October 24, 2022

Carbon credit use is reshaping timberland investments

Carbon markets are entering a period of accelerated evolution, requiring the incorporation of carbon values.

Key takeaways

- The carbon marketplace has become more transparent—and further boosted by global commitments to net zero.
- A wider appreciation of timberland's ability to cost-effectively capture CO_2 is translating into the broader incorporation of carbon values into valuation and

investment strategies.

- Carbon policies now place a higher premium on carbon credit projects that physically remove GHG rather than on those that focus on the avoidance or displacement of fossil fuels.
- Carbon-oriented investment objectives are expected to increasingly compete against those focused on commercial timber production.

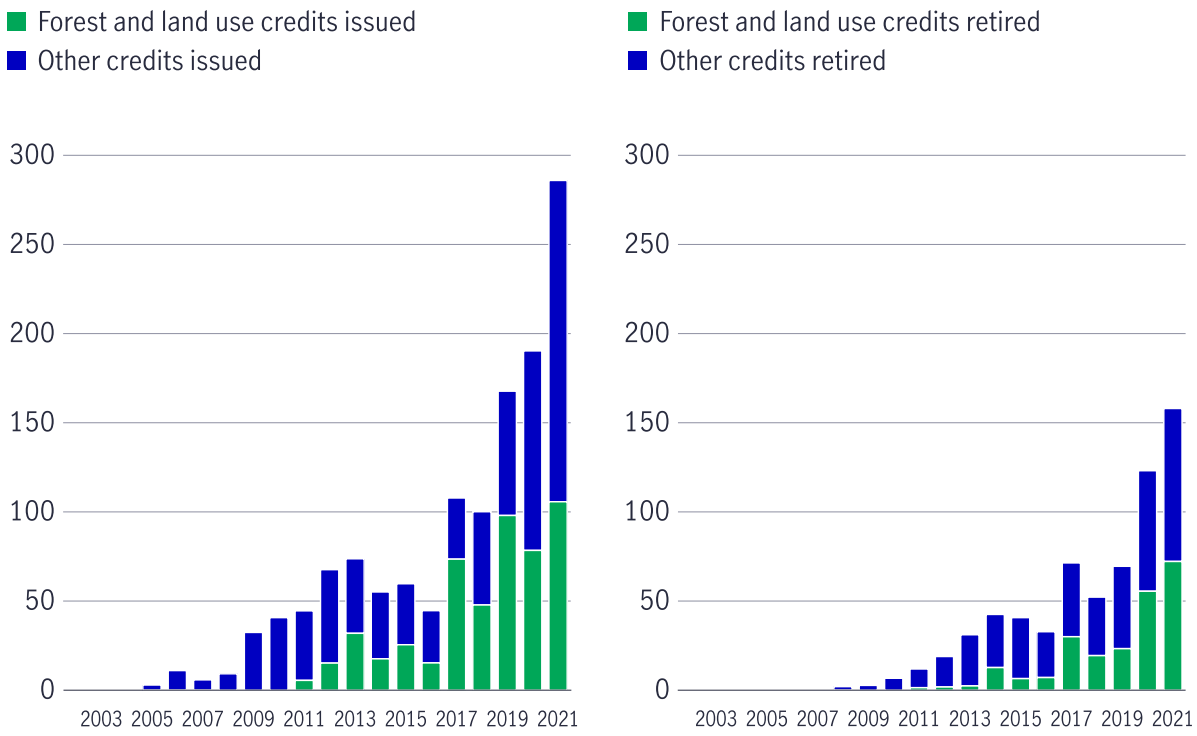
The volume of carbon credit trading has grown dramatically over the past few years. With the demand for carbon credits surging, prices have risen, and the carbon marketplace has become more transparent—and functional. The rapid development of carbon credit markets and increasing commitments by governments and corporations to create explicit goals for greenhouse gas (GHG) emissions reductions have underlined the necessary role of carbon credits in global decarbonization, supporting the anticipated upward appreciation in the price of carbon in the coming decades. The development of increasingly clear and consistent standards-setting requirements for carbon credit projects together with more robust certification and verification of project results provides a foundation for investor confidence and continued growth for carbon markets.

Dramatic growth in carbon credit demand is increasing competition in timberland transactions

Forestry projects represent a major component in the present and future supply of tradable carbon credits. The ability of forests to cost-efficiently capture and store large volumes of CO_2 for the long term is increasingly recognized by timberland investors and managers who are already starting to incorporate potential carbon values into their valuation and investment strategies. Timberland's ability to support net zero goals alongside generating financial returns is becoming an observable factor in increasing competition in timberland transactions. To effectively invest and operate in the coming decades, timberland owners will need to prioritize staying informed, engaged, and responsive to highly dynamic carbon markets.

Accelerating growth seen in traded voluntary carbon credits

Number of voluntary carbon credits issued and retired (millions)



Source: Berkeley Voluntary Registry Offsets Database, Version 5, April 2022.

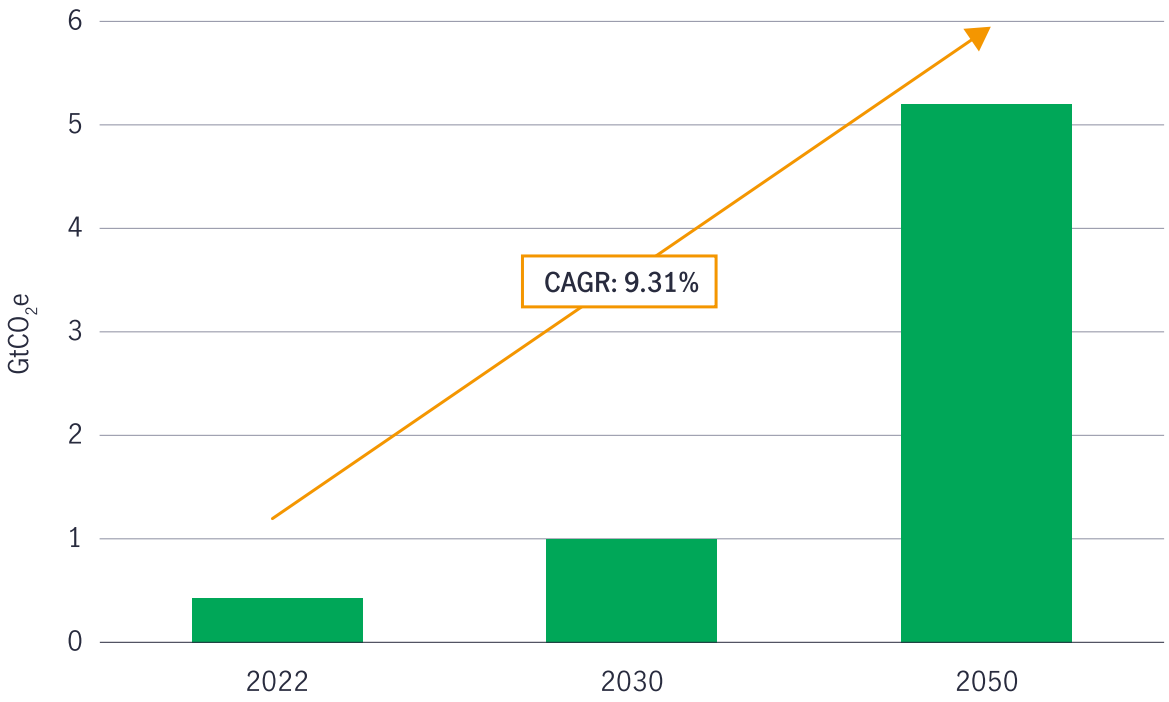
Between 2016 and 2021, growth in voluntary carbon credit issuance accelerated, increasing by over 300%. In 2021, 285 million carbon credits were issued, and the first quarter of 2022 alone saw the additional issuance of 79 million carbon credits. Annual demand (retirements) of carbon credits—a measure of a purchaser's one-time use of a carbon credit to compensate for, or neutralize, emissions—has also increased rapidly, experiencing breakneck growth since 2016. In 2021, 158 million carbon credits were retired, up 28%, from 123 million in 2020.

Future demand for carbon credits is forecast to grow exponentially between now and mid-century to meet corporate net zero target dates. In a January 2022 study, BloombergNEF projected an acceleration in the demand for carbon credits as the drivers of corporate demand shift from behavioral factors (carbon credit buying to satisfy customer concerns or to enhance branding) to fundamental factors (a last

resort mechanism to meet residual emissions based on science-aligned emissions targets). The amount of carbon dioxide equivalent (CO_2e, measured in gigatons, or $GtCO_2e$) that will need to be offset in the voluntary market is modeled to increase from 0.43 $GtCO_2e$ in 2022 to 5.2 $GtCO_2e$ by 2050, with carbon credit demand from corporations driving this steep demand growth.

Demand for carbon credits is expected to be driven by more ambitious compliance goals and corporate GHG reduction targets

Forecast carbon credit demand in the voluntary sector ($GtCO_2e$)



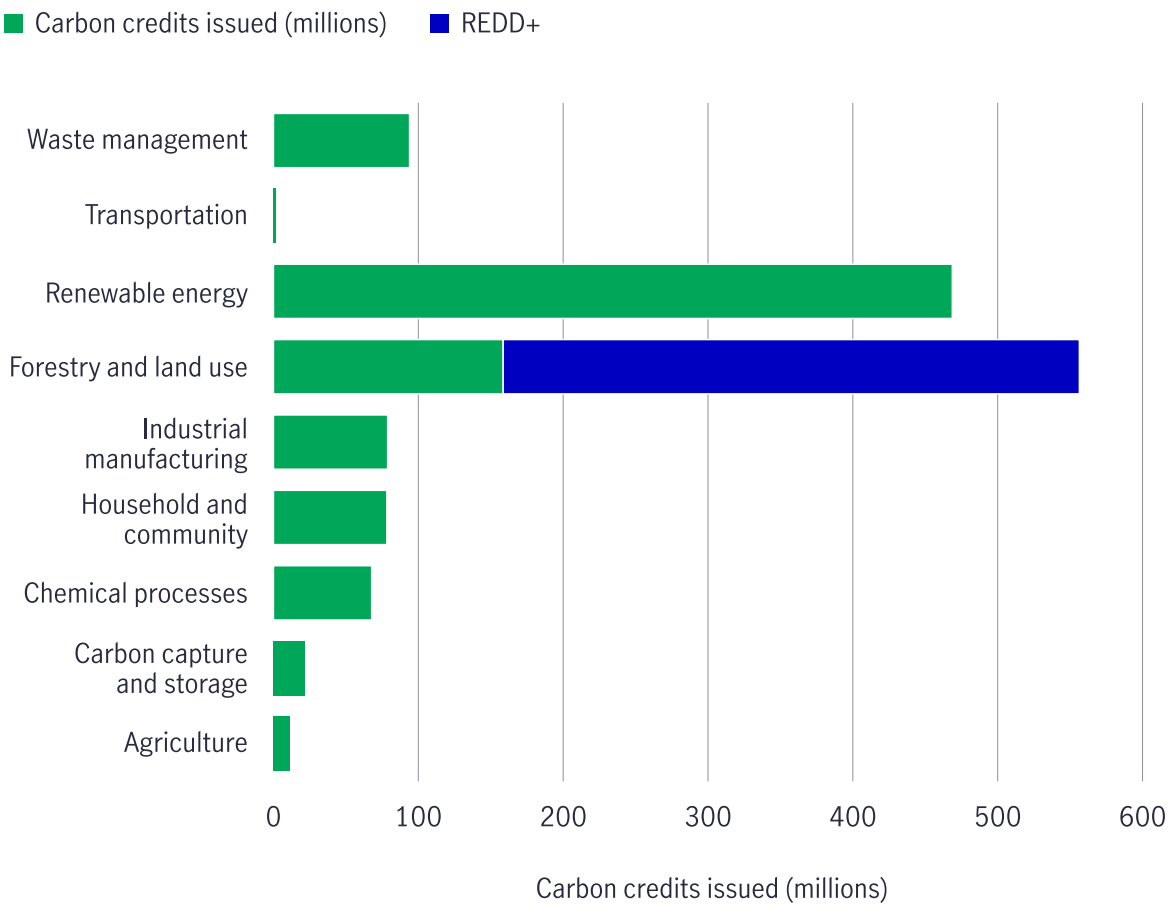
Source: Carbon Pulse, January 10, 2022. GHG refers to greenhouse gas. CAGR refers to the compound annual growth rate.

Renewable energy and forestry projects dominate the current supply of tradable carbon credits

A measure of the global voluntary carbon credit supply is the 5,000+ carbon projects registered with the four main programs (American Carbon Registry, Climate Action Reserve, Verra, and Gold Standard), with renewable energy and forestry projects representing over half of the total projects registered to date. As of Q1 2022, over 625 individual voluntary forestry and land use carbon projects have been registered, representing a combined 556 million carbon credits, or 40% of total issued credits.

Forestry and land use projects make up 40% of total carbon credits issued

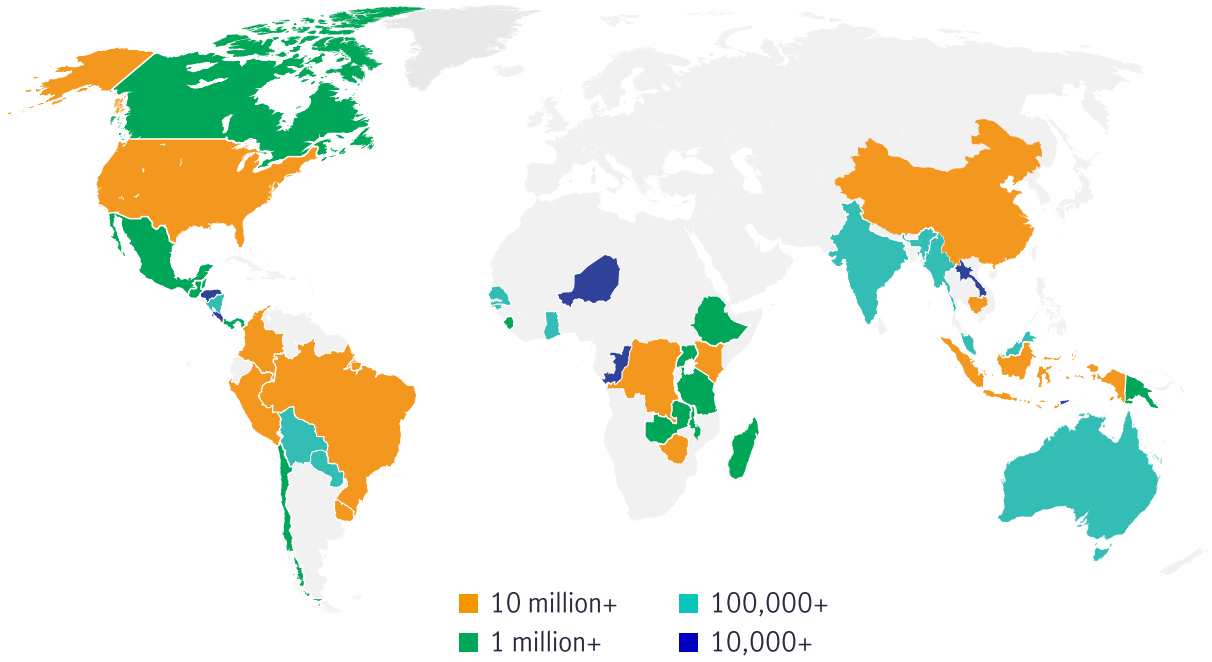
Voluntary carbon projects issued by sector (2008–Q1 2022)



Source: Berkeley Voluntary Registry Offsets Database, Version 5, April 2022; Manulife Investment Management research, as of August 2022. REDD+ refers to reducing emissions from deforestation and forest degradation in developing countries.

Three-quarters of these forestry and land use carbon credits are developed from projects classified as reducing emissions from deforestation and forest degradation (REDD+), falling into the avoided emissions category, and are located in developing countries. Given the past questionable performance of several REDD+ projects, these may face higher scrutiny in the future. Of the remaining 25% of registered forestry and land use carbon credit projects, 16% are classified as improved forest management projects, with the remaining share of projects classified as afforestation/reforestation (8%), wetland restoration (0.2%), and grassland management (1.0%).

Location of issued forest and land use carbon credits



Source: Berkeley Voluntary Registry Offsets Database, Version 5, April 2022; Manulife Investment Management research, August 2022.

Improving confidence in the quality of both carbon credits and governance

The rapidly growing voluntary carbon market is seeing greater investor interest and acceptance as more specific and accessible price information has become available. The expansion of market services specific to carbon credits, such as organizations to validate and certify projects, and trading platforms and futures markets for carbon credits is providing a foundational framework for making carbon credits comparable to other traded commodities.

The improved market infrastructure for carbon credits has been accompanied by an increase in disclosure and reporting standards, third-party carbon credit certification, and carbon project rating services. Ten draft Core Carbon Principles were published in July 2022 by the Integrity Council for the Voluntary Carbon Market (IC-VCM), an independent, multistakeholder nongovernmental organization (NGO) seeking to establish a forward-looking road map for quality and governance and to improve the ability to compare credits from different sources. The Voluntary Carbon Markets Integrity Initiative (VCMI), another NGO project independent from that of IC-VCM, launched a draft integrity code in early June 2022 that stresses responsible corporate use of carbon credits, such as aligning decarbonization targets with the Science Based Targets initiative (SBTi) and using third-party independent verifiers.

> Rapidly developing infrastructure and financial investment are boosting confidence in the quality of carbon credits and program governance, moving carbon credit markets toward commoditization.

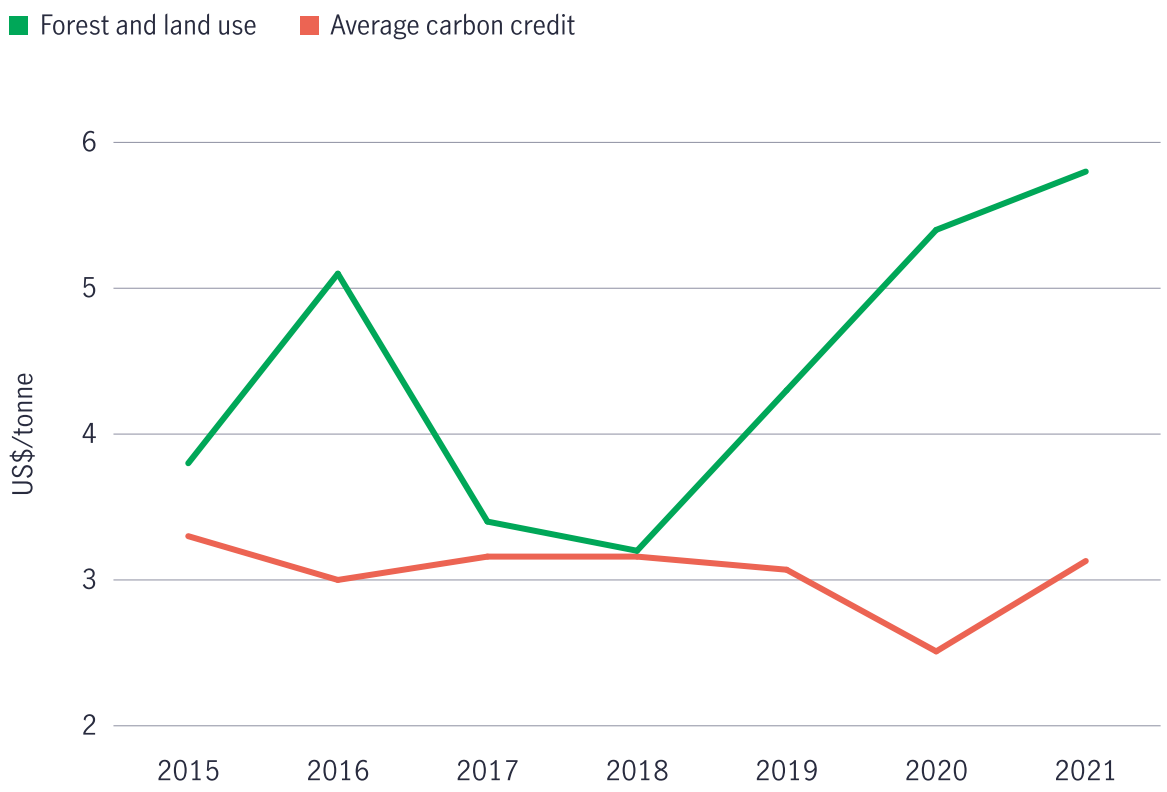
While the improved transparency, consistency, and verification of carbon credit trading are supporting the growth of future demand, policy and technological developments are also signaling significant changes to the future supply of carbon credits. Distinctions are being drawn between credits that represent removals of GHGs from the atmosphere versus credits that represent emissions avoidance. Carbon policy is

moving in the direction of explicitly favoring carbon projects that generate removal credits, such as those from forest carbon sequestration or direct air capture, and placing higher hurdles on certifying avoidance projects, such as avoided deforestation (REDD+) and the use of renewable energy projects that potentially displace fossil-fueled power plants.

The costs of solar and wind power have dropped precipitously over the past decade and are now competitive with fossil fuel power in most developed economies, diminishing the rationale for their use in generating carbon credits. In the future, the use of renewable energy projects for the issuance of carbon credits will likely be limited to emerging economies, particularly in Africa, where carbon finance can support project feasibility. Since REDD+ and renewable energy have been large components of the overall supply of carbon credits, new restrictions on these types of projects will likely shift demand to high-quality forest projects and other new classes of carbon credit projects. Markets are becoming more cognizant of the differences in quality arising from various project types and are assigning price premiums to higher-rated projects such as forest carbon sequestration.

Carbon credit prices recognize forestry projects as a premium removal

Forestry and land use voluntary carbon price vs. all other project types



Source: "State of the Voluntary Carbon Markets 2021, Installment 1," Forest Trends, September 15, 2021; Manulife Investment Management research, as of August 2022.

Carbon moves from incidental to core consideration within timberland investment

Whether or not a particular timberland property is better suited primarily for commercial timber production or for carbon sequestration depends on an investor's goals and priorities, and the decision will also be heavily influenced by the investor's assumptions around the development of carbon policy and the future trajectory of carbon and timber values.

Driven in part by the above market trends, timberland investors and managers have started to incorporate potential carbon values into their valuations and investment strategies. The inclusion of carbon values in the investment calculus of properties in certain regions with lower traditional stumpage values is suspected to have contributed to strikingly robust transaction prices in some recent timberland sales.

For example, a large timberland property in the U.S. lake states, with no differentiating attributes from other properties in the region, traded for an implied purchase price of US$1,017 per acre[1] in 2021, compared with the regional five-year average price of US$636 per acre, a value that until now has varied little over the past five years.[2] Manulife Investment Management's 2021 purchase of 90,000 acres of Maine timberland included the commitment to build carbon inventory to progress the company's climate action plan. And IKEA has secured 1.3 million acres in the U.S. South over the past four years with the stated intent of using the properties to meet corporate carbon net zero goals.

With prices for carbon credits expected to rise, the economic rationale for carbon-focused investment in timberland will improve, enabling investors with carbon-oriented objectives to be increasingly competitive with those focused on commercial timber production. Current high-quality carbon credit values in voluntary carbon markets are in the range of approximately US$6 to US$15 per tonne, which allows carbon-focused timberland investors to be competitive in regions in the United States with significant timber resources but less concentrated commercial timber demand, such as the Northeast, the lake states, and Northern California. Based on current carbon prices, carbon-oriented projects tend not to be directed to regions with more intensively managed plantations, such as those in the most developed commercial timber markets in the U.S. South or West Coast; however, the anticipated climb in carbon prices may challenge the status quo. As the relative price of carbon credits converges with the values generated by a particular region's timber production, stumpage prices in that region could be pushed higher to motivate landowners to continue to produce timber for in-place forest product facilities.

Lumber, wood panels, and other forest product mills may also need to adapt to changes in timber supply due to a shift to more carbon-oriented timberland management regimes, as well as to changes in demand tied to a shift away from concrete and steel construction to wood-based building systems with a much lower carbon profile. Carbon-focused timberland owners could delay or defer timber harvests, moderating the available supply of logs and potentially altering the size distribution of logs available to lumber mills. If the proportion of older, larger logs were to increase substantially, sawmills would have to adapt their equipment or invest in

new facilities that could efficiently process the larger dimension logs. This potential adaptation of the forest processing industry to an increased supply of larger logs might be similar to the major retooling of British Columbia's lumber mills necessary to accommodate the surge in supply of small, dead sawlogs that were salvaged in the wake of the mountain pine beetle infestation that occurred in the late 1990s. British Columbia responded by scaling up processing capacity by an additional four billion board feet over four years, at an estimated cost of over US$400 million.[3]

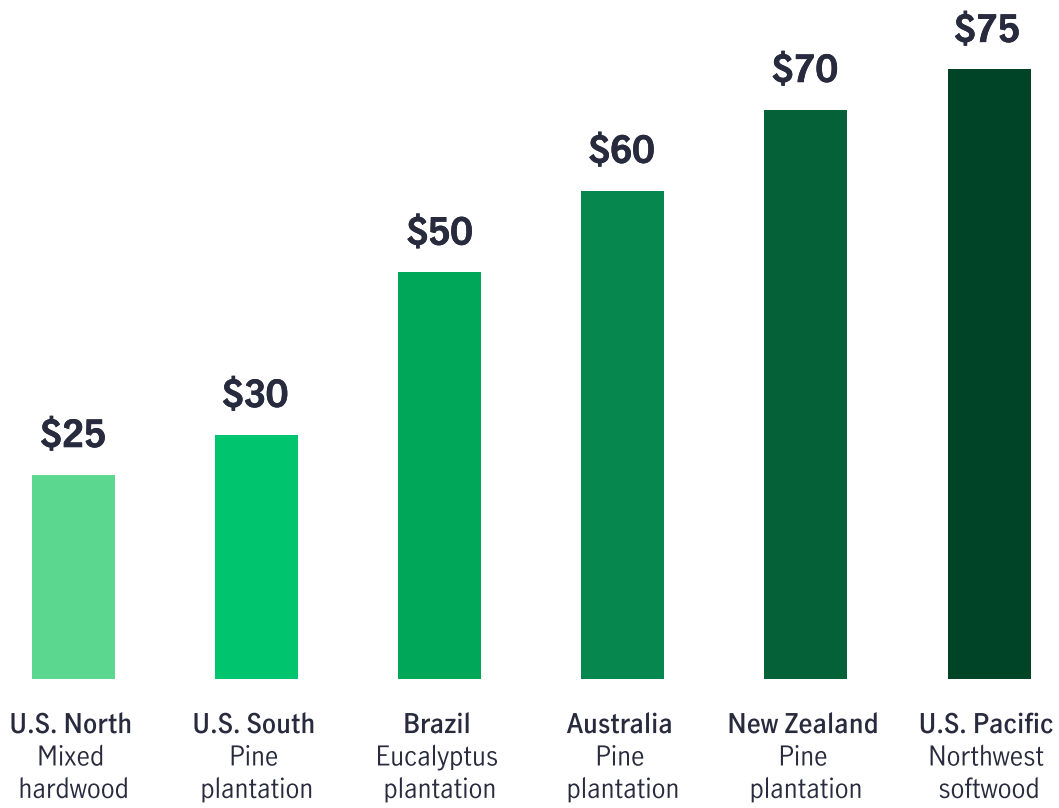
With the growing commitment to carbon-focused management by different types of private timberland owners, regional timber availability may become more constrained and could result in forest product companies adapting raw material sourcing strategies to increase security of supply. Mills could increase acquisitions and direct management of nearby, or logistically feasible, timberlands and more actively engage with large, neighboring timberland owners in formal, long-term supply agreements.

Timberland owners are likely to demand higher carbon prices to compensate for delayed harvesting

In core timberland supply regions such as the U.S. South or Pacific Northwest, our research estimates that carbon credit prices for forest carbon removal projects would need to rise from recent average levels of US$7 per tonne to motivate timberland owners to accept a long-term delay in harvesting in favor of accumulating carbon stocks on their properties. If the price of forest carbon credits were to reach an average US$30 per tonne, potential carbon returns would approach parity with current expected returns for traditional timber production management on a U.S. southern pine plantation. Similarly, the carbon price required to put the financial returns of carbon management at parity with a U.S. Pacific Northwest timberland property managed on a timber production regime is nearly US$75 per tonne.

Carbon prices necessary to shift from traditional timberland investment management vary

Price of carbon, US$/tonne



Source: Manulife Investment Management research, July 2022. Break-even prices represent the level of carbon price at which carbon projects yield returns equivalent to timber production-focused management.

Many aspects of the forest carbon market are still actively in development, but timberland owners will need to build out their resources to stay current, engaged, and capable of responding to markets and policy developments if they're to successfully incorporate carbon values into their investment strategy and on-the-ground management plans. Areas adding risk and requiring a keen focus include changes to protocol requirements, evolving quality and integrity standards, and governance in protocol interpretation to meet carbon additionality requirements.

Timberland markets are already adapting to new patterns of investing and managing timberland to account for carbon values. And incorporating carbon values into the timberland investment process and property management plans provides greater

optionality for reaching a range of financial and environmental goals. Meanwhile, the rapid growth of new wood-based building systems for multistory buildings is creating a significant extension to the long-term storage capacity of CO_2 captured by forests in the built environment. Depending on how this new layer of carbon sequestration is incorporated into global net zero accounting, the dividing line between the management of timberlands for carbon sequestration, as opposed to timber production, may become more blurred. This further supports timberland owners retaining optionality in their longer-term management planning, and the explicit inclusion of carbon values into all aspects of the timberland investment process builds on well-established sustainable management practices that are the bedrock of the timberland asset class.

1 "Timberlands Market Report," Fastmarkets RISI, April 7, 2022. 2 NCREIF Timberland Index, as of Q4 2021.

3 Fastmarkets RISI, as of March 2022; Manulife Investment Management research, as of August 2022.

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