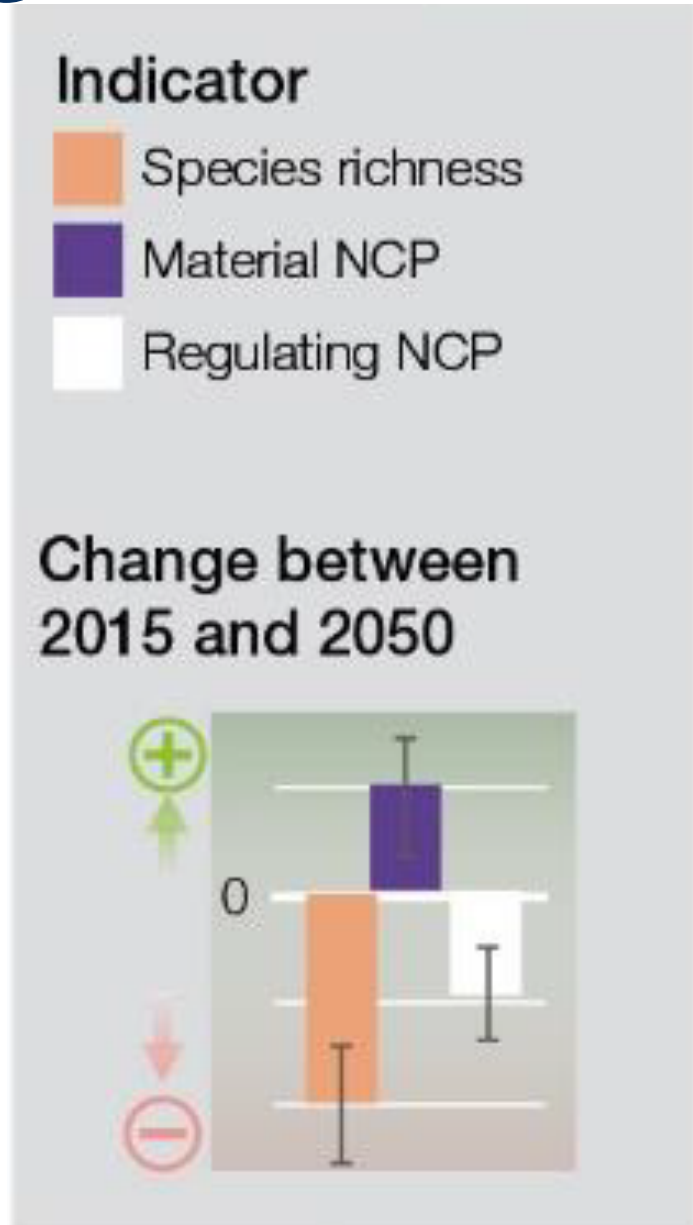
- Direct exploitation of living and non-living materials, via harvesting, logging, hunting and fishing, mining and freshwater withdrawals.
- Depletion of water resources interacts with many biophysical and societal drivers, contributing to negative impacts on nature and societies.
- Cascading effects of extraction can manifest as biodiversity losses and accelerated changes in climate, most prominently in tropical forests, marine, coastal and polar ecosystems.
- Overexploitation undermines ecosystem function.



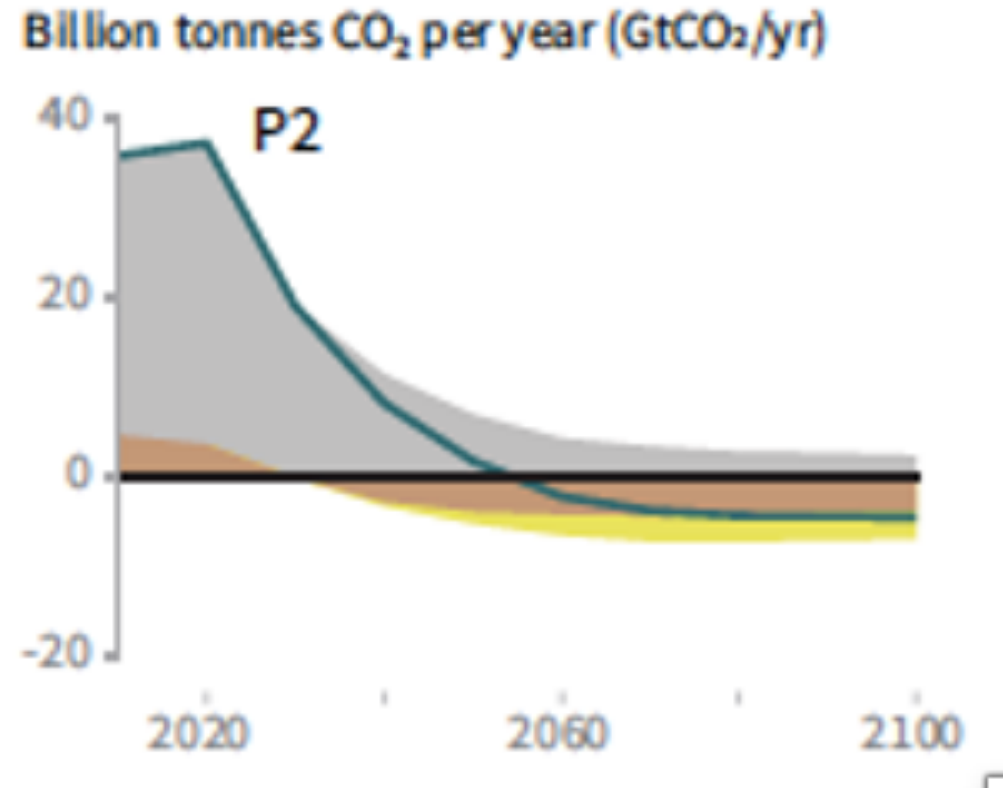
Pollution

- Strong negative effects on quality of soil, water, and the global atmosphere due to pollutants from industrial, mining and agriculture, oil spills and toxic dumping, and underwater noises from shipping.
- Air, water and soil pollution continue to increase in some areas. Nitrogen emissions several orders of magnitude larger than pre-industrial times, acidifying freshwater ecosystems.
- No substantial impact on other drivers.
- Transport expansion exacerbates pollution.

3. CDR drives biodiversity loss

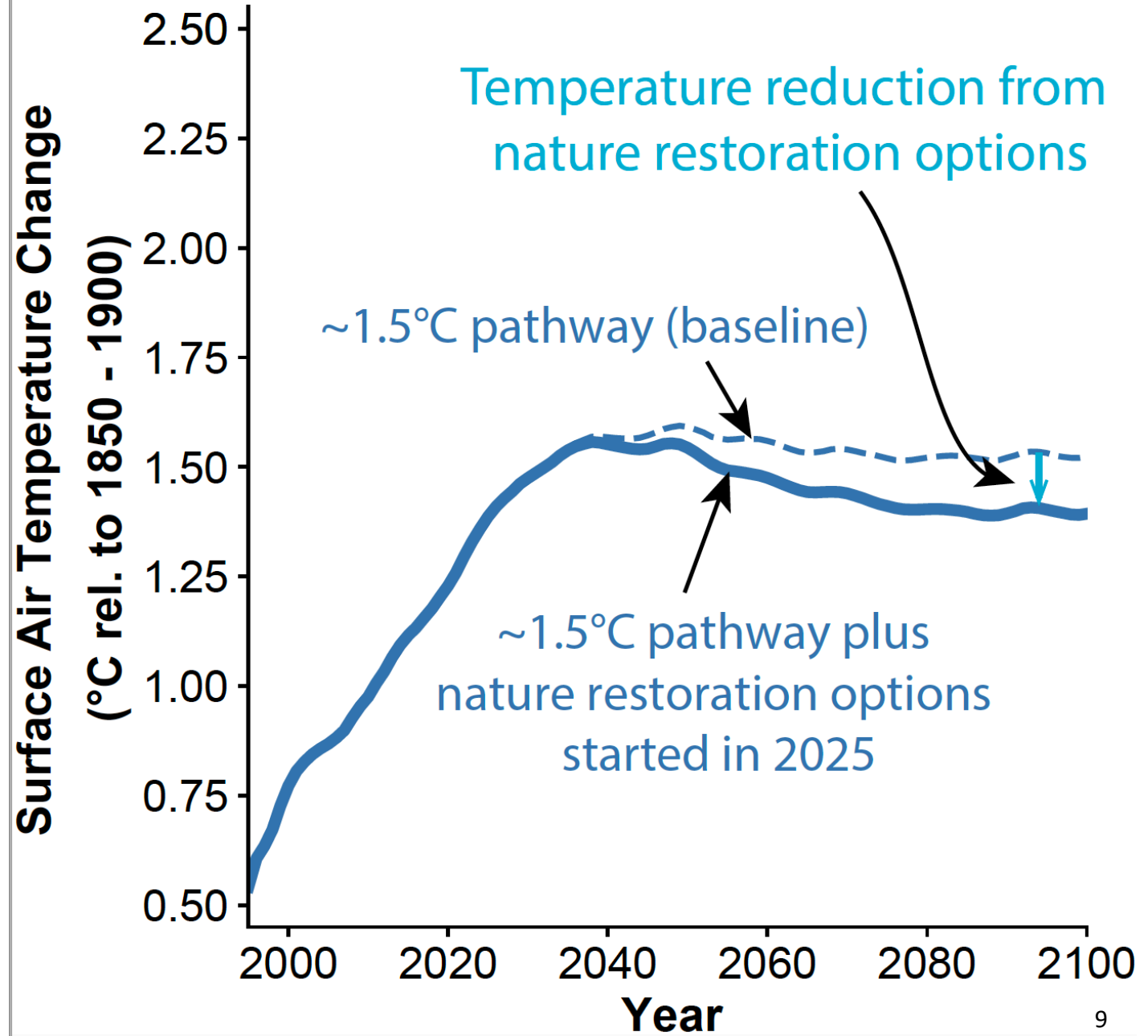


Biodiversity impacts from Carbon Dioxide Removal (CDR) and climate change under a sub-set of mitigation scenarios





Limited climate benefits from land-based CDR





The Land Gap Report

2022

Governments' over-reliance on carbon removals could push ecosystems, land rights and food security to the brink with new land area equivalent to 50 percent of the world's croplands currently being required to meet targets. Climate pledges should focus on protecting and restoring existing ecosystems with carbon benefits.

Screenshot

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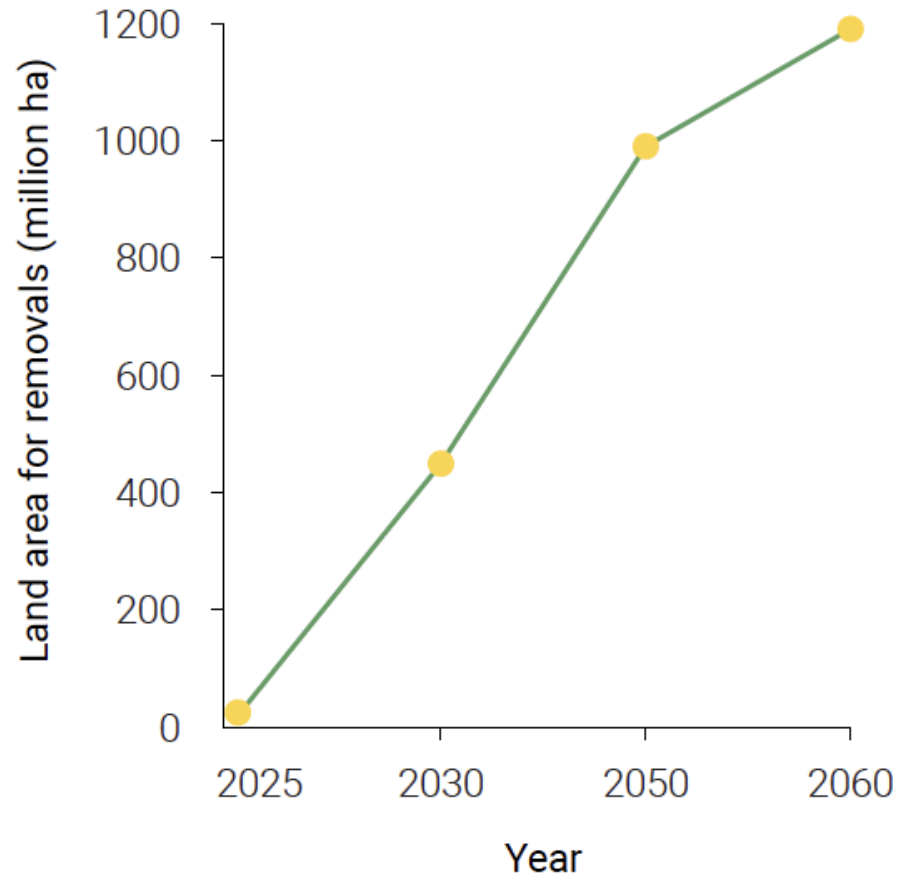
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Results



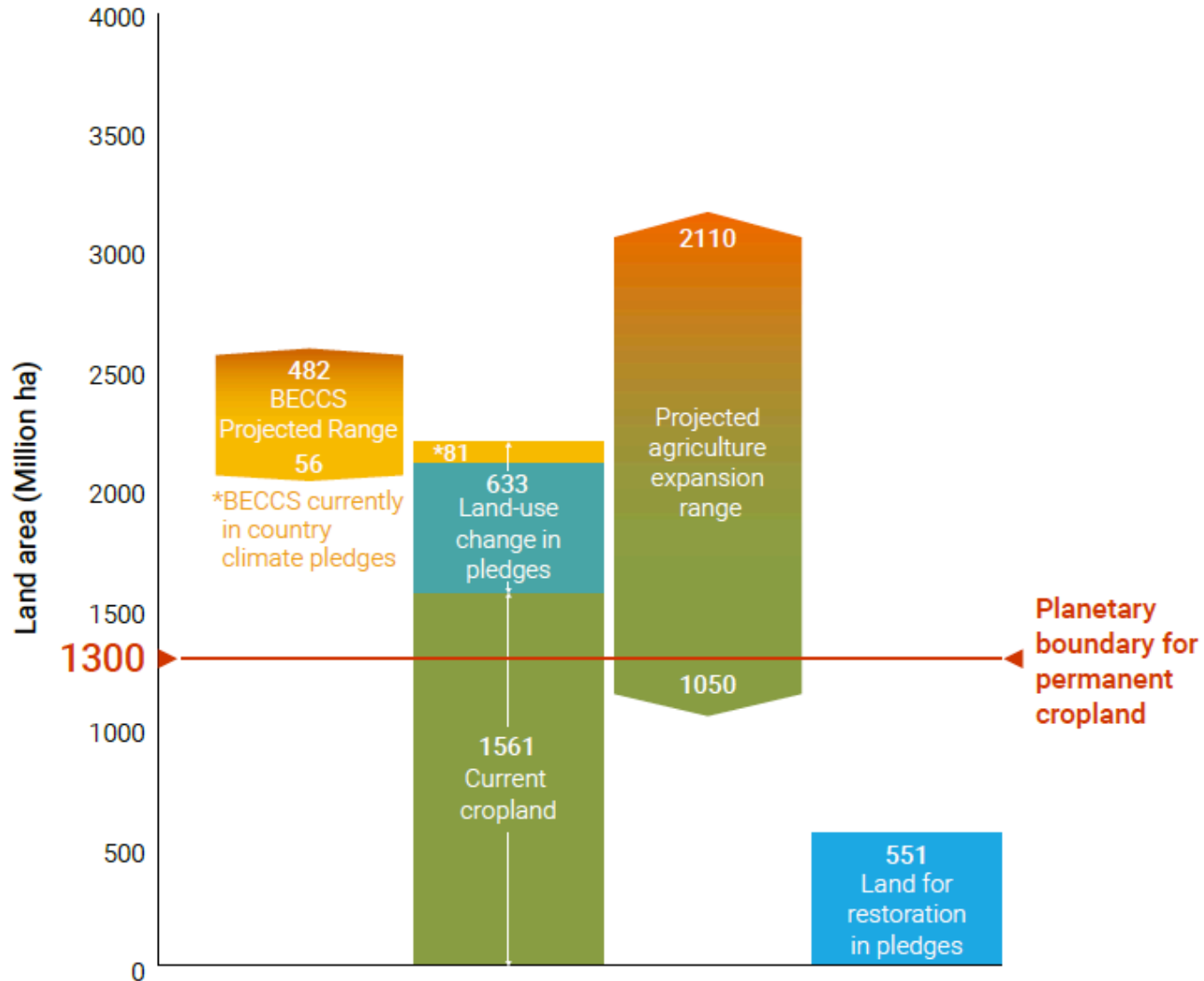
➤ **1184 million hectares required for land-based CDR in 2030 and 2050 / net-zero pledges**

Of this:

➤ **633 million hectares requires land use change** (forest expansion, tree-planting commercial plantations, energy plantations)

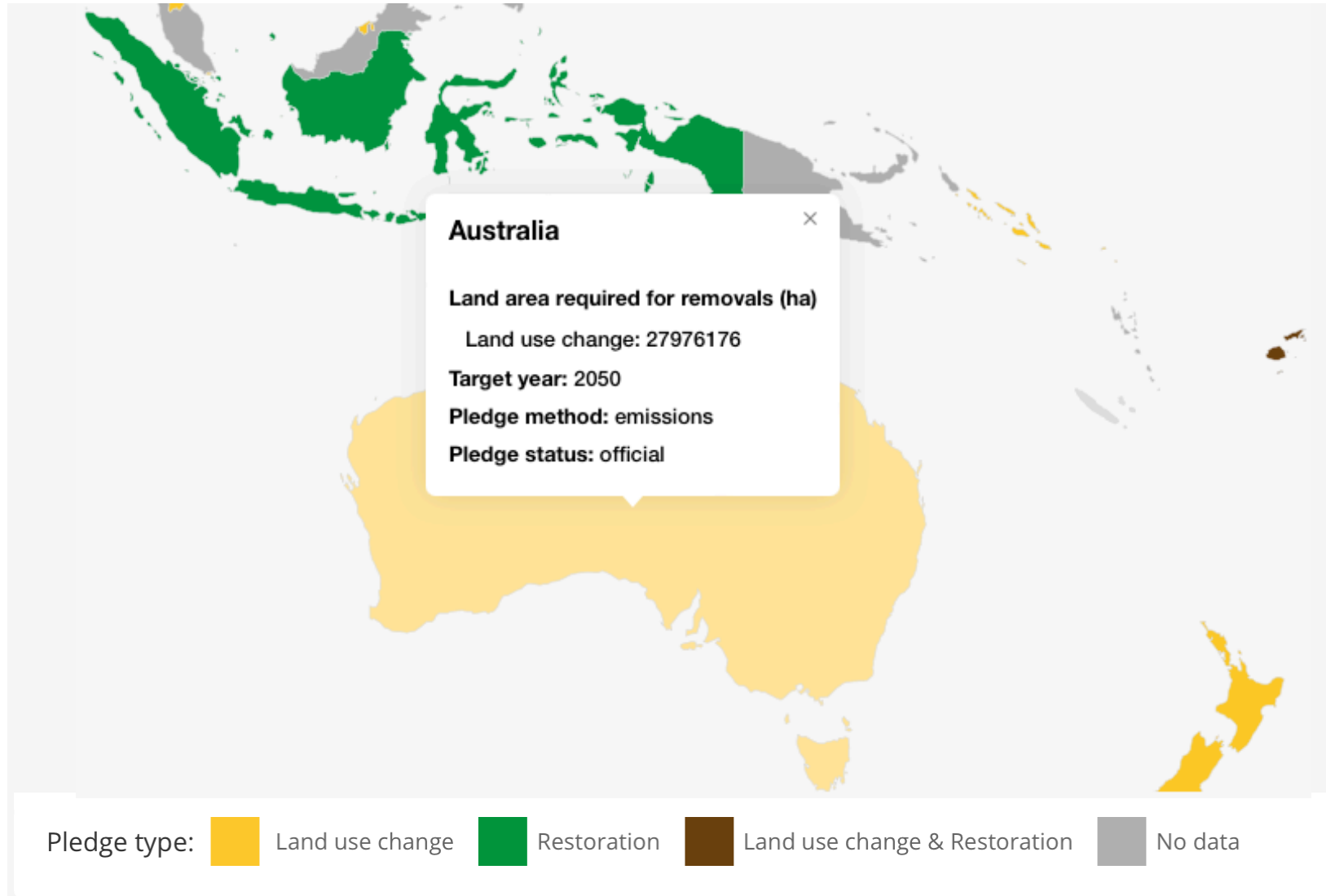
➤ **551 million ha for restoration** (degraded forests, rangelands, mangroves and wetlands, agricultural lands, agroforestry, silvopasture)

Land-use change already exceeds planetary boundaries

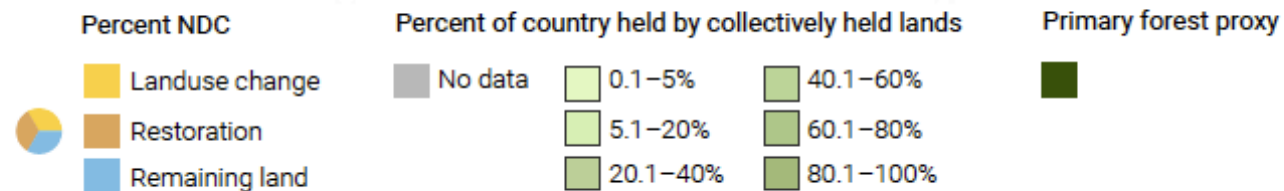
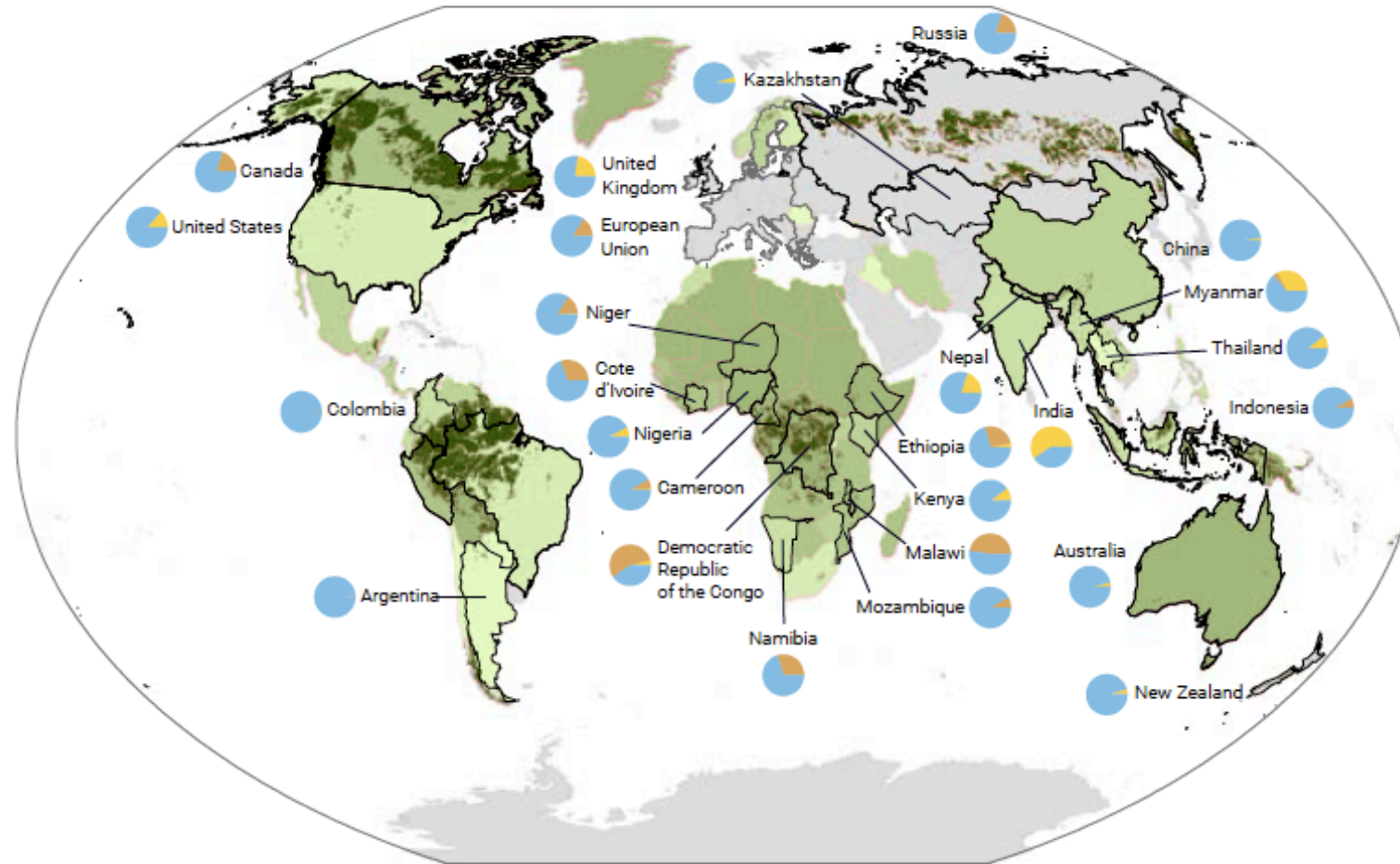




Interactive data-base www.landgap.org



Collectively held land and land-based climate pledges





Land Gap – key messages

- Countries' climate pledges rely on **unrealistic amounts of land-based carbon removal**
- More than half of the total land area pledged for carbon removal involves **land-use change**, putting potential pressure on ecosystems, food security and indigenous peoples' rights
- **Net accounting assumptions** assume that planting new trees offsets emissions from fossil fuels or land-use change - ignoring scientific and ecological principles
- **Securing land rights** for indigenous and local communities has proven most effective for preventing deforestation, conserving biodiversity, and producing food sustainably
- **Agroecology promotes socioecological resilience** by restoring ecosystem functions and services through biologically diverse agricultural and food systems



Australia - Nationally Determined Contribution

- Updated NDC communicated in mid-2022 - increases climate mitigation commitment to reduce greenhouse gas emissions by 43% below 2005 levels by 2030
 - Focus on decarbonisation of energy and industry, electric vehicles, batteries, grid stability





Safeguard Mechanism

The introduction of declining emissions baselines for Australia's major emitters, under the existing Safeguard Mechanism

- Unlimited offsets = **no absolute cap on emissions**
- Offsetting permanent fossil emissions with temporary removals into land and forests = **no climate integrity**
- Allowing new fossil fuel projects into the scheme = **no government policies that address fossil fuel expansion**

Proposed reforms risk increasing emissions in Australia and lock-in dependence on fossil fuels



Recommendations

- Prioritize the decarbonization of the global economy, via fossil fuel phase-out
- Protect and restore the world's lands and forests – supporting the rights of Indigenous Peoples and local communities who are best placed to achieve these goals
- Separate targets between emission reductions and removals to maintain the integrity of net zero pledges
- Tree-planting is not a climate strategy!



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Thank you

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