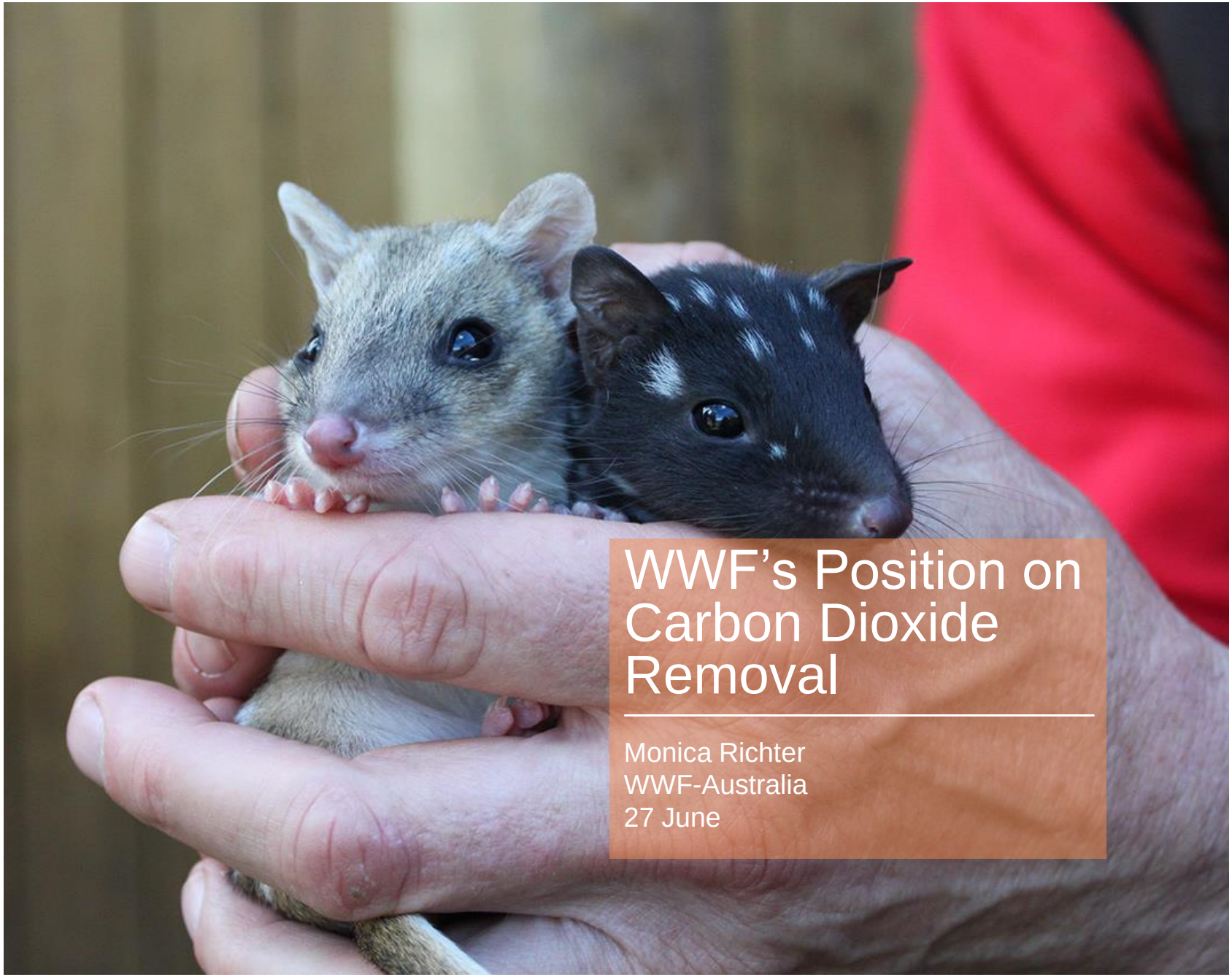

WWF’s Position on Carbon Dioxide Removal

Monica Richter
WWF-Australia
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It is better to not pollute in the first place, so rapid and deep cuts are a priority – these are necessary but not sufficient. Actively removing carbon dioxide from the atmosphere to balance out any hard-to-mitigate residual emissions must also happen. We know that land-based carbon dioxide removal options such as forest restoration can have benefits over and above climate mitigation and are a better immediate focus than more technological removal options. The balance between carbon emissions and carbon removals needs to happen globally around mid-century, and sooner in developed countries.

WWF Position Paper – Carbon Dioxide Removal
October 2018

https://wwf.panda.org/our_work/climate_and_energy/ipcc152/

Position Statement Summary

1.Most current scenarios that keep global warming within the Paris Agreement's 1.5° C limit rely on removing large amounts of carbon dioxide from the atmosphere using a mix of land-based carbon sinks and technological removal approaches, in addition to accelerated action to cut emissions.

Position Statement Summary

2. Immediate efforts must prioritise cutting greenhouse gas emissions rapidly and deeply, as less emissions entering the atmosphere means there is less need for carbon dioxide removal later in the century. Relying on carbon dioxide removal to any significant extent is a high-risk approach given uncertainties to its deliverability at scale. Thus:

○ Carbon dioxide removal must not delay or replace efforts to cut greenhouse gas emissions.

○ Pathways that rapidly cut emissions and minimise the need for carbon dioxide removal must be prioritised.

Position Statement Summary

3. However, some carbon dioxide removal is likely needed to limit global temperature rise to 1.5° C, both to cancel out hard-to-mitigate residual emissions and/or to reduce atmospheric carbon dioxide concentration in the event of temperature overshoot scenarios

Position Statement Summary

- 4. There are a range of approaches that could, in principle, be used to remove carbon dioxide from the atmosphere at very large scale, but all carry risks and their social acceptability can differ depending on the context.

○ All carbon dioxide removal approaches have potential trade-offs and/or scale limitations and no single approach will be the full removal solution in the most 1.5°C scenarios.

Position Statement Summary

○ We should prioritise those approaches which remove carbon dioxide from the atmosphere and permanently sequester it in natural systems – particularly those which have proven benefits for people and nature as well as climate.

○ The reliability, costs and benefits, impacts, and risks of many approaches are not well understood. Further research and development will help to ascertain whether they can be part of the climate solution, and their tradeoffs if so.

Position Statement Summary

5. To the extent that carbon dioxide removal approaches are implemented, they should adhere to strict environmental and social safeguards in order to minimise negative consequences.

Prioritise – Green Light

Prioritise: benefits outweigh the costs.

- **Enhancement of forest carbon stocks** through:
  - **Restoration** of ecological functioning of degraded forest landscapes – comprising peatlands, mangroves, coastal wetlands/ecosystems or low productive land – by promoting multifunctional landscapes, including reforestation and afforestation.
  - **Natural regeneration of forests**, assisted or otherwise.
- **Enhancement of soil carbon** through:
  - **Carbon sequestration in agricultural soils**, which also enhances soil health and productivity.
  - **Soil sequestration using sustainable production of biochar**.

Proceed with Caution

Further research and development is needed to ascertain whether these approaches can be part of the climate solution: balance between costs and benefits, and the unknown risks is not yet clear.

- **Afforestation** at scale on non-degraded land, which may not compensate the opportunity costs of land conversion, and may produce negative social impacts;
- **Bioenergy with carbon capture and storage (BECCS)** is land-intensive and limited in spatial suitability but could, in appropriate circumstances and with adequate safeguards, provide carbon dioxide removal;
- **Direct air capture and storage** is expensive and energy intensive but has large potential and fewer and less severe land-competition impacts; and
- **Enhanced weathering of minerals on land** requires large volumes of materials implying negative impacts from mining and transport but could permanently store a sizable amount of carbon dioxide.

Not at this time

Not suitable for use at this time since: the ecological and social uncertainties far outweigh the known benefits.

- **large-scale ocean fertilisation** as it has a high potential for unintended and damaging side effects for ocean ecosystems; and
- **Enhanced weathering of minerals added to the oceans** appear to have environmental and other costs that outweigh the potential climate benefits.

Table 1: Summary of WWF's position on Carbon Dioxide Removal, including Carbon Sequestration in Natural Systems

Pros and Cons

47. Pros and cons for different carbon dioxide removal approaches:

CARBON DIOXIDE REMOVAL APPROACH	PROS	CONS
Ecosystem restoration 	• Realises biodiversity benefits • Can be beneficial to build resilience to the effects of climate change	• Excluding forests, the overall contribution to carbon sequestration limited due to availability of suitable ecosystems • Few systems in place to value ecosystem restoration • Reversible unless safeguards in place

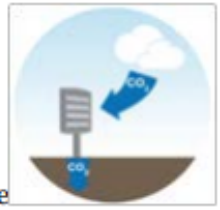
Pros and Cons

Reforestation 	• Could realise biodiversity benefits if carried out in the right way, c.f. ecosystem restoration • Can be beneficial to build resilience to the effects of climate change	• Potential local conflicts with alternative use of land • Could result in short term release of carbon from soil disturbance • Sequestration vulnerable to the effects of climate change and forest fires
Afforestation 	• Could realise biodiversity benefits if carried out in the right way • Could help build resilience in some areas • Can be combined with agriculture to some degree (e.g. planting windbreaks)	• If needed at scale will require significant land and water resources and could conflict with other demands such as food • Could result in short term release of carbon from soil disturbance • Sequestration vulnerable to the effects of climate change and forest fires

Pros and Cons

Soil carbon sequestration – agricultural practices such as no-till 	• If properly done it should not conflict with food production and may improve productivity of some agriculture • May bring wider environmental benefits such as improved soil structure and improve resilience to climate change	• Effectiveness in terms of sequestration is disputed • Reversible unless safeguards in place • Can reduce crop production
Soil carbon sequestration – use of biochar 	• Can improve soil fertility and increase agricultural productivity • Estimates suggest this has a higher potential than other soil sequestration	• Could darken soil and reduce albedo • Effectiveness in terms of sequestration at scale is not proven and may be location dependent • Use of biomass for biochar may compete with other uses of biomass and have land and water implications

Pros and Cons

Bioenergy with Carbon Capture and Storage (BECCS). 	• Can be used to provide renewable energy for power generation or high temperature heat • Carbon can theoretically be stored permanently • Both bioenergy and CCS technologies are well understood although not demonstrated together commercially • Theoretically could be implemented at scale • The CCS component could be implemented first for hard-to-mitigate industrial emissions to cut emissions sooner and reduce peak load on biomass production and DAC	• Potentially has high land, nutrient and water implications with impacts on biodiversity and human societies • Life cycle effectiveness of carbon removal disputed – will be partly dependent on the biomass used • There are risks associated with storing carbon underground such as leakage and seismic activity • Infrastructure for carbon storage not yet developed • Both use of biomass and carbon capture and storage face public opposition
Direct air capture and storage 	• Flexible technology and could be used to scale • Few negative side effects • Potential to store carbon permanently • Much smaller requirement for land and water than BECCS	• High cost • Uses significant energy (although combining DAC with renewable energy has potential to manage that risk) • Large scale capture and storage infrastructure required

Pros and Cons

Enhanced weathering of minerals – land based 	• Makes use of common materials and a process that is well understood • Carbon can be stored permanently • Storage in-situ in volcanic rock could offer an alternative to conventional techniques for storing carbon	• Requires large volumes of materials implying negative impacts from mining and transport • Large scale infrastructure would need to be developed • Would require large areas of land and side effects on soil not established • Potential economic scale of in-situ storage not clear
Enhanced weathering of minerals – ocean based 	• Large potential • Could reduce ocean acidification	• Requires large volumes of materials implying negative impacts from mining and transport • Impacts on ocean ecosystems not understood • Large scale infrastructure would need to be developed

Thank you

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