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COMMENTARY

Afforestation and Reforestation as Cost-Effective Mitigation Tools

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Afforestation and reforestation are more than cost-efficient mitigation tools. They are essential for humanity's survival. Trees and plants' photosynthesis is vital for humanity, as they absorb the CO_2 we emit and offer us O_2 which we need to breathe. Given the decrease in these ecosystems worldwide and the increase in atmospheric CO_2, there is room for existential concern (IPCC, 2023). Even though we have found new ways to transform CO_2 into O_2, their usage is still premature and not yet implemented on an international scale (Li et al., 2025). The most feasible measures are reforestation and afforestation from an economically achievable and timely perspective. Reforestation is the process of reconditioning a previously forested environment that has been destroyed by external events (primarily human acitvities). Afforestation is the process of creating a forested environment in an area that did not previously contain woodland. Both processes aim to transform destroyed and/or barren lands into fruitful ecosystems.

On a local scale, we can see the effects of climate change on our forest in interior British Columbia (B.C.), as forest insects have ravaged forests (Woods et al., 2010; Lamers et al., 2013) and forests fires have increased in frequency and magnitude (Collins et al., 2025). Such events significantly impact the economy of B.C. which is heavily reliant on lumber (Canada, 2025; *The Lumber Industry in British Columbia*, n.d.; Ministry of Forests, 2025). The direct impacts of forest fires extend far beyond the loss of property and timber. These events release large amounts of

stored carbon back into the atmosphere, intensifying climate change, and the resulting smoke severely affects people with respiratory conditions, often worsening asthma, chronic obstructive pulmonary disease (COPD), and other health issues (Frankenberg et al., 2005). While commercial afforestation and reforestation can help restore forest productivity and support the forestry sector, these measures cannot reverse the trajectory of climate change in the short term (Zhang et al., 2023).

There are clear advantages of reforestation and afforestation, as they help revive and strengthen the forestry carbon sink, where plants and trees use photosynthesis to absorb $C0_2$ and store it in their biomass. Afforestation and reforestation aim to increase the capacity of forestry as a carbon sink, or at least counterbalance the decrease caused by climate-related forest damage (Nilsson & Schopfhauser, n.d.; Ménard et al., 2022; Lamers et al., 2013). The Clean Development Mechanism via afforestation and reforestation (CDM A/R) has shown positive results in China (Hu et al. 2021). A/R is commonly considered a cost-efficient policy for climate change mitigation (Doelman et al., 2019; Forster et al., 2021). The low cost of A/R is due to the natural carbon capture of trees and the large global scale of plantation and regeneration (Busch et al., 2024). Table 1 shows the volume-weighted average price per carbon credit from transactions where the price is known for carbon dioxide removal methods in 2023. Forest management and A/R are by far the cheapest methods to remove CO_2 from the atmosphere relative to all the other carbon dioxide removal methods.

Table 1: *Carbon Dioxide Removal Methods and Costs*

Carbon Dioxide Removal Method	Weighted Average Cost (USD per tonne CO_2 removed)
Forest Management	$12
Afforestation / Reforestation	$16
Biomass Burial	$111
Biochar	$131
Bioenergy with Carbon Capture and Storage (BECCS)	$300
Enhanced Rock Weathering	$371
Bio-oil Storage	$505
Direct Air Carbon Capture and Storage (DACCS)	$715
Direct Ocean Carbon Capture and Storage (DOC)	$1,402

Note. *Adapted from S. Smith et al. (2024), The State of Carbon Dioxide Removal.*

In conclusion, afforestation and reforestation are highly cost-effective mitigation tools; however, they are not implemented as widely as they should be, and deforestation continues to rise. The first signs of deforestation are the expansion of agricultural fields (López-Carr, 2021). The conversion of forests to pasture deteriorates soil quality. To remedy this, incentives, particularly for small farmers, must be developed (López-Carr, 2021), such as financial incentive programs that make forest conservation more economically attractive (Chizmar et al., 2024). Political interventions can also communicate the benefits of forest management and the increased use of A/R beyond health and ecological consequences, including reduced soil erosion and improved soil moisture and fertility (López-Carr, 2021). Therefore, economic policies and landowner perceptions are critical for the successful implementation of afforestation and reforestation (Chizmar et al., 2024).

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